Open-BIO
Opening bio-based markets via standards, labelling and procurement

Work package 5
In situ biodegradation

Deliverable N° 5.4:
Biodegradability in freshwater test

Public summary

Version: 1

Gent, October 24th, 2016

prepared by:

Organic Waste Systems (OWS); Novamont S.p.A.; Agricultural University of Athens (AUA)
B. De Wilde & N. Mortier (OWS nv); M. Tosin, M. Pognani & F. Degli Innocenti (Novamont S.p.A.); D. Briassoulis & A. Mistriotis (AUA)

OWS nv
Dok Noord 5
B-9000 Gent
Belgium
Tel.: +32 (0)9 233 02 04
Fax: +32 (0)9 233 28 25
E-mail: nike.mortier@ows.be; maurizio.tosin@novamont.com; briassou@aua.gr
Partner website: www.ows.be; www.novamont.com; www.aua.gr
Project website : www.open-bio.eu

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° KBBE/FP7EN/613677.

List of abbreviations, acronyms and used standards

ASTM	American Society for Testing and Materials
ASTM D5864	Standard Test Method for Determining Aerobic Aquatic Biodegradation of Lubricants or Their Components
ASTM D6139	Standard Test Method for Determining the Aerobic Aquatic Biodegradation of Lubricants or Their Components Using the Gledhill Shake Flask
AUA	Agricultural University of Athens
BOD	Biological Oxygen Demand
CEN	European committee for standardisation (Comité Européen de Normalisation)
DOC	Dissolved organic carbon
EN 14047	Packaging – Determination of the ultimate aerobic biodegradability of packaging materials in an aqueous medium – Method by analysis of evolved carbon dioxide
EN 14048	Packaging – Determination of the ultimate aerobic biodegradability of packaging materials in an aqueous medium – Method by measuring oxygen demand in a closed respirometer
EN 14987	Plastics – Evaluation of disposability in waste water treatment plants. Test scheme for final acceptance and specifications
ISO	International Organization for Standardization
ISO 9408	Water quality – Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium by determination of oxygen demand in a closed respirometer
ISO 9439	Water quality – Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium – Carbon dioxide evolution test
ISO 14851	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium – Method by measuring the oxygen demand in a closed respirometer
ISO 14852	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium – Method by analysis of evolved carbon dioxide
KBBPPS	Knowledge Based Bio-based Products' Pre-Standardization
LDPE	Low Density PolyEthylene
OECD	Organisation for Economic Co-operation and Development
OECD 301B	Ready Biodegradability - CO_2 Evolution (Modified Sturm Test)

OECD 301F	Ready Biodegradability - Manometric Respirometry
PBSe	PolyButylene Sebacate
PBSeT	PolyButylene Sebacate-co-butylenTerephtalate
PHB	Poly(3-HydroxyButyrate)
$ThCO_2$	Theoretical carbon dioxide production
ThOD	Theoretical Oxygen Demand
TOC	Total Organic Carbon

1 Public summary

Open-Bio is a research project funded by the European Commission within FP7 (*7th Framework Programme for Research and Technological Development*). The goal is to investigate how bio-based products can be integrated into the market, using standardisation, labelling and procurement. Work Package 5 of Open-Bio investigates biodegradability test methods for bio-based products in several natural environments: soil, freshwater and marine environment. The objective of this work is the development of a testing scheme for a broad category of bio-based products. For several bio-based products (e.g. detergents, rinse-off cosmetics, plastic protection layers for detergents for dishwashers and washing machines, lubricants, textiles, flushables, etc.) biodegradability in freshwater is an interesting characteristic as such products will anyway be disposed in freshwater.

Within the project two methodologies were developed: (1) *Bio-based products - Determination of aerobic biological degradation of bio-based products in an aqueous solution - Test method based on O_2 consumption*, which is based on OECD 301F, ISO 9408, ISO 14851, EN 14048 and ASTM D6731, and (2) *Bio-based products - Determination of aerobic biological degradation of bio-based products in an aqueous solution - Test method based on CO_2 production*, which is based on OECD 301B, ISO 9439, ISO 14852, EN 14047, ASTM D5864 and ASTM D6139. The horizontal freshwater test methodologies incorporate the principles of the test methods on which they are based and include some improvements in order to increase the repeatability of the test methodologies (e.g. only one inoculum source is allowed instead of several inoculum sources, in the test methodology based on oxygen consumption an extra option is added to determine simultaneously the carbon dioxide production by measuring the carbon dioxide captured in the absorbent as a kind of double-check, etc.).

The two methods were improved following the interlaboratory study and the texts are presented in this report. These texts can be provided to specific standardization development organization that can use it as basis of their standards. A more extensive report is in Deliverable D5.2 that can also be used by CEN or ISO, but as it contains more detail, is not intended for other SDOs.

Website: www.open-bio.eu