

UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION  
OFFICE OF THE ADMINISTRATIVE LAW JUDGES  
Washington, D.C.



In the Matter of

ECM BioFilms, Inc.,  
a corporation, also d/b/a  
Enviroplastics International,

Respondent.

Docket No. 9358

PUBLIC VERSION REDACTED

**RESPONDENT ECM BIOFILMS' MOTION TO COMPEL AND TO SANCTION  
COMPLAINT COUNSEL FOR VIOLATION OF DISCOVERY RULES**

Pursuant to Rule 3.31 and 3.38, Respondent ECM BioFilms, Inc. (ECM) hereby moves this Court to compel Complaint Counsel to engage in a diligent search and thereafter confirm to this Court on or before April 1, 2014 that it has in fact produced to ECM all documents responsive to ECM's document production requests. ECM also moves for sanctions in light of Complaint Counsel's admitted failure to perform a diligent search of its records responsive to ECM's document production requests, for Complaint Counsel's withholding of numerous responsive documents identified below, and for Complaint Counsel's false representation to this Court and cover-up regarding its receipt of the article entitled, "Biodegradation of Bioplastics and Natural Fibers During Composting, Anaerobic Digestion and in Soil." ("Article").

[REDACTED]

[REDACTED] On December 3, 2013, Respondent served Complaint

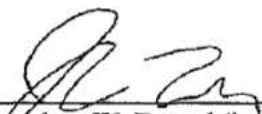
Counsel with its first set of document production requests. *See* Exh. RX-D. Requests numbered 1, 3, and 9 therein would require production of the Article and the correspondence related to it. In Complaint Counsel's response thereto, none of those responsive documents was produced. On February 28, 2014, Respondent served Complaint Counsel with its second set of document production requests. *See* Exh. RX-E. Requests numbered 1, 3 and 21, and 23 therein would require production of the Article and the correspondence related to it. In Complaint Counsel's response thereto, none of those responsive documents was produced. The uncontroverted record confirms that [REDACTED]

Accordingly, beyond peradventure of doubt, Complaint Counsel withheld a large quantity of responsive documents. Indeed, on March 10, 2014, in its Opposition, Complaint Counsel even falsely represented to this Court that it did not possess the Article in question until February 14, 2014, recanting in its Clarification of March 13, 2014 only after receipt on February 28, 2014, of a copy of ECM's subpoena *duces tecum* to Article author Michel. *See* J. Cohen Dec. ¶6 *cf.* CC Clarification Regarding Resp. Sanctions Mot. at 1. That subpoena included requests which required production of the Michel/FTC correspondence, thus ensuring revelation of the documents FTC Counsel withheld.

Given the large number of responsive documents withheld, the length of the withholding, and the cover-up attempted in Complaint Counsel's March 10, 2014 Opposition, severe sanctions are appropriate. Respondent hereby requests that, at a minimum, this Court:

- 1) Censure Complaint Counsel, and refer this matter for further investigation by Scott Wilson, FTC Inspector General, and Wallace E. Shipp, Jr., D.C. Bar Counsel, Board of Professional Responsibility;
- 2) Compel Complaint Counsel to perform a diligent search of all FTC files and produce all documents responsive to ECM's document production requests on or before April 1, 2014 and certify to this Court that complete production has been achieved as of that date;
- 3) Exclude the Article from evidence and preclude Complaint Counsel from relying on the Article and any reference to Michel in the hearing;
- 4) Summarily deny Complaint Counsel's pending motion for certification and to extend discovery and hearing dates;
- 5) Extend ECM's fact discovery deadline for at least 30 days for the limited purpose of allowing ECM the opportunity to conduct additional discovery from Michel, OSU, and others involved in the Article, including, but not limited to FTC personnel and Complaint Counsel.

Respectfully submitted,



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Jonathan W. Emord (jemord@emord.com)  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938

DATED: March 19, 2014

UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION  
OFFICE OF THE ADMINISTRATIVE LAW JUDGES  
Washington, D.C.

In the Matter of

ECM BioFilms, Inc.,  
a corporation, also d/b/a  
Enviroplastics International,

Respondent.

Docket No. 9358

PUBLIC VERSION REDACTED

**RESPONDENT'S MEMORANDUM IN SUPPORT OF ITS MOTION TO COMPEL AND TO SANCTION COMPLAINT COUNSEL FOR VIOLATION OF DISCOVERY RULES**

Pursuant to Rules 3.31 and 3.38, ECM BioFilms, Inc. (ECM), hereby moves the Court to:

(1) censure Complaint Counsel for wrongful withholding of documents responsive to Respondent's discovery requests and refer this matter for further investigation by Scott Wilson, FTC Inspector General, and Wallace E. Shipp, Jr., D.C. Bar Counsel, Board of Professional Responsibility; (2) compel Complaint Counsel to perform a diligent search of all FTC files and produce all documents responsive to ECM's document production requests on or before April 1, 2014, and certify to this Court that complete production has been achieved as of that date; (3) exclude the article entitled "Biodegradation of Bioplastics and Natural Fibers During Composting, Anaerobic Digestion and in Soil" (Article) from evidence and preclude Complaint Counsel from relying on the Article and any reference to Michel in the hearing; (4) summarily deny Complaint Counsel's pending motion for certification and to extend discovery and hearing dates; (5) extend ECM's fact discovery deadline for at least 30 days for the limited purpose of allowing ECM the opportunity to conduct additional discovery from Dr. Michel, OSU, and

others involved in the Article, including, but not limited to FTC personnel and Complaint Counsel.

By Complaint Counsel's own admission, FTC attorneys investigating ECM had possession of the Article since February 2013, fully 10 months before ECM's first document production request and 1 year before ECM's second request. Complaint Counsel intentionally withheld the responsive document until February 19, 2014 on the second day of the deposition of ECM President Robert Sinclair and continued to use the document, despite objection, in the deposition of Dr. Timothy Barber.

### **BACKGROUND**

The withheld Article (first supplied to ECM on February 19, 2014 in the deposition of Robert Sinclair) and 25 emails with Michel and attachments thereto (first supplied to ECM on March 18, 2014) were responsive to multiple ECM document requests, including Requests numbered 1, 3, and 9 in ECM's first set of requests and Requests numbered 1, 3 and 21, and 23 in ECM's second set of requests.

On February 28, 2014, Complaint Counsel opposed Respondent's Motion for Sanctions for Complaint Counsel's misconduct in the deposition of Robert Sinclair, declaring under oath that:

- "Complaint Counsel received the Ohio State Study (unsolicited) well after business hours on Friday, February 14, 2014, at approximately 8:00 PM..." *See* J. Cohen Dec. ¶6 (March 10, 2014)
- "Complaint Counsel has not communicated in any way with Frederick Michel, Eddie Gómez, OARDC, or anyone at Ohio State." *Id.* at ¶7.

But on February 28, 2014, Complaint Counsel received from ECM a copy of ECM's subpoena *duces tecum* to the author of the Article. See Exh. RX-F-1 (Copy of Michel Subpoena); Exh. RX-F-2 (Email to Complaint Counsel). In that subpoena, ECM demanded production of all correspondence between Michel and the FTC. It was then necessarily apparent to Complaint Counsel that ECM would likely obtain documents that had theretofore not been produced.

On March 13, 2014, Complaint Counsel filed a "Clarification" regarding ECM's pending Sanctions Motion. Complaint Counsel therein admitted to the withholding:

- FTC Complaint Counsel had directly communicated with Frederick Michel. See CC Clarification Regarding Resp. Sanctions Mot. at 1 (March 13, 2014)
- FTC Complaint Counsel employed Mr. Michel as a consulting expert in other investigations concerning biodegradable claims. *Id.*
- One of FTC Complaint Counsel investigated ECM during the agency's pre-Complaint investigation.
- As of November 16, 2012, FTC attorneys received a draft copy of the Article before it was published. *Id.*
- Complaint Counsel was *only now* "reviewing [their] prior discovery responses expeditiously to ascertain whether Complaint Counsel should amend or supplement them." *Id.* at 2.

See also Exh. RX-L (CC Supp. Initial Disclosures).

Not until March 18, 2014, only after ECM had informed Complaint Counsel in a meet and confer of March 17, 2014 of ECM's intention to file the instant motion, did Complaint Counsel provide ECM a "Supplemental Disclosure." See CC Supp. Initial Disclosures (March

18, 2014). The disclosure revealed that [REDACTED]  
[REDACTED] see Exh. RX-C-1, that [REDACTED]  
[REDACTED] see Exh. RX-G  
[REDACTED] and that Complaint Counsel withheld from ECM the Article,  
[REDACTED] since December 3, 2013 despite  
ECM document requests calling for those documents to be produced. See Exh. RX-D; Exh. RX-  
E.

The prejudice to Respondent is substantial: Respondent has been denied access to this information which shows agency collusion, expert bias, and non-disclosure of financial sources competitive to ECM through almost the entirety of the fact discovery phase, thereby handicapping ECM in its ability to marshal full evidence of collusion, bias, and conflict of interest. Further ECM discovery is therefore warranted to undue the harm caused by Complaint Counsel's wrongful withholding.

#### ARGUMENT

Complaint Counsel must abide by the same discovery standards that govern ECM. See generally FTC Rule 3.31 (16 C.F.R. § 3.31); see also *Republic of China v. Nat'l Union Fire Ins. Co. of Pittsburgh, Pa.*, 142 F. Supp. 551, 556 (D. Md. 1956). Complaint Counsel's wrongful withholding, related false representations to the Court, and cover-up are sanctionable. See Rule 3.38(b) (16 C.F.R. 3.38(b)). Sanctions for the discovery violations present here are warranted. See *In the Matter of Basic Research, et. al.*, 9318, 2005 WL 3524918 at2-3 (F.T.C. Nov. 22, 2005).

A penalty must be exacted that will deter the misconduct by Complaint Counsel in the future. See *Bonds v. D.C.*, 93 F.3d 801, 808 (D.C. Cir. 1996).

**A. The FTC Failed to Diligently Search For Responsive Documents In Violation of Its Obligations Under Rules 3.31 and 3.37**

Complaint Counsel altogether failed to honor key discovery obligations. Complaint Counsel declared under oath that its responses to Respondent's discovery requests were complete. *See* Exh. RX-H. They were not. Complaint Counsel confirmed production of all responsive documents. *See* Exh. RX-H. That was false. Complaint Counsel were obligated to engage in a comprehensive search for, and to produce all, documents responsive to ECM's discovery requests. *See* Rule 3.31(c)(2). They did not. There is no indication that Complaint Counsel employed, "at a minimum, a reasonable procedure to distribute discovery requests to all employees and agents of [Complaint Counsel and the FTC] potentially possessing responsive information, and to account for the collection and subsequent production of the information to [ECM]." *Nat'l Ass'n of Radiation Survivors v. Turnage*, 115 F.R.D. 543, 556 (N.D. Cal. 1987). Complaint Counsel "are custodians of the case files and records, which include all materials obtained during investigation and litigation, and are thus responsible for their safekeeping and proper disposition."<sup>1</sup> Federal Trade Commission Operating Manual, Chapter 10, Sec.13.6.4.3.

Complaint Counsel's failure to perform even a reasonable inquiry of its own records compounds the flagrant, strategic misconduct at Sinclair's deposition. Despite admitting withholding, Complaint Counsel have provided no assurance that they will search for and *produce all* responsive documents. *See* CC Clarification Regarding Resp. Sanctions at 2.

<sup>1</sup> Also available at <http://www.ftc.gov/sites/default/files/attachments/ftc-administrative-staff-manuals/ch10administrativelitigation.pdf> (last visited March 18, 2014).



**B. There Is No Justification for Complaint Counsel's Failure to Search for, and "Timely" Disclose, Responsive Documents**

In its "Clarification," Complaint Counsel offers no sound justification for its withholding of materials responsive to Respondent's discovery requests.

[REDACTED]

In Complaint Counsel's first iteration of the facts, in a sworn affidavit appended to its Opposition, Complaint Counsel somehow failed to find what they gratuitously (and erroneously) touted as an article "devastating" to ECM's case until Friday February 14, 2014 (despite the fact that the Article had been in Complaint Counsel's possession [REDACTED] See J. Cohen Dec. ¶7 (March 10, 2014). Without [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

See Exh.'s RX-I-2; RX-J; RX-G.

**C. Complaint Counsel's Misconduct Has Severely Prejudiced ECM in the Preparation of its Defense**

The ALJ may consider prejudice to a party's ability to prepare its case when determining appropriate sanctions. *Batson v. Neal Spelce Associates, Inc.*, 765 F.2d 511, 514 (5th Cir. 1985).

Complaint Counsel's failure to search comprehensively for and timely produce discovery; its wrongful withholding; and its cover-up of responsive documents has indeed prejudiced Respondent, preventing it from having sufficient opportunity and time to adduce before the close of fact discovery all facts related to the bias, misconduct, and conflict of interests present, which impugn the integrity of Complaint Counsel's case and help explain why Complaint Counsel takes various positions in this litigation. See *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d 76, 103 (2d Cir. 2008); see *Richardson v. City of Spokane, Wa.*, 12-CV-0577-TOR, 2013 WL 6795902 (E.D. Wash. Dec. 23, 2013) ("[Defendant's] inability to get information from Plaintiff almost certainly hinders their ability to develop a defense") (Order re: Defendant's Motion to Dismiss, Etc.). Every opportunity to evaluate science upon which Complaint Counsel depends to determine its validity is an essential aspect of Respondent's case in these proceedings. See *Hickman v. Taylor*, 329 U.S. 495, 507 (1947) (noting that, "Mutual knowledge of all the relevant facts gathered by both parties is essential to proper litigation").

Further, Complaint Counsel's multiple violations, which by themselves demonstrate willfulness, compound the prejudice against Respondent and call for a limited change in

procedural deadlines to secure equanimity in discovery and a meaningful rebuke. *See Arias v. Dyncorp Aerospace Operations, LLC*, 677 F. Supp. 2d 330, 332 (D.D.C. 2010).

#### **D. Relief**

The ALJ has broad discretionary power to impose sanctions. *See* 16 C.F.R. § 3.38(b). Rule 3.38(b)(4); Fed. R. Civ. P. 37(c)(1) (“If a party fails to provide information...the party is not allowed to use that information...to supply evidence on a motion, at a hearing, or at a trial, unless the failure was substantially justified or is harmless”).

First, Complaint Counsel’s wrongful withholding of documents responsive to ECM document production requests, false representations concerning the receipt of the Michel article to this Court, and (following receipt of proof that by subpoena ECM would obtain the previously secreted documents) admission in its Clarification of its withholding, all justify severe sanctions against Complaint Counsel.

Second, because of the large number of responsive documents withheld and the related misconduct mentioned above, Complaint Counsel should be ordered to perform a diligent search to uncover all documents responsive to ECM’s document production requests and produce them to ECM with a certification to this Court from Complaint Counsel that the search has been performed and that, indeed, all responsive documents have been supplied, that to occur by April 1 or such other date certain as established by the Court.

Third, Respondent requests exclusion from evidence of the Article and that no witness be allowed to use or rely on it in any manner or to make reference to Michel at hearing. Complaint Counsel’s repeated violations concerning the Article must be viewed in tandem when considering appropriate sanctions. *Benitez-Garcia v. Gonzalez-Vega*, 468 F.3d 1, 5 (1st Cir.

2006). Respondent's requested relief is, at a minimum, directly proportional to the FTC's egregious violations. *See Moore v. City of Chicago*, 02 C 5130, 2006 WL 1710234 (N.D. Ill. June 14, 2006). Had the Article, the Michel correspondence with FTC, and the attachments thereto, along with evidence of FTC payment to Michel for his service as an undisclosed consultant, been available to ECM within 60 days of the delivery of the first document request to Complaint Counsel (i.e., on or about February 3, 2014), ECM would have (in advance of depositions of ECM, ECM personnel, and Dr. Barber) reviewed the Article and evidence extensively with its experts, would have subpoenaed all underlying data and evidence concerning the Article, would have deposed Michel and all others involved in the publication and use of the Article before the aforementioned depositions, and ECM would not have been prejudiced by what became Complaint Counsel's ambush use of the Article in the deposition of ECM principal Sinclair. ECM was denied the opportunity for this discovery before key discovery events and the February 28, 2014 cut off.

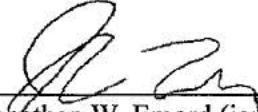
Fourth, ECM requests that the pending motion to certify and request for extension of the discovery and hearing deadlines be summarily denied in light of Complaint Counsel's misconduct. *See* Rule 3.38(b).

Fifth, ECM requests a limited 30 day extension of the discovery deadline to enable it to explore in full the bias and conflicts infecting Michel and related to the Michel/FTC relationship. The Court may authorize "for good cause" additional discovery of materials in the possession and control of the FTC. *See* Rule 3.31(c)(2). Respondent requests the opportunity to depose Complaint Counsel who worked with Michel and who performed document searches within the agency to discover all relevant information about the Article, Michel, bias and conflicts, and the sufficiency of Complaint Counsel's document search.

**CONCLUSION**

For the foregoing reasons, Respondent respectfully requests that this Court impose the above requested Order to Compel and for Sanctions.

Respectfully submitted,



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Jonathan W. Emord (jemord@emord.com)  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938

DATED this 19th day of March 2014.

**STATEMENT CONCERNING MEET AND CONFER**

Pursuant to Rule 3.22(g), 21 C.F.R. § 3.22(g), the undersigned counsel certifies that, on March 17, 2014, at approximately 1:00 PM EST, Respondent's counsel, Peter Arhangelsky and Lou Caputo, conferred by conference call with Complaint Counsel, Katherine Johnson, Elisa Jillson, and Jonathan Cohen, in a good faith effort to resolve by agreement the issues raised in the foregoing Motion for Sanctions. The parties have been unable to reach an agreement on the issue raised in the attached motion.


Respectfully submitted,

  
Jonathan W. Emord (jemord@emord.com)  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938

**STATEMENT CONCERNING CONFIDENTIALITY**

The undersigned Respondent's Counsel hereby states that the content of the foregoing motion and certain exhibits contain information properly designated by third party witnesses as "confidential" under the standing Protective Order in this case. Accordingly, ECM will submit a public version with the exhibit content redacted.

Respectfully submitted,

  
Jonathan W. Emord (jemord@emord.com)  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938

UNITED STATES OF AMERICA  
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In the Matter of

ECM BioFilms, Inc.,  
a corporation, also d/b/a  
Enviroplastics International,

Respondent.

Docket No. 9358

PUBLIC

**[PROPOSED] ORDER GRANTING RESPONDENT ECM BIOFILMS, INC.'S MOTION  
TO COMPEL AND FOR SANCTIONS**

This matter having come before the Administrative Law Judge on March 20, 2014, upon a Motion for Sanctions (“Motion”) filed by Respondent ECM BioFilms, Inc. (“ECM”) pursuant to Commission Rule 3.31 and 3.38, for an Order to compel and to sanction Complaint Counsel.

Having considered ECM’s Motion and all supporting and opposing submissions, and for good cause appearing, it is hereby ORDERED that ECM’s Motion is GRANTED and that Complaint Counsel is censured for their misconduct arising from this matter; ORDERED that such misconduct will be referred to Bar Counsel at the Washington, D.C. Board of Professional Responsibility for further investigation; ORDERED that Complaint Counsel shall perform a diligent search of all FTC files and produce all documents responsive to Respondent’s discovery requests and that Complaint Counsel shall certify to this Court, on or before April 1, 2014, that such search has been completed and responsive documents produced; ORDERED that Complaint Counsel shall be precluded from introducing into evidence or otherwise relying on, in support of any claim or defense, the article identified in Exhibit RX-B of Respondent’s Motion, entitled: Eddie F. Gomez and Frederick C. Michel Jr., “Biodegradability of conventional and

bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” *Polymer Degradation and Stability* 98 (2013) 2583-2591; DENYING Complaint Counsel’s pending motion for certification and to extend discovery and hearing dates; ORDERED that Respondent ECM BioFilm’s shall have an extended period of Fact discovery of up to 30 days to conclude discovery concerning the aforementioned Exhibit RX-B; and ORDERED that ECM shall have 30 days from the date of this Order to perform discovery related to Michel and also to FTC interaction with him.

ORDERED:

\_\_\_\_\_  
D. Michael Chappell  
Chief Administrative Law Judge

Date:



**CERTIFICATE OF SERVICE**

I hereby certify that on March 20, 2014, I caused a true and correct copy of the foregoing to be served as follows:

One hardcopy original and one courtesy copy to the **Office of the Secretary** through UPS Overnight mail:

Donald S. Clark, Secretary  
Federal Trade Commission  
600 Pennsylvania Ave., NW, Room H-113  
Washington, DC 20580  
Email: secretary@ftc.gov

One electronic courtesy copy to the **Office of the Administrative Law Judge**:

The Honorable D. Michael Chappell  
Administrative Law Judge  
600 Pennsylvania Ave., NW, Room H-110  
Washington, DC 20580

One electronic copy to **Counsel for Complainant**:

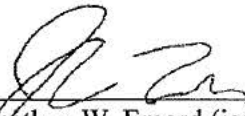
Katherine Johnson (kjohnson3@ftc.gov)  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580

Elisa Jillson (ejillson@ftc.gov)  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580

Jonathan Cohen (jcohen2@ftc.gov)  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580

I certify that I retain a paper copy of the signed original of the foregoing document that is available for review by the parties and adjudicator consistent with the Commission's Rules.

Respectfully submitted,

  
Jonathan W. Emord (jemord@emord.com)  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane

Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938

DATED: March 20, 2014

**RESPONDENT**

**EXHIBIT**

**RX-A**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**



**REDACTED**

**RESPONDENT**  
**EXHIBIT**  
**RX-B**



# Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation



Eddie F. Gómez, Frederick C. Michel Jr. \*

Department of Food, Agricultural and Biological Engineering, The Ohio State University, OARDC, 1680 Madison Avenue, Wooster, OH 44691, USA

## ARTICLE INFO

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Composting

Soil

Biodegradation

Bioplastics

## ABSTRACT

Plastics are a major constituent of municipal solid waste that pose a growing disposal and environmental pollution problem due to their recalcitrant nature. To reduce their environmental impacts and allow them to be transformed during organic waste recycling processes, various materials have recently been introduced to improve the biodegradability of plastics. These include conventional plastics amended with additives that are meant to enhance their biodegradability, bio-based plastics and natural fiber composites. In this study, the rate and extent of mineralization of a wide range of commercially available plastic alternative materials were determined during composting, anaerobic digestion and soil incubation. The biodegradability was assessed by measuring the amount of carbon mineralized from these materials during incubation under conditions that simulate these three environments and by examination of the materials by scanning electron micrography (SEM). The results showed that during a 660 day soil incubation, substantial mineralization was observed for polyhydroxyalkanoate plastics, starch-based plastics and for materials made from compost. However, only a polyhydroxyalkanoate-based plastic biodegraded at a rate similar to the positive control (cellulose). No significant degradation was observed for polyethylene or polypropylene plastics or the same plastics amended with commercial additives meant to confer biodegradability. During anaerobic digestion for 50 days, 20–25% of the bio-based materials but less than 2% of the additive containing plastics were converted to biogas ( $\text{CH}_4 + \text{CO}_2$ ). After 115 days of composting, 0.6% of an additive amended polypropylene, 50% of a plastarch material and 12% of a soy wax permeated paper pulp was converted to carbon dioxide. SEM analysis showed substantial disintegration of polyhydroxyalkanoate-based plastic, some surface changes for other bio-based plastics and coconut coir materials but no evidence of degradation of polypropylene or polypropylene containing additives. Although certain bio-based plastics and natural fibers biodegraded to an appreciable extent in the three environments, only a polyhydroxyalkanoate-based resin biodegraded to significant extents during the time scale of composting and anaerobic digestion processes used for solid waste management.

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## 1. Introduction

Plastics are synthetic and semi-synthetic polymeric compounds, derived primarily from fossil carbon sources such as crude oil and natural gas. Their mechanical properties and characteristics such as low-cost, durability and processability, have led to their widespread use for diverse applications. However most commonly used plastics are very resistant to biological degradation [1]. This has led to major challenges for waste management operations especially those that

are moving toward more sustainable waste management practices such as recycling, composting and anaerobic digestion.

It is estimated that of the 31 million tons of plastic waste generated annually in the U.S. only 8% is recycled [2]. Therefore, a large percentage of plastic waste is currently landfilled, or released into the environment. Throughout the world, roadsides, parks, beaches, oceans and natural areas are inundated with plastic debris pollution [3]. Waste management systems are also affected by high volumes of plastics that are often commingled with organic wastes (food scraps, wet paper, yard trimmings, soil and liquids), making it difficult and impractical to recycle both organic fractions and/or the plastics mixed with them without expensive cleaning, separation and sanitizing procedures [4].

\* Corresponding author. Tel.: +1 330 263 3859; fax: +1 330 263 3670.  
E-mail address: [michel.36@osu.edu](mailto:michel.36@osu.edu) (F.C. Michel).

The fact that plastics are made from non renewable resources and their persistence in the environment and during organic recycling has resulted in global concern and intensive efforts to develop plastic materials that not only have acceptable prices and similar performance to conventional plastics, but also are made from renewable feedstocks and/or undergo biodegradation in a reasonable amount of time without leaving toxic residues [5].

Although biodegradable bio-based plastics are meant to improve the sustainable use of resources, a complete life-cycle analysis including disposal must be conducted [6] to insure that the solution is not worse than the problem. Many factors impact the life-cycle carbon balance of plastics including the source of the feedstock used to make them, whether the material is recycled and the extent and type of biodegradation during disposal. For example, most plastics are derived largely from fossil sources such as natural gas or crude oil [7]. However the monomers used to make them can also be made from renewable resources. In Brazil, ethylene, the building block of one of the most widely used plastics, polyethylene [8] is made from ethanol derived from sugar cane. Although made from a biomass feedstock, this type of polyethylene is still essentially not biodegradable. On the other hand, petroleum can also be used to make plastics that are biodegradable. The lactic acid used to make polylactic acid (PLA) can be produced both by fermentation and synthetically from petroleum [9], and either type is biodegradable. On this basis, plastics can be classified into four types with respect to whether they are biodegradable and the source of the feedstock used to make them. These four types are conventional plastic, bio-based plastic, biodegradable plastic and biodegradable bio-based plastic (Table 1). Understanding the environmental benefits of these four classes of materials (Table 1) and the impact of their use on GHG emissions can be confusing and is not always straightforward.

Plastics made from petroleum, such as polyethylene, have a well-defined life cycle. When landfilled, the carbon in the plastic will be sequestered and not contribute to global warming. Recycled polyethylene may contribute even less fossil CO<sub>2</sub> to the environment if less energy is used to recycle it than is used to make it in the first place. In these cases, conventional plastics may have less impact on GHG emissions than those designed to biodegrade.

For reasons presented above, efforts have been made to develop durable plastics made from renewable biomass feedstocks [5]. These are called “bio-based plastics”. On balance this type of plastic offers a great potential to reduce greenhouse gases in the atmosphere by sequestering carbon. This is because atmospheric CO<sub>2</sub> is fixed into the carbohydrates used as their feedstock. If the plastic is eventually landfilled, this carbon will become locked for millennia within the landfill and on balance reduce atmospheric CO<sub>2</sub>. However these plastics also pose pollution problems [10].

Biodegradable bio-based plastics, are also made from biomass but are designed to be compostable and/or biodegradable. These types include PLA and polyhydroxyalkanoates-based resins (PHA)

made from corn. This class of polymer is carbon neutral from the standpoint of the carbon in the plastic, but a substantial amount of fossil energy is used to produce the plastic and the biomass feedstocks.

The class with perhaps the greatest potential to contribute to greenhouse gas emissions is biodegradable plastics made from petroleum. This is because not only is fossil energy used to produce them in the first place, but fossil carbon is released when the material ultimately biodegrades. If this biodegradation occurs in a landfill, then it usually will generate methane (CH<sub>4</sub>), which is a greenhouse gas with 21 times the warming potential of CO<sub>2</sub>. Most landfills do a poor job of capturing this gas, even those with methane recovery systems [11]. So landfilled biodegradable plastics, eventually contribute both methane and carbon dioxide to the atmosphere when they degrade.

Some novel polymers combine both biomass and fossil derived resins to decrease production prices, increase the bio-based content and improve material performance [5] (e.g. a plastarch containing a blend of a starch-based polymer and conventional plastics such as polypropylene). The biogenic renewable carbon contained in these and other biomaterials can be determined from the radioactive C<sub>14</sub> signature of the product [12]. Yet these hybrid materials likely are neither recyclable nor completely biodegradable and therefore are likely worse than conventional plastics from a GHG emissions perspective.

Composting plays an important and growing role in sustainable organic waste management and recycling. However, plastics are one of the main contaminants in composts. Biodegradable plastics are meant to address this problem. Composting of these materials also reduces their environmental impact in that they will largely be converted to CO<sub>2</sub> and not to CH<sub>4</sub> as they would be in a landfill. Since this CO<sub>2</sub> was originally fixed from the atmosphere into renewable biomass, on balance it will not increase atmospheric CO<sub>2</sub>.

Biodegradation is the mineralization of materials as a result of the action of naturally-occurring microorganisms such as bacteria and fungi [13]. The biodegradation of plastics is limited by their molecular weight, chemical structure [14], water solubility and the fact that most plastics are xenobiotic. That is, they were not present in the environment until very recently so that the evolution of metabolic pathways necessary for their biodegradation, a process that takes millions of years, has yet to occur.

In contrast, the biodegradation of natural polymers, such as starch or cellulose by microorganisms occurs relatively rapidly. It begins with the excretion of extracellular enzymes that depolymerize these materials. Once the polymer is reduced to a size that is water soluble and able to be transported through the cell wall, microbial metabolic pathways can then mineralize it [15]. Even though microorganisms drive the biodegradation process, other non-biotic chemical processes such as photo-oxidation and chemical degradation may also take place before or in parallel.

Biodegradable materials are used in diverse applications. Many different biodegradable plastics are used for food packaging and for waste containment. They have also been developed for medical applications, including medical devices and for drug delivery [16]. Biodegradable plastics are used widely in agriculture, as mulching films and low tunnels [17,18] as well as guide strings and plant nursery containers [19]. The physical properties and performance of biodegradable plastics made from PLA and natural fibers were found to be similar to conventional plastics for greenhouse crop production [20]. In addition, biodegradable potting containers have gained a high degree of acceptance among consumers [21].

Recently, various materials have begun to be marketed that claim to be biodegradable or compostable. Terms such as “degradable”, “oxo-biodegradable”, “biological”, “compostable” and “green” are often used to describe and promote different

**Table 1**  
Classes of plastics.

Class	Source	Biodegradable	Example	Reference
I	Petroleum/natural gas	No	Polyethylene, polypropylene.	[7]
II	Petroleum/natural gas	Yes	PLA <sup>a</sup> from petroleum.	[9]
III	Biomass (Corn, sugar cane, etc)	No	Polyethylene derived from corn ethanol.	[8]
IV	Biomass (Corn, sugar cane, etc)	Yes	PHA <sup>b</sup> , PLA derived from starch.	[14]

<sup>a</sup> Polylactic acid.

<sup>b</sup> Polyhydroxyalkanoates-based resin.

plastics. These materials include conventional plastics amended with additives meant to enhance biodegradability as well as bio-based plastics and natural fiber composites. There has been little research on the extent to which these materials truly degrade and/or biodegrade over the time scale of waste management processes such as composting and anaerobic digestion (AD) or in natural settings [22].

The objective of this study was to compare the relative biodegradability of a range of novel plastics and natural fiber composites during composting, AD and in soil conditions. The hypothesis was that materials that are referred to as biodegradable, compostable (or similar terms), and plastics containing additives designed to enhance biodegradability, mineralize during the time scale of waste treatment processes and in reasonable amounts of time in the environment and at rates comparable to natural materials known to be biodegradable and or compostable (e.g. cellulose paper).

## 2. Materials and methods

Standardized laboratory-scale experiments were conducted to study the biodegradability of various materials during soil incubation, composting and AD conditions [23–25]. The extent of biodegradation was calculated by measuring the average carbon ( $\text{CO}_2$  and or  $\text{CH}_4$ ) mineralized from each treatment minus the average carbon evolved from blanks, and dividing this by the total amount of sample carbon added to each treatment. Reactors containing only the inoculum (AD), soil (soil tests) or compost (compost tests) were used as blanks.

### 2.1. Materials

Materials tested included plastics designed to be biodegradable, conventional plastics amended with additives that are meant to enhance biodegradability, bio-based plastics and natural fiber composites (Tables 2 and 3). The positive and negative controls used for all experiments were cellulose paper (Fisher Scientific, PA, U.S.) and 100% conventional polypropylene (PP), respectively. Materials were tested both after grinding (a preliminary soil experiment only) and as  $1 \times 1$  cm squares (thicknesses shown in Table 3).

### 2.2. Biodegradation in soil incubation

The extent of long-term biodegradation of polymeric materials in contact with soil was determined based on ASTM D5988-03 [24]. These included PP + 2% additive, polystyrene (PS) + 2% additive,

polyethylene terephthalate (PETE) + 1% additive, plastarch, a copolyester + corn-based plastic, a wheat starch-derived plastic and PHA (Tables 2 and 3). Six natural fiber composite materials were also tested: paper pulp, paper pulp + asphalt, coconut coir, rice hull, composted cow manure and peat fiber. All samples were incubated in triplicate for a period of 660 days.

The soil media used for the experiments was a mixture of 43% certified organic top soil, 43% no-till farm soil collected at coordinates: 40.778633, -81.930873 and 14% sand. Soil was sieved to less than 2 mm particle size and large plant materials, stones, and other inert materials were removed. The chemical properties of the soil mixture are shown in Table 4. The soil media was amended with ammonium phosphate (Fisher Scientific, PA, U.S.) to maintain a C:N ratio of 20:1 based on the carbon content of the test specimen.

The soil mixture (300 g dry) was placed in the bottom of a 2-L (working volume) wide mouth jar (Ball® Corporation, item # 383178). Distilled water was added to bring the moisture content of the mixture to 60% of the moisture holding capacity. The test specimens (1 g of sample carbon) were then mixed thoroughly into the soil. A solution containing 20 ml of potassium hydroxide (KOH) 0.5 N (Fisher Scientific, PA, U.S.) was placed in a cup suspended from the lid of each vessel to trap evolved  $\text{CO}_2$ . All vessels were sealed and incubated at room temperature ( $20 \pm 2$  °C).

Carbon dioxide produced in each vessel reacted with the KOH in the cup to form potassium bicarbonate. The amount of  $\text{CO}_2$  produced was determined by titrating the KOH solution with 0.25 N hydrochloric acid (Fisher Scientific, PA, U.S.) to a phenolphthalein end-point. The experiment was designed so that the headspace volume was sufficient to prevent the oxygen concentration in the vessel from falling below 18%. The KOH traps were removed and titrated at time intervals that assured that their absorption capacity was not exceeded. The KOH traps were refilled at a rate dependent on the rate of  $\text{CO}_2$  generation in each flask. At the time of removal of the traps, the vessel was flushed and allowed to sit open to allow fresh air to fill the headspace. In addition, distilled water was added to the soil to the original weight to maintain adequate moisture.

The effect of particle size on biodegradation rate was determined by comparing the biodegradability of 1 cm squares to ground samples. Samples were ground in liquid nitrogen using a IKA® A11 basic Analytical mill (IKA® Works Inc., NC, U.S.) for 10 s. Test specimens included PP + 2% additive, co-polyester + corn-based plastic, wheat starch-derived plastic, paper pulp, paper pulp + asphalt, coconut coir and rice hull (Tables 2 and 3). Samples were incubated in triplicate for 660 days.

**Table 2**

Material information for commercially available bio-based plastics, plastics amended with additives and natural fiber composites.

Material	Material description	Formation process <sup>a</sup>
PP + 2% additive	Blend of polypropylene (PP) with 2% ECM MasterBatch Pellets™ additive (ECM BioFilms Inc., OH, U.S.)	1
PS + 2% additive	Blend of polystyrene (PS) with 2% ECM MasterBatch Pellets™ additive (ECM BioFilms Inc., OH, U.S.)	1
PETE + 1% additive	Blend of polyethylene terephthalate (PETE) with 1% EcoPure® additive (Bio-Tec Environmental LLC., NM, U.S.)	2
Plastarch	A blend of polypropylene with corn starch.	3
Co-polyester + corn-based plastic	Blend of an aliphatic aromatic co-polyester with a corn starch-derived polymer (Ecobras™, BASF).	1
Wheat starch-derived plastic	Made from a wheat starch-derived resin (OP-47 Bio®, Summit Plastic Company, OH, U.S.)	3
PHA	Made from polyhydroxyalkanoates-based resin (Metabolix, MA, U.S.)	1
Paper pulp + soy wax	Paper pulp pot permeated with soy wax.	4
Paper pulp	Recycled (74% minimum) paper pulp.	4
Paper pulp + asphalt	Blend of recycled (74% minimum) paper pulp + asphalt.	4
Coconut coir	Made from coconut husk.	7
Rice hull	Made from rice hull.	5
Composted cow manure	Made from composted cow manure.	6
Peat fiber	Made from Canadian sphagnum peat moss + wood pulp.	6

<sup>a</sup> 1 = injection molding; 2 = blow molding; 3 = thermoforming; 4 = vacuum forming; 5 = compression forming; 6 = pressure forming; 7 = other.

**Table 3**  
Chemical and physical properties of the test specimens.

Material	Chemical and physical properties <sup>a</sup>				
	Total solids (%)	Volatile solids (%dw)	Total carbon (%dw)	Total nitrogen (%dw)	Film thickness (mm)
Positive	90.3 ± 5	57.4 ± 1.1	41.8 ± 0.1	0.03 ± 0.01	0.35 ± 0.01
Negative	99.8 ± 0.1	96.3 ± 2	82.9 ± 0.1	0.06 ± 0.003	0.37 ± 0.01
PP + 2% additive	99.8 ± 0.1	97.7 ± 0.1	82.9 ± 0.3	0.04 ± 0.01	0.37 ± 0.03
PS + 2% additive	99.9 ± 0.1	97.0 ± 1.5	88.8 ± 1	0.05 ± 0.01	0.23 ± 0.01
PETE + 1% additive	99.4 ± 0.5	99.9 ± 0.1	64.6 ± 0.1	0.01 ± 0.002	0.36 ± 0.01
Plastarch	90.9 ± 2.1	57.5 ± 3	60.9 ± 0.2	0.07 ± 0.01	0.48 ± 0.03
Co-polyester + corn-based plastic	95.2 ± 0.1	99.8 ± 0.1	51.9 ± 0.3	0.10 ± 0.01	0.72 ± 0.02
Wheat starch-derived plastic	97.8 ± 0.4	98.5 ± 0.5	49.4 ± 0.1	0.74 ± 0.004	0.50 ± 0.01
PHA	99.4 ± 0.4	90.4 ± 0.5	50.7 ± 0.3	0.45 ± 0.01	0.62 ± 0.01
Paper pulp + soy wax	94.3 ± 1	91.0 ± 0.4	46.9 ± 0.3	0.06 ± 0.01	2.14 ± 0.03
Paper pulp	92.0 ± 0.1	92.0 ± 0.1	42.1 ± 0.1	0.10 ± 0.01	2.74 ± 0.01
Paper pulp + asphalt	93.4 ± 0.5	90.6 ± 0.3	46.9 ± 0.03	0.22 ± 0.02	2.61 ± 0.1
Coconut coir	96.8 ± 0.3	98.5 ± 0.5	46.7 ± 0.3	0.26 ± 0.002	1.09 ± 0.02
Rice hull	94.0 ± 0.4	89.6 ± 0.4	38.3 ± 0.1	14.1 ± 0.06	1.24 ± 0.02
Composted cow manure	92.5 ± 0.1	89.4 ± 1.0	40.5 ± 0.01	1.12 ± 0.05	2.40 ± 0.1
Peat fiber	92.1 ± 0.3	97.8 ± 0.5	45.4 ± 0.3	0.49 ± 0.07	1.74 ± 0.05

<sup>a</sup> Values are means ± SD of three replicates.

### 2.3. Biodegradation during composting

Three materials were tested under simulated composting conditions. These included PETE + 1% additive, plastarch and paper pulp + soy wax (Tables 2 and 3). The experiments were conducted in triplicate for a period of 115 days.

The test conditions used were based on a protocol described in ASTM D5338-98 (2003) [25]. This test is a measure of the degree and rate of carbon conversion to CO<sub>2</sub> under conditions that mimic a commercial scale industrial composting facility.

An 80 g sample of each test specimen was mixed with 350 g dry of mature compost inoculum (Table 4). The compost inoculum was obtained from a full-scale windrow composting facility featuring a concrete surface and controlled aeration system at OARDC. The compost contained a mixture of dairy manure and hardwood sawdust as described elsewhere [26].

The compost was collected at various locations on the windrow and screened to less than 10 mm and large inert items were discarded. The screened compost was amended with ammonium phosphate (Fisher Scientific, PA, U.S.) to give a C:N ratio of 20:1 including the carbon content of the test specimen. The initial moisture content of the mixture was adjusted to 60% (wet-weight basis).

The compost and test specimens were incubated in 4-L (working volume) vessels (length 30 cm and diameter 15 cm), made of PVC pipe placed in a 55 °C incubator (BioCold Environmental Inc., MO, U.S.). Each vessel contained approximately 1100 g of material on a wet-weight basis. The reactors were aerated from below at 100 ± 1 ml/min to maintain aerobic conditions. To avoid drying during the experiment, air was saturated by bubbling

through bottles containing water at the incubator temperature. The air exiting the vessels was passed through flasks in a separate water bath set at 9 °C to condense moisture from the off-gas. The off-gas was then analyzed for percent CO<sub>2</sub> using an infrared gas analyzer (Vaisala model GMT 220, range 0–20%). CO<sub>2</sub> data was automatically recorded using a Campbell Scientific model 23XL data logger for each vessel every hour. Each vessel was also equipped with a K-type thermocouple to measure the temperatures of the composts mix near the center of the compost vessel, and was recorded automatically every 12 min. A more complete description of the laboratory-scale composting system can be found elsewhere [27].

### 2.4. Biodegradation during anaerobic digestion

The biodegradation of four materials was compared during high solids batch anaerobic digestion. These included PP + 2% additive, PETE + 1% additive, plastarch and a co-polyester + corn-based plastic (Tables 2 and 3). The experiments were conducted in triplicate for a period of 50 days.

The anaerobic degradation of the polymeric materials was compared under high-solids AD conditions based on a protocol described in ASTM D5511-02 [23] international standard. The test measured the conversion of samples to CO<sub>2</sub> and CH<sub>4</sub> during incubation under controlled anaerobic conditions. For this study test specimens were exposed to an active methanogenic inoculum derived from a full-scale anaerobic digester treating municipal sewage sludge. These conditions resemble those found in high-solids AD digestors and in biologically active landfills, but not in typical landfills where water is excluded and removed.

**Table 4**  
Initial mean characteristics of the aerobic and anaerobic organic substrates.

Organic substrate	Chemical and physical properties <sup>a</sup>				
	Total solids (% ww)	Volatile solids (% dw)	Total carbon (% dw)	Total nitrogen (% dw)	pH
Compost <sup>b</sup> inoculum	24.3 ± 2.0	88.9 ± 1.0	48.7 ± 5.5	2.37 ± 0.2	7.95 ± 0.04
Soil mixture <sup>c</sup>	87.4 ± 0.1	2.96 ± 0.1	1.19 ± 0.2	0.13 ± 0.02	7.43 ± 0.4
Anaerobic seed <sup>d</sup> sludge	8.92 ± 0.5	59.5 ± 2.0	36.8 ± 1.0	7.21 ± 0.2	8.30 ± 0.01
Medina County <sup>e</sup> OFMSW	47.2 ± 7.2	60.3 ± 1.2	89.6 ± 1.3	0.92 ± 0.2	7.50 ± 0.4

<sup>a</sup> Values are means ± SD of three replicates.

<sup>b</sup> Dairy manure and hardwood sawdust mature compost.

<sup>c</sup> This is the value before adding water to reach 60% of the water holding capacity.

<sup>d</sup> Methanogenically active municipal sewage sludge.

<sup>e</sup> OFMSW = the organic fraction of municipal solid waste.

The AD assays were conducted in 2-L (working volume) laboratory-scale batch reactors. Temperatures were maintained at a mesophilic ( $37 \pm 1$  °C) range by means of incubators. Test specimens (25 g of sample carbon) were mixed with 750 g wet of methanogenically active sludge obtained in October of 2010 from a full-scale (3000 m<sup>3</sup>) anaerobic digester located at the City of Akron wastewater treatment plant and operated by KB Compost Services, Akron, Ohio [28]. This was mixed with 187.5 g wet of the organic fraction of municipal solid waste (OFMSW) of the Medina County, Ohio Solid Waste District to achieve the desired solids content for the test and to provide supplemental nutrients for the anaerobic microbial consortia. The chemical properties of the seed sludge and OFMSW substrate are shown in Table 4. Ammonium phosphate (Fisher Scientific, PA, U.S.) was added to the mixture to adjust the C:N ratio to a value of 20:1 considering the carbon content of the test specimen.

The volumetric production and CO<sub>2</sub> and CH<sub>4</sub> content of the biogas produced in the AD experiments were analyzed by volume displacement and gas chromatography as described by Gómez et al. [28], respectively. This information was used to calculate the moles of carbon emitted from each reactor.

## 2.5. Analytical methods

Solids content in soil, organic substrates and test specimens was determined by drying samples to a constant weight at 80 °C. The volatile solids content was determined using an ashing oven set at 500 °C for 4 h. pH was determined using a pH electrode (TMECC 04.11-A 1:5 slurry method, mass basis). Carbon (TMECC 04.01-A combustion with CO<sub>2</sub> detection) and nitrogen content (TMECC 04.02-D oxidation, Dumas method) were determined by the Service Testing and Research laboratory at the OARDC.

Selected test specimens were also analyzed before and after soil incubation using scanning electron microscopy (SEM) (Hitachi S-3500N, Hitachi High Technologies America, Inc., CA, U.S.). Samples were coated with platinum to a thickness of 0.2 kÅ using a Hummer® 6.2 sputtering system (Anatech USA, CA, U.S.). A 15 Kv electron beam was applied.

## 2.6. Statistical analysis

Three independent replicates were used for each treatment. Analysis of variance (ANOVA) was calculated for the average final cumulative percent of carbon loss for each of the studies. Comparisons for all pairs of final cumulative biodegradation means were performed using Tukey–Kramer HSD analysis. All conclusions were based on a significant difference level of  $\alpha = 0.05$ . The statistical analyses were performed using JMP statistical program version 9 (SAS Institute Inc., SAS Campus Drive, NC, U.S.).

## 3. Results and discussion

### 3.1. Biodegradation during soil incubation

The importance of understanding the biodegradability of plastics in soil has increased since these are released inadvertently into the environment where they may persist. Plastics comprise a relatively large fraction of the ubiquitous pollution found worldwide in both land and ocean environments [29]. In addition, intensive and semi-intensive agriculture utilizes large quantities of these materials annually in the form of mulches, as plantable pots, nursery containers [30]. This has resulted in the recent development of biodegradable agricultural plastics for these applications [31,32]. One example of this is biodegradable plant nursery pots. Some containers are designed to be plantable pots (e.g. rice hull and

coconut coir) allowing them to degrade in the soil after planting, or to be composted at plant nurseries rather than being landfilled.

An initial experiment was conducted to assess the effect of particle size on biodegradation during soil incubation. Seven materials were tested and the amount of carbon converted to CO<sub>2</sub> was compared using student's *t* method for particle size effect. Student's *t* method revealed that out of the seven materials studied in this experiment, only one, a co-polyester + corn-based plastic, showed a significant effect of particle size on biodegradability. A significantly greater extent of biodegradation was observed for co-polyester + corn-based plastic in 1 × 1 cm square film form ( $55.1 \pm 2.1\%$ ) after 660 days as compared to a ground sample of the same material ( $39.71 \pm 2.4\%$ ). For the rest of the materials, there was not a significant effect of particle size on biodegradation. Results from this study suggested that for most of the materials studied, biodegradability in soil was not greatly affected by particle size under the experimental conditions used in the study.

A second soil experiment was conducted to evaluate the relative biodegradability of thirteen different test specimens in 1 × 1 cm square film form. These included bio-based plastics, plastics amended with additives that are meant to enhance biodegradability and natural fiber composites. The experiment was conducted for a period of 660 days. The initial moisture content of the mixes was  $16.6 \pm 2.1\%$  and the final mean soil moisture content on a wet-weight basis across all treatments was  $14.3 \pm 3.3\%$  (wet-weight basis) which is  $84.9 \pm 2.4\%$  of the 60% moisture holding capacity of the soil mixture. The positive control (cellulose paper) exhibited  $74.2 \pm 4.5\%$  conversion during the period of incubation.

For some bio-based plastics and the positive controls (cellulose paper), the initial rate of mineralization was rapid (Fig. 1). Most of the mineralization took place during the first 300 days of incubation (Fig. 1). The most rapid initial rate of conversion was observed for co-polyester + corn-based plastic with almost  $34.6 \pm 2.4\%$  mineralized during the first 55 days of the experiment. The extent of PHA biodegradation was initially lower, but its extent surpassed that of co-polyester + corn-based plastic after approximately 280 days reaching a value of  $48.5 \pm 4.6\%$ . For the wheat starch-derived plastic and plastarch conversion rates were  $14.2 \pm 0.8$  and  $24.6 \pm 1.4\%$  after 110 and 280 days of experiment, respectively.

Final (660 days) cumulative biodegradation values during soil incubation for the positive control, PHA and co-polyester + corn-based plastic were  $74.2 \pm 4.5$ ,  $69.2 \pm 6.4$  and  $55.1 \pm 6.1\%$ , respectively. For the wheat starch-derived plastic and plastarch the final conversion reached  $19.7 \pm 1.1$  and  $31.3 \pm 1.7\%$ , respectively.

SEM images of PHA and co-polyester + corn-based plastic before and after mineralization showed substantial changes in the

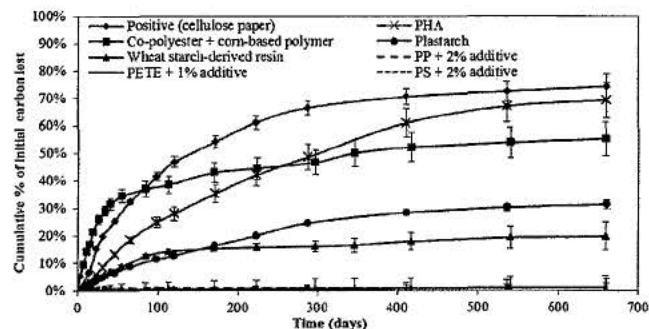
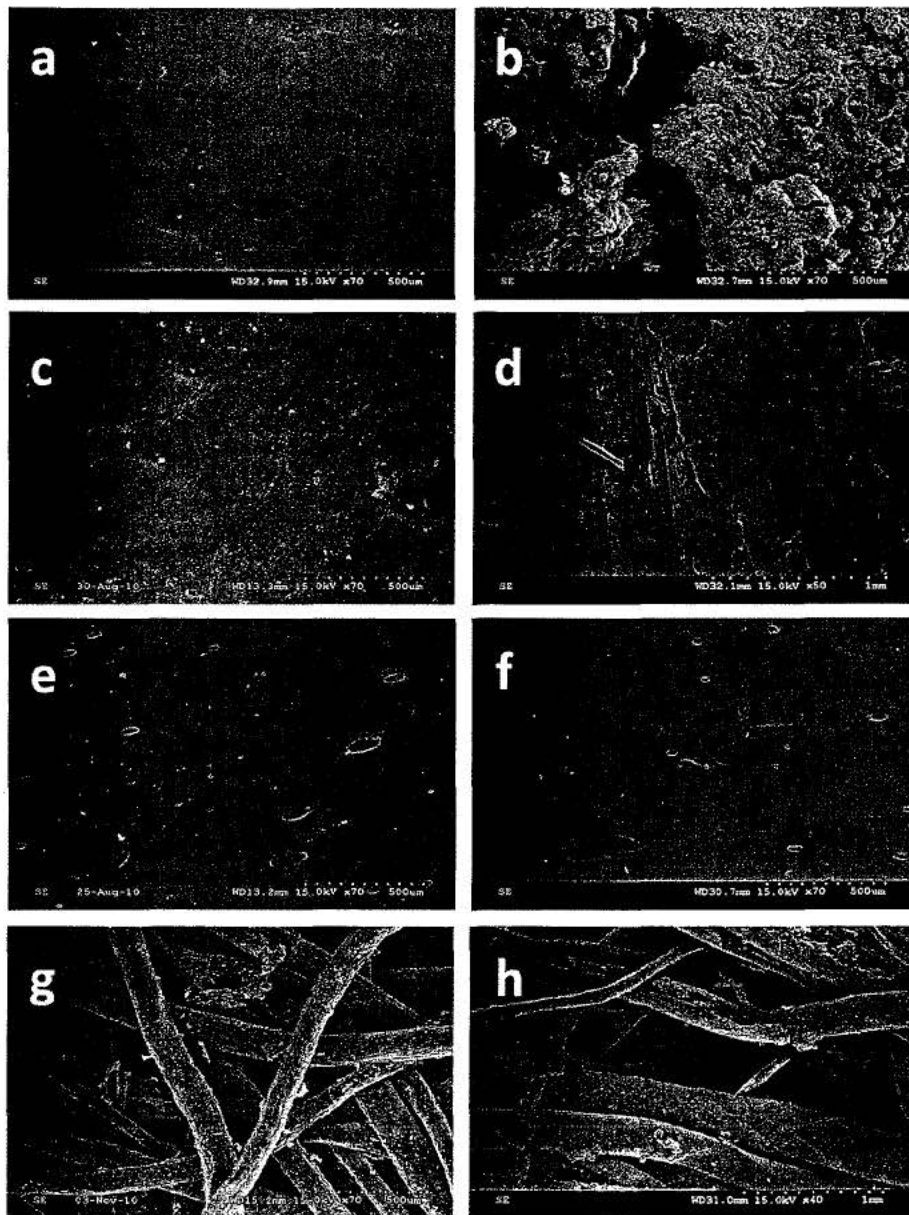


Fig. 1. Cumulative carbon loss (CO<sub>2</sub>-C) as percentage of initial carbon ( $\pm$  cumulative standard error) for bio-based plastics and for conventional plastics amended with additives during 660 days of soil incubation. For some data points standard error bars are smaller than markers.

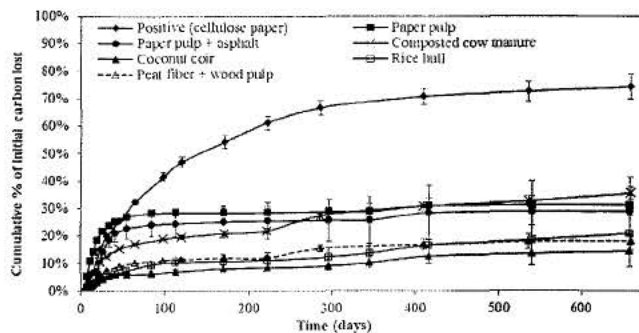


**Fig. 2.** Scanning electron micrographs of plastics during 2 years of soil incubation. From top to bottom: PHA (a: initial, b: final), co-polyester + corn-based plastic (c: initial, d: final), polypropylene + 2% additive (e: initial, f: final) and coconut coir (g: initial, h: final).

surface of the PHA material (Fig. 2A and B) and some degradation of the co-polyester + corn-based plastic (Fig. 2C and D).

For conventional plastics and the same plastics amended with additives that were supposed to enhance biodegradability, almost no biodegradation was observed after nearly two years of incubation in soil (Fig. 1). The highest observed conversion during soil incubation was  $1.0 \pm 0.1\%$  (PP + 2% additive). For all other plastics amended with additives, the final cumulative biodegradation ranged between 0.9 and 1%. These values were less than that measured for the negative control (PP) which reached a final cumulative conversion of  $1.3 \pm 0.7\%$ . Although they were not significantly different. SEM images did not reveal qualitative changes in the appearance of PP or PP + 2% additive after the 2 year incubation period (Fig. 2E and F).

The mineralization in soil of the natural fiber composite materials was most rapid during the first 65 days of the experiment



**Fig. 3.** Cumulative carbon loss ( $\text{CO}_2\text{-C}$ ) as percentage of initial carbon ( $\pm$  cumulative standard error) for natural fiber composites during 660 days of soil incubation. For some data points standard error bars are smaller than markers.



(Fig. 3). This was followed by a period of slow mineralization until the termination of the experiment (Fig. 3). After 660 days, the mineralization percent of the composted cow manure, paper pulp and paper pup + asphalt were  $35.5 \pm 2.3$ ,  $31.3 \pm 3.6$ ,  $29.4 \pm 2.1\%$ , respectively. Lower final conversion values were observed for rice hull, peat fiber and coconut coir with values of  $21.1 \pm 2.6$ ,  $18.3 \pm 0.7$  and  $14.4 \pm 2.5\%$ , respectively. SEM images of coconut coir revealed some surface changes indicative of biodegradation (Fig. 2G and H).

Approximately 74.2% of cellulose added to soil was converted to  $\text{CO}_2$  after 660 days. This is similar to the conversion of cellulose of 80% reported in a 800 day soil incubation conducted to evaluate how carbon substrates affect microbial biomass yield in soil biodegradation tests [33].

The highest biodegradability observed during soil incubation was reported for PHA (70%); a polyhydroxyalkanoate-based plastic. This was similar in magnitude to the extent of mineralization of the cellulose positive control (cellulose paper). Bacterial polyhydroxyalkanoates are intracellular aliphatic polyesters of various chain lengths [34]. Several studies have been conducted to study the biodegradability of aliphatic polyesters under different conditions [35–38]. Mineralization of these polymers is mainly achieved by cleavage of the ester bonds which occurs due to both enzymatic and chemical hydrolysis [39].

Statistically analysis revealed that significant differences in the extent of biodegradation ( $F_{15,32} = 822.2$ ,  $P < 0.0001$ ) existed between group means. Tukey–Kramer HSD analysis revealed that among bio-based plastics, the difference between PHA and the positive control (cellulose paper) was not significant. Analyses also revealed that differences were not significant between plastics amended with additives that are meant to enhance biodegradability and the negative control (PP). For natural fiber composites all test specimens differed significantly from both the positive and negative controls (Fig. 3).

The results of this study indicate that conventional plastics containing additives do not biodegrade any faster than non-additive containing plastics in soil. Manufacturers of these additives claim that if at least 1–5% (by weight) of their additive is added to plastics products, these will fully biodegrade when disposed of in microbe-rich environments. These claims are not supported by the findings of this study.

The greatest extent of biodegradation among the fiber composite materials tested was the composted cow manure (35%). This was unexpected since low carbon conversion rates were anticipated for the composted cow manure since it had previously been biologically degraded. After undergoing a composting cycle, much of the carbon contained in the cow manure was expected to be stable and humified [26,40]. However, much less extents of degradation were observed for uncomposted composites produced from rice hulls, from peat fiber pot and coconut coir. For these materials, the extent of degradation in soil ranged from 14 to 21% (Fig. 3). These materials have been used as natural composites due to their low price and structural strength [41,42]. Approximately 46% of coconut coir is lignin [43] as is 21–40% of rice hulls [44] which may have limited their biodegradation.

### 3.2. Biodegradation during composting

Three different materials were evaluated for their relative rate of degradation during composting. The materials were composted at  $55^\circ\text{C}$  under aerobic conditions for a period of 115 days. The tested materials included plastarch, paper pulp + soy wax and PETE + 1% additive (Tables 2 and 3).

The initial moisture content was adjusted to 60% and the final mean compost moisture content across all treatments was  $64.2 \pm 3.3\%$  (wet-weight basis).

Mineralization under composting conditions occurred at a rapid initial rate for both the positive control and the plastarch material during the first 80 days (Fig. 4). Overall, the positive control (cellulose paper) exhibited  $78.4 \pm 3.5\%$  conversion during composting.

For paper + soy wax, a majority of the mineralization took place during the first 15 days. For PETE + 1% additive no significant conversion was observed over the entire period of study (Fig. 4). The final cumulative biodegradation during composting for plastarch, paper + soy wax and PETE + 1% additive was  $51.3 \pm 4.9$ ,  $12.4 \pm 2.7$  and  $0.6 \pm 3.7\%$ , respectively. The ANOVA indicated that statistically significant differences in the extent of biodegradation ( $F_{4,7} = 496.6$ ,  $P < 0.0001$ ) existed between group means. Tukey–Kramer HSD analysis revealed that all test specimens differed from the positive control. However, PETE + 1% additive did not differ significantly from the negative control.

None of the tested materials mineralized at rates comparable to the positive control material. The highest cumulative biodegradation during composting was observed for the plastarch containing material (51.3%). Starch is made of repeating glucose units linked by glucosidic bonds that are susceptible to enzymatic attack. Uses and applications of starch in its native form or blended with other materials have been discussed [45,46]. Biodegradation of the starch containing portion of the material has been reported [47,48]. However the reason that the plastarch degraded more slowly than cellulose is not known.

After 20 days, only 12% of the paper pulp composite was converted to  $\text{CO}_2$  during composting. The low level of cumulative degradation could be related to inhibitory properties of the soy derived wax on the microbial consortia or limiting water accessibility. For plastics containing additives, no degradation was observed. Additives did not improve the biodegradability of PETE during composting.

### 3.3. Biodegradation during anaerobic digestion

Understanding the biodegradation of different materials in anaerobic conditions such as in industrial sewage sludge AD systems, landfills and anoxic environments is important since under these conditions, microorganisms mineralize organic substrates to both  $\text{CO}_2$  and methane. Methane itself can be used as a fuel source but if not captured it has a global warming potential 21 times stronger than  $\text{CO}_2$ . Since in the U.S. only 30% of the landfills capture methane and among those that do capture, only a small percentage of the methane produced is recovered, then biodegradable plastics in landfills have a greater potential than composted biodegradable plastics to contribute to global warming.

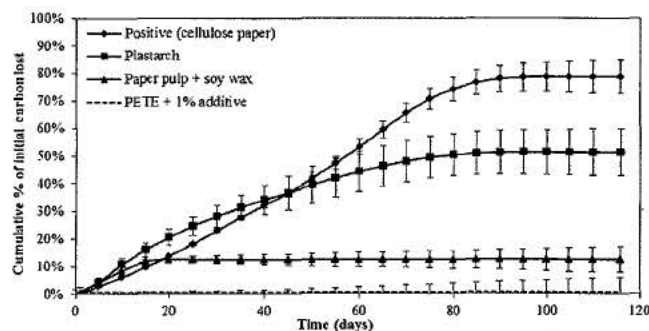


Fig. 4. Cumulative carbon loss ( $\text{CO}_2\text{-C}$ ) as percentage of initial carbon ( $\pm$  cumulative standard error) for bio-based plastics, conventional plastics amended with additives and natural fiber composites during 115 days of thermophilic composting. For some data points standard error bars are smaller than markers.

The biodegradability of polymeric materials exposed to an active methanogenic inoculum was studied under controlled laboratory conditions that resemble those found during active AD for a period of 50 days. They likely differ somewhat from the conditions within a landfill where moisture is usually removed and a greater diversity of materials is present. Yet the extent of biodegradation is likely similar to what would ultimately occur over many years in a landfill environment.

Materials tested included plastarch, co-polyester + corn-based plastics, PP + 2% additive and PETE + 1% additive (Tables 2 and 3). The mean methane content in the biogas across treatments during the entire period of study was  $54.1 \pm 6.1\%$ .

During the AD incubation, the positive control (cellulose paper) exhibited  $74.1 \pm 4.8\%$  conversion. For plastarch, the carbon conversion rate to biogas was similar to the positive control (cellulose paper) for the first 7 days (Fig. 5). However, after this period, the rate of conversion slowed as compared to the positive control through day 28. In contrast, no significant mineralization was observed for the plastics containing additive samples over the entire period of the study.

The final cumulative carbon conversion during AD for plastarch and co-polyester + corn-based plastic were  $26.4 \pm 3.5$  and  $20.2 \pm 4.4\%$ , respectively. The final conversion values for PP + 2% additive and PETE + 1% additive were  $3.1 \pm 3.7$  and  $2.2 \pm 1.6\%$ , respectively. The ANOVA indicated that statistically significant differences in the extent of biodegradation ( $F_{5,12} = 50.7, P < 0.0001$ ) existed between group means. The Tukey–Kramer HSD analysis revealed that the bio-based plastics were significantly different than the positive control but not different from each other. There was no significant difference in the carbon conversion of the negative control (PP) and the plastic containing the additive.

The biodegradability of different bio-based materials including cellulose and starch [49,50] has been investigated previously under anaerobic conditions [51,52]. Yagi et al. [53] studied the biodegradability of cellulose powder under mesophilic (35 °C) and thermophilic (55 °C) AD conditions. Cellulose powder reached a cumulative conversion of 80% under both temperature conditions. Other authors have also studied the anaerobic mineralization of aliphatic polyesters. Abou-Zeid et al. [54] conducted a study to determine the biodegradability of the natural polyesters poly(b-hydroxybutyrate) (PHB), poly(b-hydroxybutyrate-co-11.6%-b-hydroxyvalerate) (PHBV) and the synthetic polyester poly( $\epsilon$ -caprolactone) (PCL) using different anaerobic sludges and individual strains. Biodegradability of the powdered materials was measured as the percent of weight loss. They found that almost all the PHB was converted in 9 days, but only 60 and 30% weight loss

was observed for the PHBV and PCL, respectively. Similar results were reported by Shin et al. [55] in which nearly complete conversion was observed for the natural bacterial polyester but no biodegradability for synthetic analogs was observed under simulated landfill conditions.

The results of this study indicate that materials have different rates of mineralization under different end of life scenarios. For example, the positive control reached 70% conversion in 25 days during AD while 75 and 400 days were needed to reach the same extent of conversion under composting and soil incubation conditions, respectively. The plastarch material degraded faster under composting conditions reaching 50% conversion in 85 days than under AD and soil incubation conditions where only 26 and 30% was converted after 50 and 660 days, respectively. For co-polyester + corn-based plastic 20% of the material was converted during 20 days of soil incubation while 50 days were needed to reach the same value during AD. Ultimately, co-polyester + corn-based plastic reached 55% conversion after 660 days of soil incubation. Conventional plastics and those containing additives did not degrade at all under any of the three conditions.

Biodegradable plastics are potential alternatives to petroleum-based materials that can be incorporated into organic recycling schemes based on anaerobic digestion or composting. They also could potentially reduce the pollution associated with conventional plastics and therefore lead to the development of products that are more environmentally friendly. Ideally, biodegradable materials must be useful for a predetermined service life and then biodegrade in a short period of time, leaving no visible fragments and no toxic residues when composted or anaerobically digested. Disposal of these materials in landfills as opposed to anaerobic digestions is not recommended since under anaerobic conditions they biodegrade to form methane and most landfills capture only a small fraction of the methane created [56].

#### 4. Conclusion

In this study, the relative biodegradability of a range of polymeric materials and natural fiber composites used for various commercial applications was investigated under composting, soil incubation and anaerobic digestion conditions. The validity of the tests was confirmed in that positive controls (cellulose paper) biodegraded by more than 70% in all three systems in a reproducible manner.

While some of the bio-based plastics and natural fibers biodegraded to an appreciable extent, plastics containing additives that supposedly confer biodegradability to polymers such as polyethylene and polypropylene did not improve the biodegradability of these recalcitrant polymers. SEM analysis confirmed that substantial biodegradation of polyhydroxyalkanoate-based plastics occurred and that some surface changes occurred in co-polyester + corn-based plastic and coconut coir materials. However, SEM confirmed that no degradation of polypropylene and polyethylene occurred, even after amendment with additives meant to confer biodegradability.

The relative biodegradability of the materials during long-term soil incubation was PHA > co-polyester + corn-based plastic > composted cow manure > plastarch > paper pulps > natural fibers > conventional plastics containing additives to enhance biodegradability = conventional plastics. For anaerobic digestion and composting the relative biodegradability was plastarch > co-polyester + corn-based plastic > conventional plastics with additives and plastarch > paper pulp + soy wax > conventional plastic with additives, respectively.

Over the time scale of organic recycling processes (composting and anaerobic digestion) most of the bioplastics biodegraded to

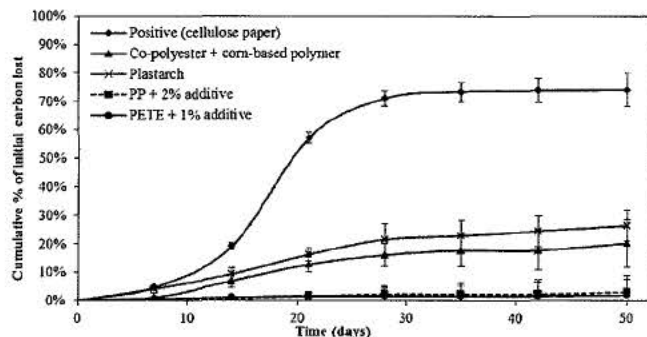


Fig. 5. Cumulative carbon loss ( $\text{CO}_2\text{-C}$ ) as percentage of initial carbon ( $\pm$  cumulative standard error) for bio-based plastics, conventional plastics amended with additives and natural fiber composites during 50 days of anaerobic digestion. For some data points standard error bars are smaller than markers.

only a limited extent. Furthermore, under anaerobic incubation, some of the bio-based plastics biodegraded to generate methane, a potent greenhouse gas that unless captured may negate the perceived environmental benefits of using these materials. Biodegradable plastics made from petroleum (Class II), may have more adverse environmental impacts than conventional plastics (Class I) if their ultimate fate is landfilling and anaerobic conversion to methane.

### Acknowledgments

The authors thank the Ohio State University Department of Food, Agricultural and Biological Engineering for financial support to the main author during this project. We would also like to thank the OSU Molecular and Cellular Imaging Center at OARDC for assistance with scanning electron micrographs.

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**RESPONDENT**

**EXHIBIT**

**RX-C-1**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**



**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**



**RESPONDENT**

**EXHIBIT**

**RX-C-2**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**REDACTED**

**RESPONDENT**

**EXHIBIT**

**RX-D**

**UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION  
OFFICE OF THE ADMINISTRATIVE LAW JUDGES  
Washington, D.C.**

**In the Matter of**

**ECM BioFilms, Inc.,  
a corporation, also d/b/a  
Enviroplastics International,**

**Respondent.**

**Docket No. 9358**

**RESPONDENT'S FIRST SET OF REQUESTS  
FOR PRODUCTION OF DOCUMENTS**

Respondent ECM BioFilms, Inc. ("ECM"), by counsel and pursuant to Rule 3.37 of the Federal Trade Commission's Rule of Practice for Adjudicative Proceedings ("Rules"), hereby requests that Complaint Counsel for the Federal Trade Commission produce the following documents and/or tangible things for inspection and copying at Emord & Associates, P.C., 3210 South Gilbert Road, Suite 4, Chandler, Arizona, 85286, or at such time and place as may be agreed upon by all counsel.

**INSTRUCTIONS**

1. These instructions and definitions should be construed to require responses or production based on all information within the Federal Trade Commission's possession, domain, custody, or control, including such information within the personal knowledge of those employed by the FTC and by those acting on the FTC's behalf.

2. If you are unable to produce a document or item requested, please state in writing why you cannot produce the document or thing and, if your inability to produce the document or thing is because it is not in your possession, dominion, control, or that of a person from whom

you could obtain it, state the name, address, and telephone number of any person or entity you believe may have the original or a copy of any such document or thing.

3. Your response is required within 30 days after service of these Requests per 16 C.F.R. § 3.37(b).

4. If you object to any of the requests, answer to the extent that each request or part thereof is not objectionable, and state the precise part of the request to which you intend to object. Please provide each ground for such objection in sufficient detail to permit Respondent's counsel to evaluate the legal sufficiency of same.

5. If, in answering these Requests, you encounter any ambiguities when construing a request, instruction, or definition, your response shall state the matter deemed ambiguous and the construction used in responding.

6. Where a claim of privilege is asserted in responding or objecting to any discovery demanded in these Requests and information is not provided on the basis of such assertion, you shall, in your response, identify the nature of the privilege claimed, together with the following information: (a) the date of the responsive document(s); (b) the sender of the document(s); (c) the addressee(s) or recipient(s); (d) the number of pages; (e) the subject matter; (f) the basis for which the privilege is claimed; (g) the names of all persons to whom copies of any part of the document(s) were furnished; (h) the present location of the document(s) and all copies thereof; and (i) each person who has ever had possession, custody, or control of the document(s), to the extent known.

7. If the requested document(s) are maintained in a file, the entire file folder is included in the request for production of those documents generally, to the extent such production is reasonably necessary for context.

8. You are under a continuing obligation to supplement your answers to these document production requests under Rule 3.31(e). Every Request for Production herein shall be deemed a continuing Request for Production, and the FTC is to supplement its answers promptly if and when it obtains responsive documents which add to or are in any way inconsistent with the FTC's initial production.

9. Unless the context clearly requires otherwise, the singular form of any term used herein shall include the plural, and vice versa. The present tense of any verb shall include the past tense, and vice versa. Similarly, the masculine gender shall include the feminine, and vice versa.

10. The terms "and" and "or" in these Requests shall be construed conjunctively or disjunctively as necessary, to make the applicable sentence or phrase inclusive rather than exclusive and to ensure a complete, thorough, and accurate response.

11. Unless otherwise stated, the relevant time period for purposes of these Requests is the time period between January 1998 and the date of hearing in this case.

### **DEFINITIONS**

Notwithstanding any specific definition set forth below, each word, term, or phrase used in these Requests is intended to have the broadest meaning permitted under the Rules of Practice of the Federal Trade Commission.

1. The terms "Complaint Counsel," "you," "your," "FTC," "Complainant," or "Commission" are interchangeable in meaning and are to be understood to include all employees, agents, attorneys, consultants, representatives, officers, and persons acting or purporting to act on behalf of the United States Federal Trade Commission, other than the

entities that are identified in Practice Rule 3.35(a) as individuals or entities outside the scope of discovery for purposes of these requests.

2. The term “Document” means documents and other tangible things as defined in the broadest sense permissible under the Rules of Practice of the Federal Trade Commission and shall include, without limitation, all written (whether handwritten, typewritten, computer printed or otherwise generated), recorded, graphic or visual matter of material of any kind in original format or, if an original is not available, any copies, as well as any non-identical copies (regardless of origin and whether or not including additional writing thereon or attached thereto) and whether or not still in existence and drafts of any: books, papers, photographs, video tapes, movie films, tapes or other photographic recordings, microfilm, microfiche, computer printouts, audio or video tape recordings, magnetic tapes, punch cards, records, reports, letters or any correspondence, electronic mail (“e-mail”) or similar electronic communications, telegrams, telexes, memoranda, notes, field notes, marginal notations, complaints, contracts, studies, affidavits, agendas, minutes, resolutions, diaries, appointment books, calendars, desk calendars, analysis, work papers, statistical reports, circulars, charts, transcripts, bills, invoices, receipts, worksheets, checks, logs, ledgers, payrolls, tax records, audits, reviews, sketches, graphs or graphics, pamphlets, brochures, manuals, financial reports, financial summaries, summary statements, lists, agreements, purchase orders, expense records, purchase and sale statements or their equivalent, depositions, interview transcripts or their equivalent, press releases in publications, discs, data cells, drums, printouts, data compilations, maps, lawsuits including all pleadings or memoranda submitted to or for submission to any court, administrative agency, association, or Governmental tribunal, whether in or outside the United States, text messages, phone logs, phone bills, internet social networking posts or entries, internet web posts or entries



of any kind, any and all other types of tangible things in whatever form upon or in which information is or may be recorded, whether mechanical, electronic or handwritten, including any physical file or its equivalent in which any such document or tangible thing has been or is stored or maintained. .

3. The term “Correspondence” is used in the broadest sense to include any communication through the exchange of written or spoken word, including, but not limited to any such exchange through letters, electronic mail (“e-mail”) or similar electronic communications, text messages, SMS messages or similar electronic communications, telegrams, telexes, memoranda, facsimiles, notes, cards, and phone conversations and records thereof.

4. The term “Person” is used in the broadest sense to include natural persons, public or private corporations, charitable or non-charitable corporations, and their subsidiaries that are divisions, proprietorships, partnerships, Governmental entities, associations, organizations, groups, trusts, estates, and any other form of an entity or organization. Any reference herein to a party that is a corporation, partnership, or any entity other than a natural person, shall include reference to all past and present subsidiaries, affiliates, directors, officers, employees, and agents of the entity.

5. The term “Personnel” is used in the broadest sense to include natural persons, Governmental entities, and any other form of an entity or organization employed by or acting as agents for Complainants including their respective attorneys, agents, employees, and all persons acting on their behalf including, without limitation, the other Complainants and their agents.

6. The terms “Pertaining to” or “Concerning” mean relating to, referring to, constituting, containing, embodying, reflecting, identifying, stating, dealing with, or is in any

way pertinent to or associated with the specified subject, including documents concerning the preparation of other documents.

7. The terms “Article” or “Publication” shall refer to all pieces of writing including, but not limited to, newspaper pieces, magazine pieces, and information released or appearing in scientific peer-reviewed journals.

8. The term “Communication” shall include any oral statement, dialogue, colloquy, discussion or conversations, and also means any transfer of thoughts or ideas between persons by means of documents, and includes any transmittal of information in the form of oral or written facts, ideas, inquiries, or data transfer from one location to another by electronic or similar means, including without limitation, writings, telephonic conversations and oral conversations other than telephonic conversations, SMS messaging, and internet web posts.

9. The term “ECM” or “Respondent” shall include, without limitation, ECM BioFilms, Inc., its agents, employees, officers, or anyone else acting on its behalf.

10. The term “Complaint” as used throughout these requests for production shall refer to the Complaint filed by the Federal Trade Commission against ECM BioFilms, Inc., Docket No. 9358 (Oct. 28, 2013).

11. The terms “test,” “analysis,” “protocol,” “study,” “survey,” “data,” or “experiment,” shall include, without limitation, any procedure intended to establish the quality, credibility, veracity, plausibility, performance, or reliability of scientific theories, concepts, or ideas, or any measurement (whether or not “scientific” or valid) of human, scientific, or other facts and statistics collected together for reference or analysis.

12. The term “plastic” as used throughout these requests shall collectively refer to any synthetic material made from a wide range of polymers such as polyethylene, PVC, nylon, and others, including, but not limited to, all thermoplastics and thermosets.

13. The term “ECM Plastic” means any plastic product treated with or incorporating an ECM additive.

14. The term “ECM Additive” means the additive manufactured by ECM for inclusion in plastics products as a component of the finished plastic.

15. The term “biodegradation” and any variation thereof means decomposition or degradation by or through the action of biological and biochemical agents.

### **REQUESTS**

**Request 1.** Provide all documents that concern whether plastics in general and ECM Plastics in particular will break down and decompose into elements found in nature after customary disposal or in a landfill.

**Request 2.** Provide all documents, whether prepared by or for the Commission or any other entity, concerning consumer perception, comprehension, or recall (including, but not limited to, copy tests, marketing or consumer surveys and reports, penetration tests, recall tests, audience reaction tests, and communication tests) of plastics biodegradability; biodegradability in general; landfill composition; or conditions of customary waste disposal.

**Request 3.** Provide all documents that support or call into question your conclusion that ECM’s biodegradable claims for degradation are false.

**Request 4.** Provide all documents that support or call into question your conclusion that consumers likely interpret unqualified degradable claims to mean that the entire product or

package will completely decompose into elements found in nature within one year after customary disposal.

**Request 5.** Provide all documents relating to your contention that express or implied representations made in or implied by ECM BioFilm's written advertising or promotional materials are false or misleading.

**Request 6.** Provide all correspondence between FTC and ASTM and ASTM present and past members, officers, directors, or agents.

**Request 7.** Provide all documents pertaining to the ASTM standards which concern plastics biodegradability, or concern ASTM policies, membership, or revisions to standards.

**Request 8.** Provide all documents that relate to your contention that end-consumers (as opposed to ECM's trade customers) view, understand, or rely on ECM's written advertising materials.

**Request 9.** Provide all documents relating to any investigation conducted by you or on your behalf relating to any advertising claims or representations concerning the ECM MasterBatch Pellets, or any other ECM plastics additive.

**Request 10.** Produce all documents concerning your contention that landfills are generally anaerobic environments that lack oxygen and that restrict the amount of liquid infiltration or moisture content.

**Request 11.** Provide all documents concerning plastics chemistry, formation, polymerization, formulation, mineralization, enzymatic degradation, or depolymerization in biodegradable and non-biodegradable polymers.

**Request 12.** Provide all documents relating to your contention that ECM's tests were not designed to support its claims, and that the data from ECM's testing is invalid or cannot support reliable conclusions.

**Request 13.** Produce all documents concerning the period of time under which conventional plastics generally biodegrade, including documents supporting your contention that plastics will normally require hundreds of thousands of years to biodegrade.

**Request 14.** Produce all documents concerning your definition of "competent and reliable" scientific evidence as that definition concerns biodegradation claims for plastics in general and ECM' express and/or implied claims challenged by the FTC.

**Request 15.** Provide all documents relating to any advertisement or promotional material for the ECM MasterBatch pellets, other than documents produced by Respondents in pre-complaint disclosures or discovery.

**Request 16.** Produce all documents identified in any answer to an Interrogatory propounded by ECM or on which you rely in answering any Interrogatory propounded by ECM.

DATED this 3rd day of December 2013

Respectfully submitted,

/s/ Jonathan W. Emord

Jonathan W. Emord  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938  
Email: [jemord@emord.com](mailto:jemord@emord.com)

**CERTIFICATE OF SERVICE**

I hereby certify that on December 3, 2013, I caused a true and correct copy of the paper original of the foregoing **RESPONDENT'S INITIAL DOCUMENT REQUESTS** to be served as follows:

One electronic copy to **Counsel for Complainant:**

Katherine Johnson  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580  
Email: [kjohnson3@ftc.gov](mailto:kjohnson3@ftc.gov)

Elisa Jillson  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580  
Email: [ejillson@ftc.gov](mailto:ejillson@ftc.gov)

I further certify that I retain a paper copy of the signed original of the foregoing document that is available for review by the parties and adjudicator consistent with the Commission's Rules.

/s/ Jonathan W. Emord  
Jonathan W. Emord  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938  
Email: [jemord@emord.com](mailto:jemord@emord.com)

**RESPONDENT**  
**EXHIBIT**  
**RX-E**

**UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION  
OFFICE OF THE ADMINISTRATIVE LAW JUDGES  
Washington, D.C.**

**In the Matter of**

**ECM BioFilms, Inc.,  
a corporation, also d/b/a  
Enviroplastics International,**

**Respondent.**

**Docket No. 9358**

**RESPONDENT'S SECOND SET OF REQUESTS  
FOR PRODUCTION OF DOCUMENTS**

Respondent ECM BioFilms, Inc. ("ECM"), by counsel and pursuant to Rule 3.37 of the Federal Trade Commission's Rule of Practice for Adjudicative Proceedings ("Rules"), hereby requests that Complaint Counsel for the Federal Trade Commission produce the following documents and/or tangible things for inspection and copying at Emord & Associates, P.C., 3210 South Gilbert Road, Suite 4, Chandler, Arizona, 85286, or at such time and place as may be agreed upon by all counsel.

**INSTRUCTIONS**

1. These instructions and definitions should be construed to require responses or production based on all information within the Federal Trade Commission's possession, domain, custody, or control, including such information within the personal knowledge of those employed by the FTC and by those acting on the FTC's behalf.

2. If you are unable to produce a document or item requested, please state in writing why you cannot produce the document or thing and, if your inability to produce the document or thing is because it is not in your possession, dominion, control, or that of a person from whom



you could obtain it, state the name, address, and telephone number of any person or entity you believe may have the original or a copy of any such document or thing.

3. Your response is required within 30 days after service of these Requests per 16 C.F.R. § 3.37(b).

4. If you object to any of the requests, answer to the extent that each request or part thereof is not objectionable, and state the precise part of the request to which you intend to object. Please provide each ground for such objection in sufficient detail to permit Respondent's counsel to evaluate the legal sufficiency of same.

5. If, in answering these Requests, you encounter any ambiguities when construing a request, instruction, or definition, your response shall state the matter deemed ambiguous and the construction used in responding.

6. Where a claim of privilege is asserted in responding or objecting to any discovery demanded in these Requests and information is not provided on the basis of such assertion, you shall, in your response, identify the nature of the privilege claimed, together with the following information: (a) the date of the responsive document(s); (b) the sender of the document(s); (c) the addressee(s) or recipient(s); (d) the number of pages; (e) the subject matter; (f) the basis for which the privilege is claimed; (g) the names of all persons to whom copies of any part of the document(s) were furnished; (h) the present location of the document(s) and all copies thereof; and (i) each person who has ever had possession, custody, or control of the document(s), to the extent known.

7. If the requested document(s) are maintained in a file, the entire file folder is included in the request for production of those documents generally, to the extent such production is reasonably necessary for context.

8. You are under a continuing obligation to supplement your answers to these document production requests under Rule 3.31(e). Every Request for Production herein shall be deemed a continuing Request for Production, and the FTC is to supplement its answers promptly if and when it obtains responsive documents which add to or are in any way inconsistent with the FTC's initial production.

9. Unless the context clearly requires otherwise, the singular form of any term used herein shall include the plural, and vice versa. The present tense of any verb shall include the past tense, and vice versa. Similarly, the masculine gender shall include the feminine, and vice versa.

10. The terms "and" and "or" in these Requests shall be construed conjunctively or disjunctively as necessary, to make the applicable sentence or phrase inclusive rather than exclusive and to ensure a complete, thorough, and accurate response.

11. Unless otherwise stated, the relevant time period for purposes of these Requests is the time period between January 1998 and the date of hearing in this case.

#### **DEFINITIONS**

Notwithstanding any specific definition set forth below, each word, term, or phrase used in these Requests is intended to have the broadest meaning permitted under the Rules of Practice of the Federal Trade Commission.

1. The terms "Complaint Counsel," "you," "your," "FTC," "Complainant," or "Commission" are interchangeable in meaning and are to be understood to include all employees, agents, attorneys, consultants, representatives, officers, and persons acting or purporting to act on behalf of the United States Federal Trade Commission, other than the

entities that are identified in Practice Rule 3.35(a) as individuals or entities outside the scope of discovery for purposes of these requests.

2. The term "Document" means documents and other tangible things as defined in the broadest sense permissible under the Rules of Practice of the Federal Trade Commission and shall include, without limitation, all written (whether handwritten, typewritten, computer printed or otherwise generated), recorded, graphic or visual matter of material of any kind in original format or, if an original is not available, any copies, as well as any non-identical copies (regardless of origin and whether or not including additional writing thereon or attached thereto) and whether or not still in existence and drafts of any: books, papers, photographs, video tapes, movie films, tapes or other photographic recordings, microfilm, microfiche, computer printouts, audio or video tape recordings, magnetic tapes, punch cards, records, reports, letters or any correspondence, electronic mail ("e-mail") or similar electronic communications, telegrams, telexes, memoranda, notes, field notes, marginal notations, complaints, contracts, studies, affidavits, agendas, minutes, resolutions, diaries, appointment books, calendars, desk calendars, analysis, work papers, statistical reports, circulars, charts, transcripts, bills, invoices, receipts, worksheets, checks, logs, ledgers, payrolls, tax records, audits, reviews, sketches, graphs or graphics, pamphlets, brochures, manuals, financial reports, financial summaries, summary statements, lists, agreements, purchase orders, expense records, purchase and sale statements or their equivalent, depositions, interview transcripts or their equivalent, press releases in publications, discs, data cells, drums, printouts, data compilations, maps, lawsuits including all pleadings or memoranda submitted to or for submission to any court, administrative agency, association, or Governmental tribunal, whether in or outside the United States, text messages, phone logs, phone bills, internet social networking posts or entries, internet web posts or entries

of any kind, any and all other types of tangible things in whatever form upon or in which information is or may be recorded, whether mechanical, electronic or handwritten, including any physical file or its equivalent in which any such document or tangible thing has been or is stored or maintained. .

3. The term "Correspondence" is used in the broadest sense to include any communication through the exchange of written or spoken word, including, but not limited to any such exchange through letters, electronic mail ("e-mail") or similar electronic communications, text messages, SMS messages or similar electronic communications, telegrams, telexes, memoranda, facsimiles, notes, cards, and phone conversations and records thereof.

4. The term "Person" is used in the broadest sense to include natural persons, public or private corporations, charitable or non-charitable corporations, and their subsidiaries that are divisions, proprietorships, partnerships, Governmental entities, associations, organizations, groups, trusts, estates, and any other form of an entity or organization. Any reference herein to a party that is a corporation, partnership, or any entity other than a natural person, shall include reference to all past and present subsidiaries, affiliates, directors, officers, employees, and agents of the entity.

5. The term "Personnel" is used in the broadest sense to include natural persons, Governmental entities, and any other form of an entity or organization employed by or acting as agents for Complainants including their respective attorneys, agents, employees, and all persons acting on their behalf including, without limitation, the other Complainants and their agents.

6. The terms "Pertaining to" or "Concerning" mean relating to, referring to, constituting, containing, embodying, reflecting, identifying, stating, dealing with, or is in any

way pertinent to or associated with the specified subject, including documents concerning the preparation of other documents.

7. The terms “Article” or “Publication” shall refer to all pieces of writing including, but not limited to, newspaper pieces, magazine pieces, and information released or appearing in scientific peer-reviewed journals.

8. The term “Communication” shall include any oral statement, dialogue, colloquy, discussion or conversations, and also means any transfer of thoughts or ideas between persons by means of documents, and includes any transmittal of information in the form of oral or written facts, ideas, inquiries, or data transfer from one location to another by electronic or similar means, including without limitation, writings, telephonic conversations and oral conversations other than telephonic conversations, SMS messaging, and internet web posts.

9. The term “ECM” or “Respondent” shall include, without limitation, ECM BioFilms, Inc., its agents, employees, officers, or anyone else acting on its behalf.

10. The term “Complaint” as used throughout these requests for production shall refer to the Complaint filed by the Federal Trade Commission against ECM BioFilms, Inc., Docket No. 9358 (Oct. 28, 2013).

11. The terms “test,” “analysis,” “protocol,” “study,” “survey,” “data,” or “experiment,” shall include, without limitation, any procedure intended to establish the quality, credibility, veracity, plausibility, performance, or reliability of scientific theories, concepts, or ideas, or any measurement (whether or not “scientific” or valid) of human, scientific, or other facts and statistics collected together for reference or analysis.

12. The term “plastic” as used throughout these requests shall collectively refer to any synthetic material made from a wide range of polymers such as polyethylene, PVC, nylon, and others, including, but not limited to, all thermoplastics and thermosets.

13. The term “ECM Plastic” means any plastic product treated with or incorporating an ECM additive.

14. The term “ECM Additive” means the additive manufactured by ECM for inclusion in plastics products as a component of the finished plastic.

15. The term “biodegradation” and any variation thereof means decomposition or degradation by or through the action of biological and biochemical agents.

### **REQUESTS**

**Request 1.** Provide all documents that concern the article, “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation,” Eddie F. Gomez and Frederick C. Michel Jr., Polymer Degradation and Stability 98 (2013) 2583-2591, including, but not limited to all mail and emails and records concerning the date and time of FTC receipt related to, and documents referencing the article, “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

**Request 2.** Provide all documents pertaining to all sources of payment, benefit(s), publicity, and/or compensation to Dr. Ramani Narayan.

**Request 3.** Provide all documents pertaining to all sources of payment, benefit(s), publicity, and/or compensation to Eddie F. Gómez and Frederick C. Michel Jr, authors of the article, “Biodegradability of conventional and bio-based plastics and natural fiber composites

during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

**Request 4.** Provide all documents concerning the opinion that tests found in ECM-FTC-000069-000241 and ECM-FTC-000497-509 are not supportive of ECM’s claims.

**Request 5.** Provide all documents that support the opinion that free chloride is not an adequate measurement of biodegradation in a test modeled after ASTM D 5511 and/or D5526 that involves polyvinyl chloride (PVC) plastics.

**Request 6.** Provide all documents that concern the opinion that carbon-14 testing is an available and acceptable method to measure whether a plastic infused with an additive is biodegradable in an anaerobic environment.

**Request 7.** Provide all documents that concern the opinion that existing testing laboratories are capable of carbon-14 testing for ECM products specifically.

**Request 8.** Provide all documents concerning all testing methods that are “competent and reliable scientific evidence” of biodegradable plastic claims.

**Request 9.** Provide all documents, including, but not limited to all correspondence, phone logs, notes, meeting minutes, agendas, and presentations, and evaluations that make reference to, involve, and/or concern the following:

- O.W.S.
- Any employee, officer, or representative of the Biodegradable Products Institute (“BPI”)
- Dr. Ramani Narayan
- APCO Insight
- The American Chemistry Council

- Eden Research Laboratory
- Northeast Laboratories, Inc.
- The University of New Mexico
- Ohio State University
- Michigan State University

**Request 10.** Provide all documents and correspondence with the Environmental Protection Agency concerning the Revised Green Guides, biodegradable claims, bioreactors, and modern solid waste landfills.

**Request 11.** Provide all documents concerning Revised Green Guides Section 260.8 (16 C.F.R. 260.8), including, but not limited to those identifying all FTC personnel involved and/or participated in its revision, and those describing each individual's involvement and/or participation; all articles, journals, and other sources reviewed, considered, and/or used in any manner; and documents containing the names and contact information of all non-FTC personnel that were contacted, consulted with, and/or contributed to revisions of Section 260.8.

**Request 12.** Provide all documents and correspondence concerning the FTC's investigation of ECM's marketing claims, including, but not limited to the circumstances of how and when FTC first learned of ECM and its claims; correspondence with any non-FTC personnel about ECM; and internal correspondence of FTC personnel concerning ECM.

**Request 13.** All documents and correspondence among any FTC employees concerning any proposed consent order for ECM ever contemplated by the FTC.

**Request 14.** All documents concerning FTC's definition of the term "end- use consumer(s)" as used by the FTC in its adjudicative action against ECM, including, but not



limited to Complaint Counsel's use of the term at the Initial Prehearing Conference in this matter on November 21, 2013.

**Request 15.** All documents concerning and/or supportive of the FTC's claim in its Complaint that ECM provided the "means and instrumentalities" to its customers and independent distributors for the commission of deceptive acts or practices.

**Request 16.** Provide all documents concerning all tests and methods that, according to the FTC, form a reasonable basis in support of a claim that plastic products are biodegradable in municipal solid waste landfills or landfills generally.

**Request 17.** Provide all documents concerning American Plastic Manufacturing, Inc..

**Request 18.** Provide all documents supporting FTC's allegation that ECM provided its customers and independent distributors with the "means and instrumentalities for the commission of deceptive acts or practices."

**Request 19.** Provide all documents supportive of the allegation that the claim "The plastic products made with our additives will break down in approximately 9 months to 5 years in nearly all landfills or wherever else they may end up" was material to ECM customers' purchase of ECM's additive.

**Request 20.** Provide all documents supportive of the allegation that the claim "The plastic products made with our additives will break down in approximately 9 months to 5 years in nearly all landfills or wherever else they may end up" was material to end-use consumers' purchase of ECM Plastics.

**Request 21.** Provide all documents supportive of the allegation that landfills "do not present conditions that would allow ECM plastics to completely break down and decompose into elements found in nature within a reasonable short period of time."

**Request 22.** Provide all documents concerning any FTC presentation, lecture, or appearance in which any member of the BPI was present and/or participated.

**Request 23.** Provide all documents concerning the FTC's pre-Complaint investigation of ECM BioFilms, including, but not limited to how the FTC first learned of ECM and ECM's claims, and the FTC's decision to issue a Complaint.

DATED this 28th day of February 2014

Respectfully submitted,

/s/ Jonathan W. Emord  
Jonathan W. Emord  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938  
Email: [jemord@emord.com](mailto:jemord@emord.com)

**CERTIFICATE OF SERVICE**

I hereby certify that on February 28, 2014, I caused a true and correct copy of the paper original of the foregoing **RESPONDENT'S SECOND SET OF REQUESTS FOR PRODUCTION OF DOCUMENTS** to be served as follows:

One electronic copy to **Counsel for Complainant:**

Katherine Johnson  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580  
Email: [kjohnson3@ftc.gov](mailto:kjohnson3@ftc.gov)

Elisa Jillson  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580  
Email: [ejillson@ftc.gov](mailto:ejillson@ftc.gov)

Jonathan Cohen  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Avenue, NW  
Mail stop M-8102B  
Washington, D.C. 20580  
Email: [jcohen2@ftc.gov](mailto:jcohen2@ftc.gov)

I further certify that I retain a paper copy of the signed original of the foregoing document that is available for review by the parties and adjudicator consistent with the Commission's Rules.

/s/ Jonathan W. Emord  
Jonathan W. Emord  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Telephone: 202-466-6937  
Facsimile: 202-466-6938  
Email: [jemord@emord.com](mailto:jemord@emord.com)

**RESPONDENT**  
**EXHIBIT**  
**RX-F-1**



A Professional Corporation

WASHINGTON | VIRGINIA | PHOENIX

11808 WOLF RUN LANE  
CLIFTON, VA 20124

3210 S. GILBERT ROAD  
SUITE 4

CHANDLER, AZ 85286  
(602) 388-8899 | FAX (602) 393-4361

1050 SEVENTEENTH STREET, N.W.  
SUITE 600

WASHINGTON, D.C. 20036  
(202) 466-6937 | FAX (202) 466-6938

February 28, 2014

Lou F. Caputo, Esq.  
602.388.8901  
lcaputo@emord.com

VIA UPS

Frederick C Michel Jr.  
Ohio State University  
207 Hayden Hall  
1680 Madison Avenue  
Wooster, Ohio 44691

*Re: In the Matter of ECM BioFilms, Inc., Docket No. 9358*

Dear Mr. Michel:

Pursuant to the Federal Trade Commission's Rules of Practice, please find enclosed Respondent ECM BioFilms, Inc.'s subpoena *duces tecum*. This subpoena requests the production of documents and other materials. Included with the subpoena is Schedule A, which describes the instructions and specific requests of Respondent and a copy of the Protective Order issued in this matter.

Please provide all requested documents no later than March 17, 2014. We welcome you to contact us with questions.

Sincerely,

Jonathan W. Emord  
Peter A. Arhangelsky  
Lou F. Caputo



# SUBPOENA DUCES TECUM

Provided by the Secretary of the Federal Trade Commission, and  
Issued Pursuant to Commission Rule 3.34(b), 16 C.F.R. § 3.34(b)(2010)

1. TO

Frederick C Michel Jr.  
Ohio State University  
207 Hayden Hall  
1680 Madison Avenue  
Wooster, Ohio 44691

2. FROM

UNITED STATES OF AMERICA  
FEDERAL TRADE COMMISSION

This subpoena requires you to produce and permit inspection and copying of designated books, documents (as defined in Rule 3.34(b)), or tangible things, at the date and time specified in Item 5, and at the request of Counsel listed in Item 9, in the proceeding described in Item 6.

3. PLACE OF PRODUCTION

Emord & Associates, P.C.  
3210 S. Gilbert Road, Suite 4  
Chandler, AZ 85286

4. MATERIAL WILL BE PRODUCED TO

Peter Arhangelsky

5. DATE AND TIME OF PRODUCTION

March 17, 2014, 5:00 PM EST

6. SUBJECT OF PROCEEDING

In the matter of ECM BioFilms, Inc., Docket No. 9358

7. MATERIAL TO BE PRODUCED

See Attached Schedule A for description of all documents and materials.

8. ADMINISTRATIVE LAW JUDGE

Chief Administrative Law Judge  
D. Michael Chappell  
Federal Trade Commission  
Washington, D.C. 20580

9. COUNSEL AND PARTY ISSUING SUBPOENA

Jonathan W. Emord, Peter Arhangelsky, Lou  
Caputo  
Emord & Associates, P.C. for Respondent  
ECM BioFilms, Inc.

DATE SIGNED

2/28/14

SIGNATURE OF COUNSEL ISSUING SUBPOENA

## GENERAL INSTRUCTIONS

### APPEARANCE

The delivery of this subpoena to you by any method prescribed by the Commission's Rules of Practice is legal service and may subject you to a penalty imposed by law for failure to comply.

### MOTION TO LIMIT OR QUASH

The Commission's Rules of Practice require that any motion to limit or quash this subpoena must comply with Commission Rule 3.34(c), 16 C.F.R. § 3.34(c), and in particular must be filed within the earlier of 10 days after service or the time for compliance. The original and ten copies of the petition must be filed before the Administrative Law Judge and with the Secretary of the Commission, accompanied by an affidavit of service of the document upon counsel listed in Item 9, and upon all other parties prescribed by the Rules of Practice.

### TRAVEL EXPENSES

The Commission's Rules of Practice require that fees and mileage be paid by the party that requested your appearance. You should present your claim to counsel listed in Item 9 for payment. If you are permanently or temporarily living somewhere other than the address on this subpoena and it would require excessive travel for you to appear, you must get prior approval from counsel listed in Item 9.

A copy of the Commission's Rules of Practice is available online at <http://bit.ly/FTCRulesofPractice>. Paper copies are available upon request.

This subpoena does not require approval by OMB under the Paperwork Reduction Act of 1980.

**SCHEDULE "A" TO SUBPOENA DUCES TECUM DIRECTED TO**

**FREDERICK C MICHEL JR.**

**INSTRUCTIONS**

- A. Unless otherwise specified, the time period covered by a numbered request shall be limited to the time period extending from January 1, 2007 until the present date, unless differently stated therein.
- B. Documents must be delivered to Counsel for Respondent at the following address:  
  
Emord & Associates, P.C.,  
3210 South Gilbert Road, Suite 4  
Chandler, AZ 85286
- C. A complete copy of each document should be submitted even if only a portion of the document is within the terms of the numbered request. The document shall not be edited, cut or expunged and shall include all covering letters and memoranda, transmittal slips, appendices, tables or other attachments.
- D. All information submitted shall be clearly and precisely identified as to the numbered request(s) to which it is responsive. Pages in the submission should be numbered consecutively, and each page should be marked with a unique "Bates" document tracking number.
- E. Documents covered by these numbered requests are those which are in your possession or under your actual or constructive custody or control, whether or not such documents were received from or disseminated to any other person or entity, including attorneys, accountants, directors, officers and employees.
- F. Documents that may be responsive to more than one numbered request need not be submitted more than once. However, your response should indicate, for each document submitted, each numbered request to which the document is responsive. Identification shall be by the Bates number if the documents(s) were so numbered when submitted or by author and subject matter if not so numbered.
- G. If any of the documentary materials requested in these numbered requests are available in machine-readable form (such as floppy or hard disks, drums, core storage, magnetic tapes or punch cards), state the form in which it is available and describe the type of computer or other machinery required to read the documents involved. If the information requested is stored in a computer or a file or record generated by a computer, indicate whether you have an existing program that will print the information in readable form and state the name, title, business address and telephone number of each person who is familiar with the program.
- H. All objections to these numbered requests, or to any individual request, must be raised in the initial response or otherwise waived.

I. The Federal Trade Commission's Rules of Practice describes withholding requested material responsive to a subpoena under Rule 3.38A. For your convenience, Rule 3.38A states:

(a) Any person withholding material responsive to a subpoena issued pursuant to §3.34 or §3.36, written interrogatories requested pursuant to §3.35, a request for production or access pursuant to §3.37, or any other request for the production of materials under this part, shall assert a claim of privilege or any similar claim not later than the date set for production of the material. Such person shall, if so directed in the subpoena or other request for production, submit, together with such claim, a schedule which describes the nature of the documents, communications, or tangible things not produced or disclosed - and does so in a manner that, without revealing information itself privileged or protected, will enable other parties to assess the claim. The schedule need not describe any material outside the scope of the duty to search set forth in §3.31(c)(2) except to the extent that the Administrative Law Judge has authorized additional discovery as provided in that paragraph.

(b) A person withholding material for reasons described in §3.38A(a) shall comply with the requirements of that subsection in lieu of filing a motion to limit or quash compulsory process.

J. The Federal Trade Commission's Rules of Practice describes motions to quash and/or limit subpoenas under Rule 3.34(c). For your convenience, Rule 3.34 states in relevant part:

(c) *Motions to quash; limitation on subpoenas.* Any motion by the subject of a subpoena to limit or quash the subpoena shall be filed within the earlier of 10 days after service thereof or the time for compliance therewith. Such motions shall set forth all assertions of privilege or other factual and legal objections to the subpoena, including all appropriate arguments, affidavits and other supporting documentation, and shall include the statement required by §3.22(g). Nothing in paragraphs (a) and (b) of this section authorizes the issuance of subpoenas except in accordance with §§3.31(c)(2) and 3.36.

K. Some documents that you are requested to provide may be confidential. In the Protective Order dated October 22, 2013, Chief Administrative Law Judge D. Michael Chappell ordered that a party conducting discovery from third parties shall provide such third parties a copy of the Protective Order so as to inform third parties of his, her, or its rights. See ALJ Protective Order at 2, ¶4. Accordingly, a copy of the Protective Order is attached with this subpoena.

L. If any requested material is withheld based on a claim of privilege, submit together with such claim a schedule of the items withheld. For each item withheld, the schedule should state: (a) the item's type, title, specific subject matter and date; (b) the names, addresses, positions and organizations of all authors or recipients of the item; and (c) the specific grounds for



claiming that the item is privileged. If only part of a responsive document is privileged, all non-privileged portions of the document must be submitted.

### **DESCRIPTION OF DOCUMENTS REQUESTED**

Please produce the original or copies of the following documents (the term "documents" shall include all records, books of account, worksheets, checks, instructions, specifications, manuals, reports, books, periodicals, pamphlets, publications, raw and refined data, memoranda, graphs, drawings, notes, lab books, advertisements, list studies, meeting minutes, working papers, transcripts, magnetic tapes or discs, punch cards, computer printouts, letters, correspondence<sup>1</sup>, agreements, drafts of agreements, telegrams, email, drafts, proposals, employee records, customer records, log files recommendations, and any other data recorded in readable and/or retrievable form, whether typed, handwritten, reproduced, magnetically recorded, coded, or in any other ay made readable or retrievable):

1. All documents concerning<sup>2</sup> ECM BioFilms, Inc.
2. All correspondence between you and ECM BioFilms, Inc.
3. All documents sent or received by you making reference to ECM BioFilms,

Robert Sinclair, or ECM BioFilms Master Batch Pellets.

<sup>1</sup> The term "correspondence" is intended, used, and defined in its broadest sense allowable under the FTC Rules of Practice. Such term includes, but is not limited to embrace emails, documents appended to emails, reports and any other written or electronic document of any kind that is communicated from the subpoena recipient or its agents to any and all other persons and entities.

<sup>2</sup> The term "concerning" is intended, used, and defined in its broadest sense allowable under the FTC Rules of Practice and should be considered to be synonymous with regarding, relating to, mentioning, discussing, referencing, implicating, explaining, or about the documents subject to any and all individual requests in this subpoena.

4. All documents concerning any test or report (including any and all notes and raw data) performed or written about a product or substance containing any product of ECM BioFilms, Inc., including “ECM Masterbatch Pellets.”

5. All documents concerning the article, Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

6. All drafts and notes concerning the article, Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

7. All documents concerning the involvement of any and all individuals with the article, Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591, and/or the tests and procedures described in such article.

8. All documents concerning the actual tests and procedures (including any and all notes, drafts, protocols, identity and sources of the ECM additives received and used, and all raw data) described in “Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

9. Reserve samples of all plastics allegedly containing the ECM additive that are referenced in the article, “Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-

based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

10. All documents specifically concerning all funding and sources of funding for the article, Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

11. All documents and correspondence concerning Ohio State University’s knowledge and/or approval of the article, Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591.

12. All documents concerning any presentations, official discussions, lectures, interviews and/or publications in which the article Gómez, EF, Michel Jr., FC. “Biodegradability of conventional and bio-based plastics and natural fiber composites during composting, anaerobic digestion and long-term soil incubation” Polymer Degradation and Stability. Vol. 98 (December 2013): 2583-2591 was discussed.

13. All documents concerning any other test, article, report, and/or project involving all versions of ASTM International standard D5511.

14. All correspondence between you and Eddie F. Gómez concerning biodegradable products; biodegradable plastic products; compostable products; compostable plastic products; ECM BioFilms; ECM additives and/or plastic products allegedly containing ECM additives; Dr. Ramani Narayan; all versions of ASTM D5511, D5526, D5338, D6400; and/or Biodegradable Products Institute (“BPI”).

15. All documents concerning Dr. Ramani Narayan.
16. All correspondence between you and Dr. Ramani Narayan.
17. All documents concerning the BPI.
18. All correspondence between you and the BPI.
19. All correspondence between you and any member, employee, or representative of ASTM International.
20. All correspondence between you and any member, employee, representative, or officer of the United States Federal Trade Commission.
21. All documents concerning your education, training, and experience, including a list of all current and pending articles and written works that you have authored or co-authored.

#### **INSTRUCTIONS FOR COMPLIANCE BY DELIVERY OF DOCUMENTS**

If documents are delivered by hand, overnight delivery service, certified mail, or any other means your response shall be accompanied by an affidavit, executed by you that provides:

The names, addresses, positions, and organizations of all persons whose files were searched and all persons who participated in or supervised the collection of the documents<sup>3</sup>, and a brief description of the nature of the work that each person performed in connection with the collecting the documents.

A statement that the search was complete and that responsive documents are being produced.

A statement as to whether the documents were made at or near the time of the occurrence of the matters set forth in such documents, kept in the course of your regularly conducted business, whether it was your regular practice to make and keep such documents, and the custodian of records and/or other executive(s) and/or employees of Ohio State University who have knowledge of such matters, can authenticate the documents and materials produced, and who can testify to such matters.

<sup>3</sup> “Document” and “documents” as used in this Attachment are defined in this subpoena’s “Description of Documents Requested” section.

A statement as to whether any document called for by the subpoena has been misplaced, lost or destroyed. If any document has been misplaced, lost, or destroyed, identify: type of documents the date (or approximate date) of the documents, subject matter of the documents, all persons to whom it was addressed, circulated, or shown; its date of destruction, or when it was lost or misplaced; the reason it was destroyed, lost or misplaced; and the custodian of the documents on the date of its destruction, loss, or misplacement.

A declaration that states:

I declare (or certify, verify, or state) under penalty of perjury that the foregoing is true and correct.

Executed on [date].

[Signature of party executing the declaration]

Respectfully submitted,

/s/ Jonathan W. Emord

Jonathan W. Emord, Esq.  
EMORD & ASSOCIATES, P.C.  
11808 Wolf Rune Lane  
Clifton, VA 20124  
Ph: 202-466-6937  
Fx: 202-466-6938  
Em: [jemord@emord.com](mailto:jemord@emord.com)  
Counsel to ECM BioFilms, Inc.

UNITED STATES OF AMERICA  
FEDERAL TRADE COMMISSION  
OFFICE OF ADMINISTRATIVE LAW JUDGES

In the Matter of )  
)  
)

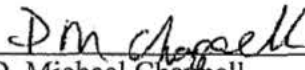
ECM BioFilms, Inc., )  
a corporation, also d/b/a )  
Envioplastics International, )  
Respondent. )

DOCKET NO. 9358

**PROTECTIVE ORDER GOVERNING DISCOVERY MATERIAL**

Commission Rule 3.31(d) states: "In order to protect the parties and third parties against improper use and disclosure of confidential information, the Administrative Law Judge shall issue a protective order as set forth in the appendix to this section." 16 C.F.R. § 3.31(d). Pursuant to Commission Rule 3.31(d), the protective order set forth in the appendix to that section is attached verbatim as Attachment A and is hereby issued.

ORDERED:

  
\_\_\_\_\_  
D. Michael Chappell  
Chief Administrative Law Judge

Date: October 22, 2013

## ATTACHMENT A

For the purpose of protecting the interests of the parties and third parties in the above-captioned matter against improper use and disclosure of confidential information submitted or produced in connection with this matter:

**IT IS HEREBY ORDERED THAT** this Protective Order Governing Confidential Material ("Protective Order") shall govern the handling of all Discovery Material, as hereafter defined.

1. As used in this Order, "confidential material" shall refer to any document or portion thereof that contains privileged, competitively sensitive information, or sensitive personal information. "Sensitive personal information" shall refer to, but shall not be limited to, an individual's Social Security number, taxpayer identification number, financial account number, credit card or debit card number, driver's license number, state-issued identification number, passport number, date of birth (other than year), and any sensitive health information identifiable by individual, such as an individual's medical records. "Document" shall refer to any discoverable writing, recording, transcript of oral testimony, or electronically stored information in the possession of a party or a third party. "Commission" shall refer to the Federal Trade Commission ("FTC"), or any of its employees, agents, attorneys, and all other persons acting on its behalf, excluding persons retained as consultants or experts for purposes of this proceeding.
2. Any document or portion thereof submitted by a respondent or a third party during a Federal Trade Commission investigation or during the course of this proceeding that is entitled to confidentiality under the Federal Trade Commission Act, or any regulation, interpretation, or precedent concerning documents in the possession of the Commission, as well as any information taken from any portion of such document, shall be treated as confidential material for purposes of this Order. The identity of a third party submitting such confidential material shall also be treated as confidential material for the purposes of this Order where the submitter has requested such confidential treatment.
3. The parties and any third parties, in complying with informal discovery requests, disclosure requirements, or discovery demands in this proceeding may designate any responsive document or portion thereof as confidential material, including documents obtained by them from third parties pursuant to discovery or as otherwise obtained.
4. The parties, in conducting discovery from third parties, shall provide to each third party a copy of this Order so as to inform each such third party of his, her, or its rights herein.
5. A designation of confidentiality shall constitute a representation in good faith and after careful determination that the material is not reasonably believed to be already in the public domain and that counsel believes the material so designated constitutes confidential material as defined in Paragraph 1 of this Order.

6. Material may be designated as confidential by placing on or affixing to the document containing such material (in such manner as will not interfere with the legibility thereof), or if an entire folder or box of documents is confidential by placing or affixing to that folder or box, the designation "CONFIDENTIAL – FTC Docket No. 9358" or any other appropriate notice that identifies this proceeding, together with an indication of the portion or portions of the document considered to be confidential material. Confidential information contained in electronic documents may also be designated as confidential by placing the designation "CONFIDENTIAL – FTC Docket No. 9358" or any other appropriate notice that identifies this proceeding, on the face of the CD or DVD or other medium on which the document is produced. Masked or otherwise redacted copies of documents may be produced where the portions deleted contain privileged matter, provided that the copy produced shall indicate at the appropriate point that portions have been deleted and the reasons therefor.

7. Confidential material shall be disclosed only to: (a) the Administrative Law Judge presiding over this proceeding, personnel assisting the Administrative Law Judge, the Commission and its employees, and personnel retained by the Commission as experts or consultants for this proceeding; (b) judges and other court personnel of any court having jurisdiction over any appellate proceedings involving this matter; (c) outside counsel of record for any respondent, their associated attorneys and other employees of their law firm(s), provided they are not employees of a respondent; (d) anyone retained to assist outside counsel in the preparation or hearing of this proceeding including consultants, provided they are not affiliated in any way with a respondent and have signed an agreement to abide by the terms of the protective order; and (e) any witness or deponent who may have authored or received the information in question.

8. Disclosure of confidential material to any person described in Paragraph 7 of this Order shall be only for the purposes of the preparation and hearing of this proceeding, or any appeal therefrom, and for no other purpose whatsoever, provided, however, that the Commission may, subject to taking appropriate steps to preserve the confidentiality of such material, use or disclose confidential material as provided by its Rules of Practice; sections 6(f) and 21 of the Federal Trade Commission Act; or any other legal obligation imposed upon the Commission.

9. In the event that any confidential material is contained in any pleading, motion, exhibit or other paper filed or to be filed with the Secretary of the Commission, the Secretary shall be so informed by the Party filing such papers, and such papers shall be filed *in camera*. To the extent that such material was originally submitted by a third party, the party including the materials in its papers shall immediately notify the submitter of such inclusion. Confidential material contained in the papers shall continue to have *in camera* treatment until further order of the Administrative Law Judge, provided, however, that such papers may be furnished to persons or entities who may receive confidential material pursuant to Paragraphs 7 or 8. Upon or after filing any paper containing confidential material, the filing party shall file on the public record a duplicate copy of the paper that does not reveal confidential material. Further, if the protection for any such material expires, a party may file on the public record a duplicate copy which also contains the formerly protected material.



10. If counsel plans to introduce into evidence at the hearing any document or transcript containing confidential material produced by another party or by a third party, they shall provide advance notice to the other party or third party for purposes of allowing that party to seek an order that the document or transcript be granted *in camera* treatment. If that party wishes *in camera* treatment for the document or transcript, the party shall file an appropriate motion with the Administrative Law Judge within 5 days after it receives such notice. Except where such an order is granted, all documents and transcripts shall be part of the public record. Where *in camera* treatment is granted, a duplicate copy of such document or transcript with the confidential material deleted therefrom may be placed on the public record.

11. If any party receives a discovery request in any investigation or in any other proceeding or matter that may require the disclosure of confidential material submitted by another party or third party, the recipient of the discovery request shall promptly notify the submitter of receipt of such request. Unless a shorter time is mandated by an order of a court, such notification shall be in writing and be received by the submitter at least 10 business days before production, and shall include a copy of this Protective Order and a cover letter that will apprise the submitter of its rights hereunder. Nothing herein shall be construed as requiring the recipient of the discovery request or anyone else covered by this Order to challenge or appeal any order requiring production of confidential material, to subject itself to any penalties for non-compliance with any such order, or to seek any relief from the Administrative Law Judge or the Commission. The recipient shall not oppose the submitter's efforts to challenge the disclosure of confidential material. In addition, nothing herein shall limit the applicability of Rule 4.11(e) of the Commission's Rules of Practice, 16 CFR 4.11(e), to discovery requests in another proceeding that are directed to the Commission.

12. At the time that any consultant or other person retained to assist counsel in the preparation of this action concludes participation in the action, such person shall return to counsel all copies of documents or portions thereof designated confidential that are in the possession of such person, together with all notes, memoranda or other papers containing confidential information. At the conclusion of this proceeding, including the exhaustion of judicial review, the parties shall return documents obtained in this action to their submitters, provided, however, that the Commission's obligation to return documents shall be governed by the provisions of Rule 4.12 of the Rules of Practice, 16 CFR 4.12.

13. The provisions of this Protective Order, insofar as they restrict the communication and use of confidential discovery material, shall, without written permission of the submitter or further order of the Commission, continue to be binding after the conclusion of this proceeding.

**RESPONDENT**  
**EXHIBIT**  
**RX-F-2**

**From:** Lou Caputo  
**To:** [kjohnson3@ftc.gov](mailto:kjohnson3@ftc.gov)  
**Cc:** [eiillson@ftc.gov](mailto:eiillson@ftc.gov); [jcohen2@ftc.gov](mailto:jcohen2@ftc.gov); Jonathan Emord; Peter Arhangelsky  
**Subject:** Third-Party Subpoenas Duces Tecum  
**Date:** Friday, February 28, 2014 3:30:00 PM  
**Attachments:** [Subpoena \(EcoSmart\).pdf](#)  
[Subpoena \(Elsevier\).pdf](#)  
[Supp. Subpoena \(Narayan\).pdf](#)  
[Subpoena \(Gomez\).pdf](#)  
[Subpoena \(Michel\).pdf](#)  
[Subpoena \(Almenar\).pdf](#)

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Counsel,

Per the ALJ's Scheduling Order, please find the attached subpoenas *duces tecum* that were sent earlier today to the respective subjects.

Best,

**Lou Caputo | EMORD & ASSOCIATES, P.C.** | 3210 S. Gilbert Rd., Ste 4 | Chandler, AZ 85286 Firm: (602) 388-8901 | Facsimile: (602) 393-4361 | [www.emord.com](http://www.emord.com)

**NOTICE:** This is a confidential communication intended for the recipient listed above. The content of this communication is protected from disclosure by the attorney-client privilege and the work product doctrine. If you are not the intended recipient, you should treat this communication as strictly confidential and provide it to the person intended. Duplication or distribution of this communication is prohibited by the sender. If this communication has been sent to you in error, please notify the sender and then immediately destroy the document.

**RESPONDENT**

**EXHIBIT**

**RX-G**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**



**REDACTED**

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**REDACTED**

**REDACTED**

**RESPONDENT**  
**EXHIBIT**  
**RX-H**

**UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION**

<b>In the Matter of</b>	)	
	)	
<b>ECM BioFilms, Inc.,</b>	)	<b>Docket No. 9358</b>
<b>a corporation, also d/b/a</b>	)	
<b>Enviroplastics International</b>	)	

**COMPLAINT COUNSEL'S RESPONSE TO  
RESPONDENT ECM BIOFILMS, INC.'S FIRST SET OF  
REQUESTS FOR PRODUCTION OF DOCUMENTS AND THINGS**

Pursuant to Rule 3.37 of the Federal Trade Commission's Rules of Practice for Adjudicative Proceedings, Complaint Counsel hereby submits the following objections and responses to Respondent ECM Biofilms, Inc.'s ("ECM's") First Set of Requests for Production of Documents and Things.

**GENERAL OBJECTIONS**

1. Complaint Counsel reserves the right to assert additional objections to production of information or documents as appropriate and to supplement these objections and responses. As to each request where Complaint Counsel has stated that it will produce or make responsive documents available for inspection, such a statement does not imply or represent that responsive documents are known to exist or do, in fact, exist. Complaint Counsel objects to the Document Requests to the extent they seek information that is not relevant to the subject matter of the litigation and/or not reasonably calculated to lead to the discovery of relevant information.

2. Complaint Counsel's willingness to provide information or documents notwithstanding the objectionable nature of the Document Request shall not be construed as (a) an acknowledgment or admission that the material is relevant; (b) a waiver of the General

Objections or the Objections asserted in response to specific document requests; or (c) an agreement that requests for similar information will be treated in a similar manner.

3. Complaint Counsel objects to each document request to the extent that it calls for information or the production of any document that is protected from disclosure by the attorney-client privilege, the attorney work-product privilege, the deliberative process privilege, the law enforcement privilege, the investigative privilege, the government informant privilege, the non-testifying expert privilege, the joint prosecution privilege, the common interest doctrine, that is exempt from disclosure pursuant to confidentiality provisions set forth in the FTC Act, that is protected from disclosure by the privilege for information given to the FTC on a Pledge of Confidentiality, that is protected from disclosure under principles of financial privacy, that is subject to a protective order from another litigation, or that is subject to any other applicable legal protection or privilege. The inadvertent production of any privileged documents shall not be deemed a waiver of any applicable privilege with respect to that document or any other document or information.

4. Complaint Counsel objects to each document request to the extent that it calls for materials generated and transmitted between Complaint Counsel and non-testifying Federal Trade Commission employees, as outside the scope of discovery pursuant to Rule 3.31(c)(2).

5. Complaint Counsel objects to each document request to the extent it seeks information that is not relevant to the subject matter of the litigation and/or not reasonably calculated to lead to the discovery of information relevant to the allegations of the complaint, to the proposed relief, or to Respondent's defenses.

6. Complaint Counsel objects to each document request to the extent that it is overly broad, unduly burdensome, vague, and ambiguous.

7. Complaint Counsel objects to each document request to the extent that it seeks documents that are not in the possession, custody, or control of Complaint Counsel.

8. Complaint Counsel will not produce documents responsive to this request that Respondent previously has produced to Complaint Counsel at any point during the investigation or litigation in this matter.

9. Complaint Counsel will not produce documents responsive to this request that have been provided to Respondent previously.

10. This response addresses only documents collected or reviewed in the course of the investigation and prosecution of this case and that are in the possession, custody or control of the FTC Bureau of Consumer Protection. *See* FTC Rule 3.31(c)(2). Complaint Counsel objects to the Requests to the extent they seek documents outside this scope, and such documents will not be produced.

11. Each of the foregoing General Objections is incorporated in each of the Responses hereinafter set forth. Subject to and without waiving any of such objections, Complaint Counsel responds as follows:

#### **OBJECTIONS AND RESPONSES TO REQUESTS**

**Request for Production 1:** Provide all documents that concern whether plastics in general and ECM Plastics in particular will break down and decompose into elements found in nature after customary disposal or in a landfill.

**Response:** Complaint Counsel objects to Request for Production 1 on the grounds that a request for documents concerning plastics in general is overly broad, vague, and ambiguous. Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 2:** Provide all documents, whether prepared by or for the Commission or any other entity, concerning consumer perception, comprehension, or recall (including, but not limited to, copy tests, marketing or consumer surveys and reports, penetration tests, recall tests, audience reaction tests, and communication tests) of plastics biodegradability; biodegradability in general; landfill composition; or conditions of customary waste disposal.

**Response:** Complaint Counsel objects to Request for Production 2 on the grounds that it is overly broad, vague, and ambiguous. Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 3:** Provide all documents that support or call into question your conclusion that ECM's biodegradable claims for degradation are false.

**Response:** Complaint Counsel objects to Request for Production 3 on the grounds that the request is overly broad, vague, and ambiguous. Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 4:** Provide all documents that support or call into question your conclusion that consumers likely interpret unqualified degradable claims to mean that the entire product or package will completely decompose into elements found in nature within one year after customary disposal.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 5:** Provide all documents relating to your contention that express or implied representations made in or implied by ECM BioFilm's written advertising or promotional materials are false or misleading.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 6:** Provide all correspondence between FTC and ASTM and ASTM present and past members, officers, directors, or agents.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 7:** Provide all documents pertaining to the ASTM standards which concern plastics biodegradability, or concern ASTM policies, membership, or revisions to standards.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 8:** Provide all documents that relate to your contention that end-consumers (as opposed to ECM's trade customers) view, understand, or rely on ECM's written advertising materials.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.



**Request for Production 9:** Provide all documents relating to any investigation conducted by you or on your behalf relating to any advertising claims or representations concerning the ECM MasterBatch Pellets, or any other ECM plastics additive.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 10:** Produce all documents concerning your contention that landfills are generally anaerobic environments that lack oxygen and that restrict the amount of liquid infiltration or moisture content.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 11:** Provide all documents concerning plastics chemistry, formation, polymerization, formulation, mineralization, enzymatic degradation, or depolymerization in biodegradable and non-biodegradable polymers.

**Response:** Complaint Counsel objects to Request for Production 11 on the grounds that it is overly broad, vague, and ambiguous. Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 12:** Provide all documents relating to your contention that ECM's tests were not designed to support its claims, and that the data from ECM's testing is invalid or cannot support reliable conclusions.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 13:** Produce all documents concerning the period of time under which conventional plastics generally biodegrade, including documents supporting your contention that plastics will normally require hundreds of thousands of years to biodegrade.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 14:** Produce all documents concerning your definition of “competent and reliable” scientific evidence as that definition concerns biodegradation claims for plastics in general and ECM’s express and/or implied claims challenged by the FTC.

**Response:** Complaint Counsel objects to Request for Production 14 on the grounds that it is overly broad, vague, and ambiguous. Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 15:** Provide all documents relating to any advertisement or promotional material for the ECM MasterBatch pellets, other than documents produced by Respondents in pre-complaint disclosures or discovery.

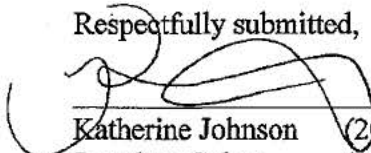
**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

**Request for Production 16:** Produce all documents identified in any answer to an Interrogatory propounded by ECM or on which you rely in answering any Interrogatory propounded by ECM.

**Response:** Subject to and without waiving the foregoing objections, Complaint Counsel will produce responsive, non-privileged documents.

Dated: January 2, 2014

Respectfully submitted,

  
Katherine Johnson (202) 326-2185

Jonathan Cohen (202) 326-2551

Elisa K. Jillson (202) 326-3001

Division of Enforcement

Bureau of Consumer Protection

Federal Trade Commission

600 Pennsylvania Avenue, NW

Mailstop M-8102B

Washington, DC 20580

**CERTIFICATE OF SERVICE**

I hereby certify that on January 2, 2014, I caused a true and correct copy of the paper original of the foregoing *Complaint Counsel's Response to Respondent ECM Biofilms, Inc.'s First Set of Requests for Production of Documents or Things* to be served as follows:

**One electronic copy to Counsel for the Respondent:**

Jonathan W. Emord  
Emord & Associates, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Email: [jemord@emord.com](mailto:jemord@emord.com)

Peter Arhangelsky  
Emord & Associates, P.C.  
3210 S. Gilbert Road, Suite 4  
Chandler, AZ 85286  
Email: [parhangelsky@emord.com](mailto:parhangelsky@emord.com)

Lou Caputo  
Emord & Associates, P.C.  
3210 S. Gilbert Road, Suite 4  
Chandler, AZ 85286  
Email: [lcaputo@emord.com](mailto:lcaputo@emord.com)

I further certify that I possess a paper copy of the signed original of the foregoing document that is available for review by the parties and the adjudicator.

  
\_\_\_\_\_  
Katherine Johnson  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Ave., NW, M-8102B  
Washington, DC 20580  
Telephone: (202) 326-2185  
Facsimile: (202) 326-2558  
Email: [kjohnson3@ftc.gov](mailto:kjohnson3@ftc.gov)

**RESPONDENT**

**EXHIBIT**

**RX-I-1**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**RESPONDENT**

**EXHIBIT**

**RX-I-2**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**



**REDACTED**

**REDACTED**

**REDACTED**

**RESPONDENT**

**EXHIBIT**

**RX-J**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**



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**RESPONDENT**

**EXHIBIT**

**RX-K**

**CONFIDENTIAL – SUBJECT TO  
PROTECTIVE ORDER**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**

**REDACTED**



**REDACTED**

**REDACTED**

**RESPONDENT**  
**EXHIBIT**  
**RX-L**

**UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION**

<b>In the Matter of</b>	)	
	)	
<b>ECM BioFilms, Inc.,</b>	)	<b>Docket No. 9358</b>
<b>a corporation, also d/b/a</b>	)	
<b>Enviroplastics International</b>	)	
	)	

**COMPLAINT COUNSEL’S SUPPLEMENTAL INITIAL DISCLOSURES**

Under Commission Rule of Practice § 3.31(b) and (e), Complaint Counsel supplements its Initial Disclosures. The information disclosed herein is based upon information reasonably available to Complaint Counsel. Without waiving any privileges or prejudicing the ability to supplement these Supplemental Initial Disclosures if additional information becomes available, Complaint Counsel makes the following supplemental disclosures:

**I. Individuals and Entities Likely To Have Discoverable Information**

In addition to the individuals and entities identified in Complaint Counsel’s original Initial Disclosures, we have listed in Supplemental Appendices C and D, individuals and entities that are likely to have discoverable information relevant to the allegations asserted in the Complaint, the proposed relief, or Respondent’s defenses.<sup>1</sup> When available, Complaint Counsel has set forth each individual’s or entity’s name and, if known, address and telephone number.<sup>2</sup>

<sup>1</sup> Documents received from ECM Biofilms, Inc. (“ECM”) in response to Complaint Counsel’s requests may include other individuals likely to have discoverable information relevant to the allegations asserted in the Complaint, the proposed relief, or Respondent’s defenses.

<sup>2</sup> Any contact with Federal Trade Commission (“Commission”) employees must be made through Complaint Counsel.

**II. Documents and Electronically Stored Information**

Attached are copies of additional documents and electronically stored information in the Bureau of Consumer Protection's possession, custody, or control that are relevant to the allegations asserted in the Complaint, the proposed relief, or Respondent's defenses. Complaint Counsel is in the process of searching for additional relevant documents, except that Complaint Counsel will not provide any documents, materials, or electronically stored information subject to the limitations in § 3.31(c)(2), privileged as defined in § 3.31(c)(4), pertaining to hearing preparation as defined in § 3.31(c)(5), or pertaining to experts as defined in § 3.31A. To the extent that such documents are produced, it is without waiver of any protections or privileges.

Dated: March 17, 2014

Respectfully submitted,

/s/ Katherine Johnson

Katherine Johnson (202) 326-2185

Elisa K. Jillson (202) 326-3001

Division of Enforcement

Bureau of Consumer Protection

Federal Trade Commission

600 Pennsylvania Avenue, NW

Mailstop M-8102B

Washington, DC 20580

**CERTIFICATE OF SERVICE**

I hereby certify that on March 18, 2014, I caused a true and correct copy of the foregoing Complaint Counsel's Supplemental Initial Disclosures to be served as follows:

One electronic copy to **Counsel for the Respondent:**

Jonathan W. Emord  
Emord & Associates, P.C.  
11808 Wolf Run Lane  
Clifton, VA 20124  
Email: [jemord@emord.com](mailto:jemord@emord.com)

Peter Arhangelsky  
Emord & Associates, P.C.  
3210 S. Gilbert Road, Suite 4  
Chandler, AZ 85286  
Email: [parhangelsky@emord.com](mailto:parhangelsky@emord.com)

Lou Caputo  
Emord & Associates, P.C.  
3210 S. Gilbert Road, Suite 4  
Chandler, AZ 85286  
Email: [lcaputo@emord.com](mailto:lcaputo@emord.com)

/s/ Katherine Johnson  
Katherine Johnson  
Division of Enforcement  
Bureau of Consumer Protection  
Federal Trade Commission  
600 Pennsylvania Ave., NW, M-8102B  
Washington, DC 20580  
Telephone: (202) 326-2185  
Facsimile: (202) 326-2558  
Email: [kjohnson3@ftc.gov](mailto:kjohnson3@ftc.gov)

**Supplemental Appendix C**

**Individuals or Entities Associated with Scientific Testing**

<b>Name and Title</b>	<b>Contact Information</b>	<b>Counsel (if known)</b>
Ohio State University	Through counsel	Jan Alan Neiger Assistant Vice President and Associate General Counsel The Ohio State University Office of Legal Affairs 1590 North High Street, Suite 500 Columbus, Ohio 43201 Phone: 614-292-0611/FAX: 614-292-8699 E-Mail: Neiger.4@osu.edu
Frederick Michel	Contact through counsel	Jan Alan Neiger Assistant Vice President and Associate General Counsel The Ohio State University Office of Legal Affairs 1590 North High Street, Suite 500 Columbus, Ohio 43201 Phone: 614-292-0611/FAX: 614-292-8699 E-Mail: Neiger.4@osu.edu
Eddie F. Gomez	Contact through counsel	Jan Alan Neiger Assistant Vice President and Associate General Counsel The Ohio State University Office of Legal Affairs 1590 North High Street, Suite 500 Columbus, Ohio 43201 Phone: 614-292-0611/FAX: 614-292-8699 E-Mail: Neiger.4@osu.edu

**Supplemental Appendix D**

**Current and Former FTC Employees**

<b>Name and Title</b>	<b>Contact Information</b>	<b>Counsel (if known)</b>
Kathleen Pessolano	Unknown	Complaint Counsel
Zachary Hunter	Unknown	Complaint Counsel
Matthew Wilshire, Attorney	Federal Trade Commission 600 Pennsylvania Ave., NW Mailstop M-8102B Washington DC, 20580 Tel: contact through Complaint Counsel	Complaint Counsel
David Hendrickson, Investigator	Federal Trade Commission 600 Pennsylvania Ave., NW Mailstop M-8102B Washington DC, 20580 Tel: contact through Complaint Counsel	Complaint Counsel



**RESPONDENT**

**EXHIBIT**

**RX-M**

UNITED STATES OF AMERICA  
BEFORE THE FEDERAL TRADE COMMISSION  
OFFICE OF THE ADMINISTRATIVE LAW JUDGES  
Washington, D.C.

In the Matter of

ECM BioFilms, Inc.,  
a corporation, also d/b/a  
Envioplastics International,


Respondent.

Docket No. 9358

**DECLARATION OF LOU CAPUTO IN SUPPORT OF RESPONDENT ECM'S  
MOTION TO COMPEL AND FOR SANCTIONS**

In accord with 28 U.S.C. § 1746, I declare under penalty of perjury that the following is true and correct:

1. I am over the age of eighteen years and I make this affidavit on personal knowledge of its contents and in further support of Respondent's Motion for a Protective Order.
2. I am employed by the law firm Emord & Associates, P.C., which represents ECM BioFilms in matters before the Federal Trade Commission. I am an attorney of record in the above-captioned case.
3. **Exhibit RX-F-1** hereto is a true and correct copy of a subpoena *duces tecum* sent to Dr. Frederick Michel on February 28, 2014.
4. **Exhibit RX-F-2** hereto is a true and correct copy of an email sent to Complaint Counsel and Dr. Michel on February 28, 2014.

  
\_\_\_\_\_  
Lou F. Caputo  
Respondent's Counsel

Executed this 19th day of March 2014 in Chandler, Arizona.