Innovative fully biodegradable mulching films & fruit protection bags for sustainable agricultural practices - LIFE14 ENV/ES/000486

LIFE MULTIBIOSOL

"High performance biomass extracted functional hybrid polymer coatings for packaging – HyperBioCoat project"

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HyperBioCoat

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What is HyperBioCoat about?

The project aims at developing new biobased and biodegradable coating for rigid and flexible plastic packaging.

The challenge of this project is to provide superior barrier properties to biodegradable packaging materials.

The innovation will be carried out by combining the high-performance ORMOCER® concept with oligomeric hemicellulose feedstock, as residual waste from food industry.

This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme. Grant Agreement N. 720736

HyperBioCoat

European Commission

Life

The consortium

aitiip centro tecnológico

ARCHA

BAYERNWALD

cosmetic BEAUTY CARE EXCELLENCE

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PLASMA ELECTRONIC CHANGING SURFACES

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Technical objectives

Biobased

Lacquers with inorganically or organically functionalised biopolymers mainly from lignocellulosic biomass.

Biodegradable

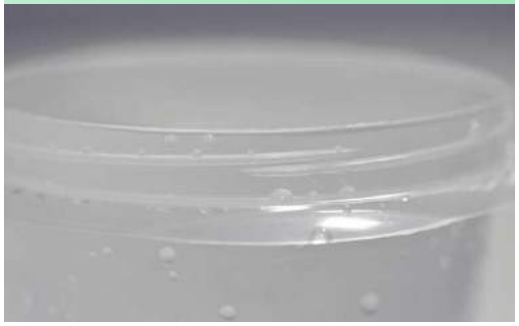
High biodegradability and better LCA features due to use of biomass extracted biodegradable material (no need to be landfilled and / or incinerated).

Barrier properties

High barrier performances.

Excellent barrier against water vapour, oxygen or flavours.

- OTR: < 1 cm3/(m2·d·bar) @ 23ºC & 65% RH
- WVTR: < 1 g/(m2·d) @ 38ºC & 90% RH



Advantages of the coating

10% cost reduction

By means of side-streams of existing commercial processes, the HyperBioCoat solution is cost-competitiveness.

20% CO_2 less emissions

By replacing fossil-based precursor materials with biobased starting materials, it can be estimated that the CO_2 emissions will be reduced at least by 20 % for bioORMOCER®s as compared to purely fossil-based.

Demonstrators

Project results will be applied in three different packaging to be tested and validated.

FOOD

Flexible retail food packaging, where shelf life product will be increased.

COSMETIC

Symmetric bottle with screw cap.

MEDICAL

Flexible tray for medical needle parts.

Role of ARCHA

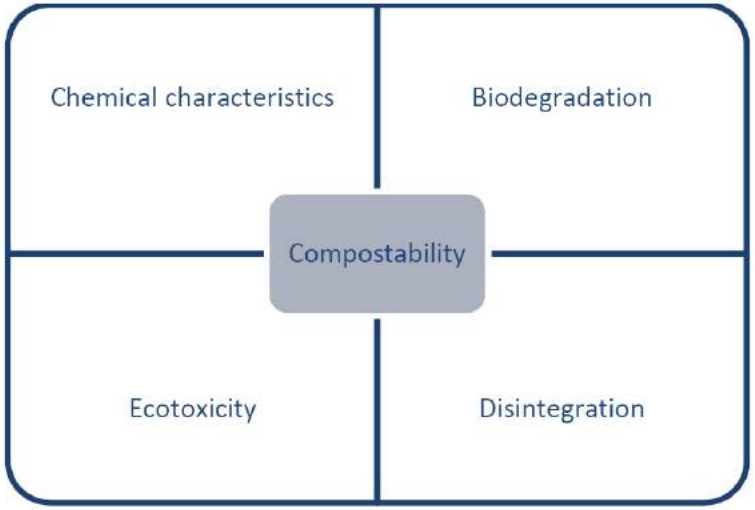
Analyses of coated films, containers and packaging:

- **Biodegradability and compostability assessment**
- **Antimicrobial and migration properties**
- **LCA and LCC analyses**

Biodegradability tests on materials and products

EN 13432-2000

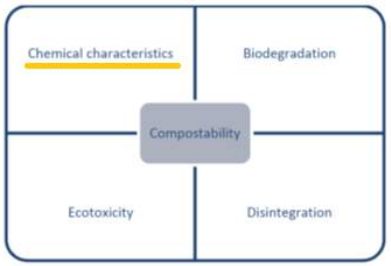
Packaging—Requirements for packaging recoverable through composting and biodegradation—Test scheme and evaluation criteria for the final Acceptance of packaging



Archa is going to be recognised by Vincotte for:

Heavy metal concentrations for plastic materials for compostable packaging (EN 13432:2000)

(mg/kg d.m.)	Concentration Limits
As	5
Cd	0,5
Cr	50
Cu	50
F	100
Hg	0,5
Mo	1
Ni	25
Pb	50
Se	0,75
Zn	150



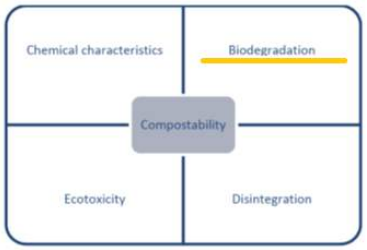
Heavy metal concentrations in composted residues (EC Regulation 2092/91 on fertilisers)

(mg/kg d.m.)	REGULATION EC 2092/91
Cd	0,7
Cr (VI)	0 (< DL)
Cu	70
Hg	0,4
Ni	25
Pb	45
Zn	200

Chemical and chemico-physical parameters in composted residues (ISO 14855:2013)

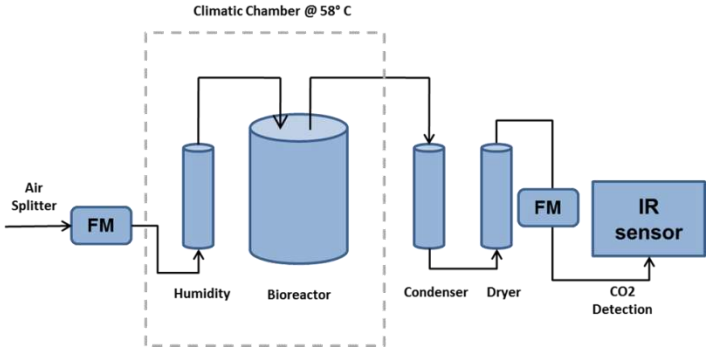
	Optimal values (ISO 14855)
DM (% w/w)	50-55%
VS (% w/w dm)	< 30%
C/N	10-40
pH	7,0-9,0

Biodegradability tests on materials and products



Biodegradability tests are carried according to official method ISO 14855-1:2013

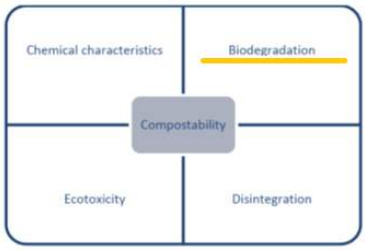
Test methods determine the degree and the rate of aerobic biodegradation of plastic materials on exposure to a controlled-composting environment

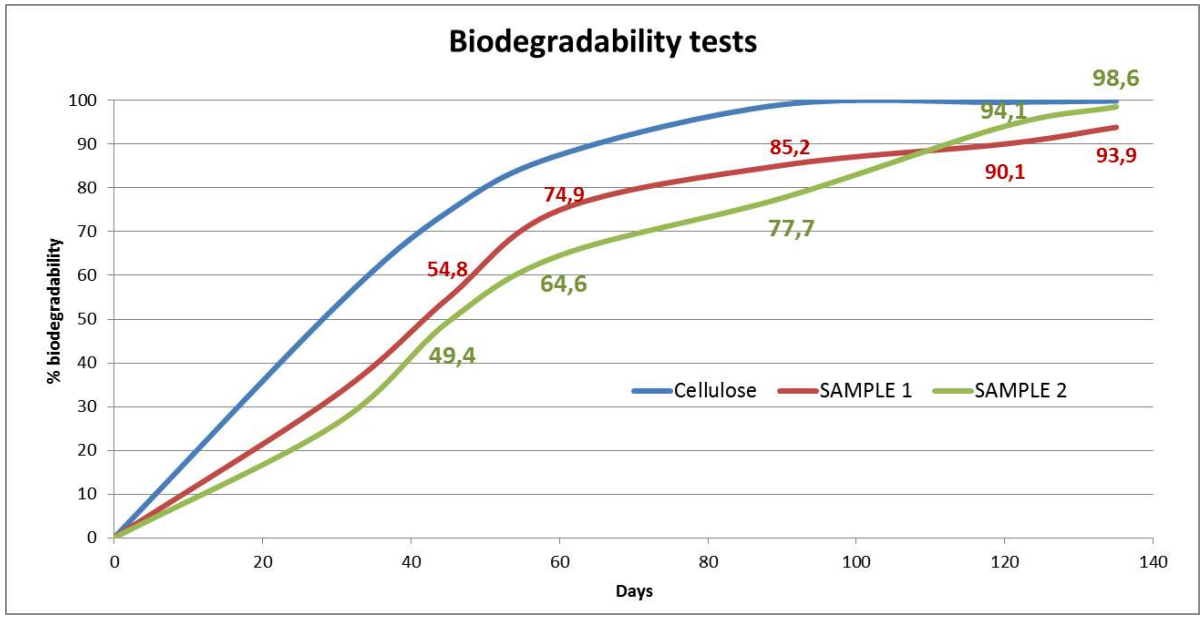


DESCRIPTION:

- Test will be performed on 3 replicates for each sample, compared with cellulose film as biodegradability positive control, a blank control containing only the inoculum;
- Test material can be defined “biodegradable under composting conditions” if its degradation results at least 90% in less than 6 months.

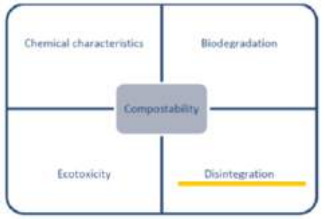
Biodegradability tests on materials and products





Disintegration tests on developed materials and products

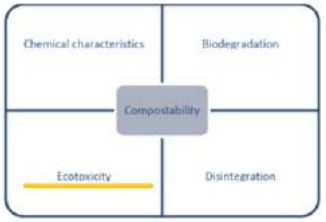
ISO 16929-2013 "Plastics -- Determination of the degree of disintegration of plastic materials under composting conditions in a pilot-scale test"



DESCRIPTION:

- Pieces of the plastic test material will be composted with a prepared solid matrix (municipal solid waste).
- The degree of disintegration will be determined after a composting cycle, by sieving the final matrix through a 2 mm sieve in order to recover the non-disintegrated residues.
- The disintegration test will occur efficiently if less than 10% of the original mass of loaded samples is above 2 mm sieve after 12 weeks.
- Disintegration tests will be carried out on those materials proven to be successful from biodegradability test.

Eco-toxicological tests on composted residues



OECD 208 (July 2006) "Terrestrial Plant Test: Seedling Emergence and Seedling Growth Test"

DESCRIPTION:

- Tests evaluate the differences in toxic or phytotoxic potency between control compost (blank sample) and final compost obtained from the degradation of the materials.
- According to EN 13432, the determination of phytotoxic effects can be performed:
  - **germination test**

  - **plant growth test**

Antimicrobial performance of new Bio-ORMOCERs®

ISO 22196:2011 - Measurement of antibacterial activity on plastics surfaces.

DESCRIPTION:

- Test method is used to evaluate the antibacterial activity of treated plastic to inhibit or kill the growth of test microorganisms.
- Standardized test organisms are inoculated onto the surface of test material for 24 hours.
- Surviving microorganisms are counted to evaluate the antimicrobial activity of the test material

Migration properties for food and cosmetic applications

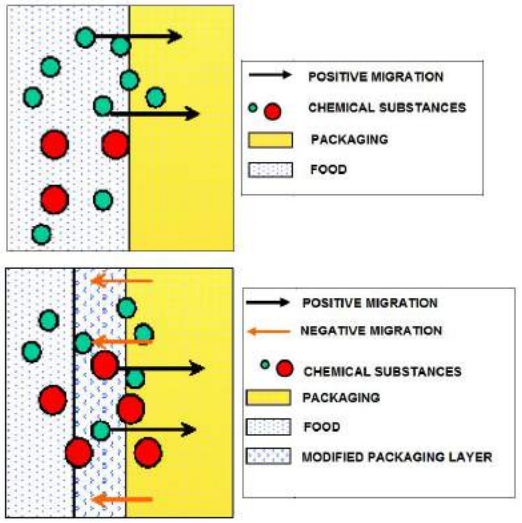
Regulation (EU) N. 10/2011. Migration tests should mimic the conditions of use, taking into account the physical state of the packaged food and the nature/extent of the contact.

OVERALL MIGRATION:

- EN 1186 Materials and articles in contact with foodstuffs – Plastics

SPECIFIC MIGRATION:

- EN 13130 Materials and articles in contact with foodstuffs - Plastics substances subject to limitation - Guide to test methods for the specific migration of substances from plastics to foods and food simulants and the determination of substances in plastics and the selection of conditions of exposure to food simulants.



Migration properties for food and cosmetic applications

For demonstration of compliance for plastic materials and articles not yet in contact with food, the tests must be carried out with three different food simulants:

A = Ethanol 10 % (v/v)

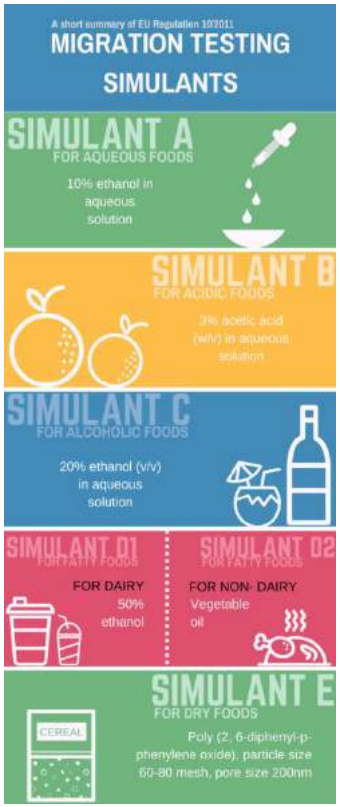
B = Acetic acid (3% w/v)

D2 = vegetable oil

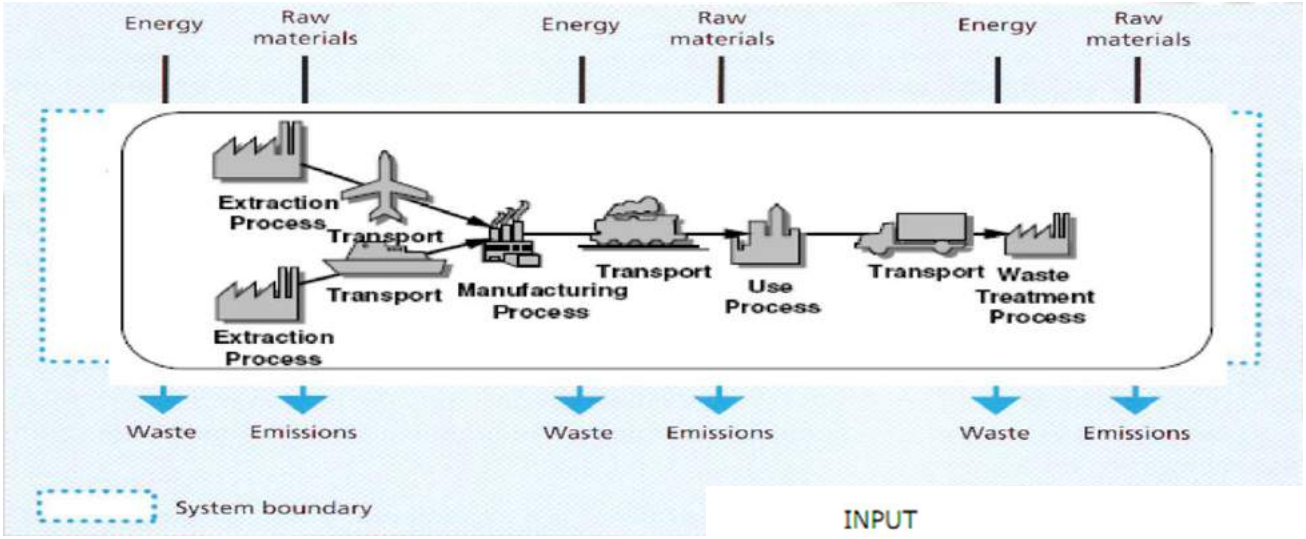
Simulants A and B are assigned for foods that have a hydrophilic character.

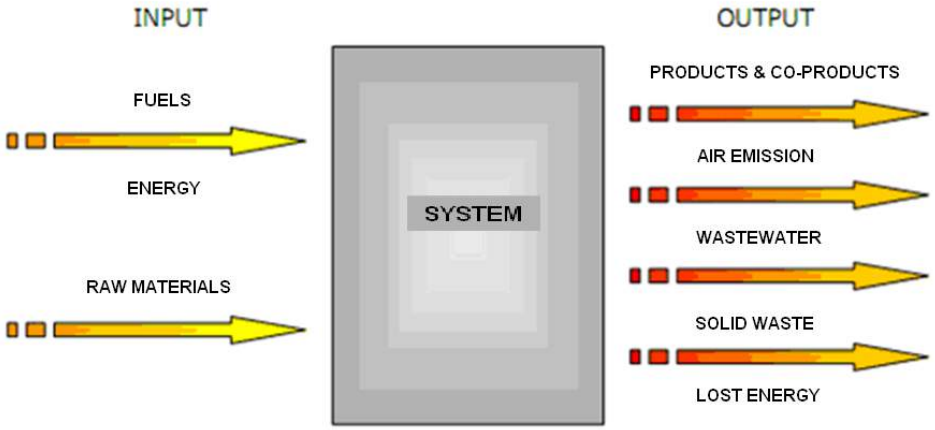
Food simulant B is used for those foods which have a pH below 4.5.

Food simulants D2 is assigned for foods that have a lipophilic character



Environmental impact by using LCA analysis and economic feasibility by using LCC approach





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