Biodegradability of plastics in the open environment

Presented by Michael Sander from ETH Zürich & Miriam Weber from HYDRA Marine Sciences, members of the SAPEA working group

ETH zürich

HYDRA Marine Sciences

SAPEA
Science Advice for Policy by European Academies

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European Commission

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Research and testing

in soil → **Michael Sander; ETH Zurich, Switzerland**

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in marine & freshwater → **Miriam Weber; HYDRA Marine Sciences, Germany**

Plastic pollution:
Are biodegradable plastics a solution ?

Not for littering!

Instead to be solved by sustainable use of plastics and proper waste management (waste hierarchy concept)!

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Plastic pollution:
Are biodegradable plastics a solution ?

Yes, for selected, specific applications!

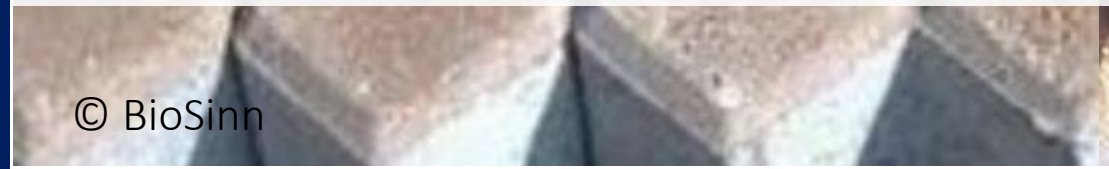
Intentional release to open environment
& recovery of plastic not foreseen or impossible

Geotextile

Plastic pollution:
Are biodegradable plastics a solution ?

Yes, for selected, specific applications!

High potential of loss to environment
& recovery often impossible or not feasible



Plastic beads for concrete slab transport

Plastic pollution:
Are biodegradable plastics a solution ?

Yes, for selected, specific applications!

Unavoidable release into environment
& recovery is impossible

Shoe soles

Plastic pollution:
Are biodegradable plastics a solution ?

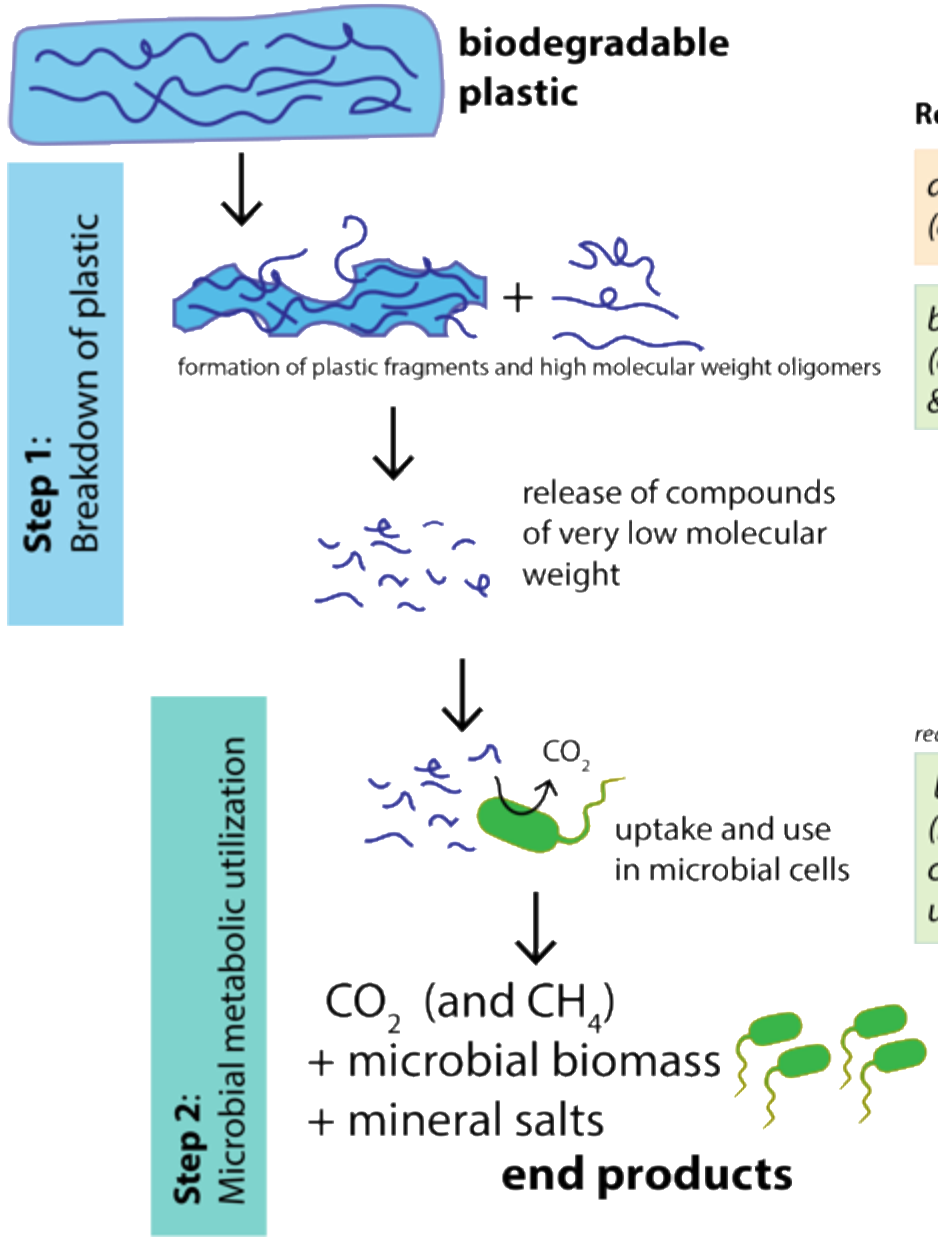
Compilation of possible applications:

BioSinn project

Nova Institute

https://renewable-carbon.eu/publications/product/biosinn-products-for-which-biodegradation-makes-sense-pdf/

Plastic biodegradation



Reactions involved

abiotic
(e.g., chemical hydrolysis)

biotic
(e.g., enzymatic hydrolysis & enzymatic oxidation)

reactions involved:

biotic
(microbial uptake and catabilic and anabolic utilization)

Regulatory aspects

Time frame for acceptable extent of biodegradation to be achieved

Variations in biodegradation potential among different 'open environments'

soil
≠
sediment
≠
river
≠
lake
≠
ocean

Steps forward

Consider different timeframes

months

Mulch film

years

geotextile

Regulatory aspects

Time frame for acceptable extent of biodegradation to be achieved

3

8

Variations in biodegradation potential among different 'open environments'

soil

≠

sediment

≠

river

≠

lake

≠

ocean

© HYDRA

Steps forward

Consider different timeframes

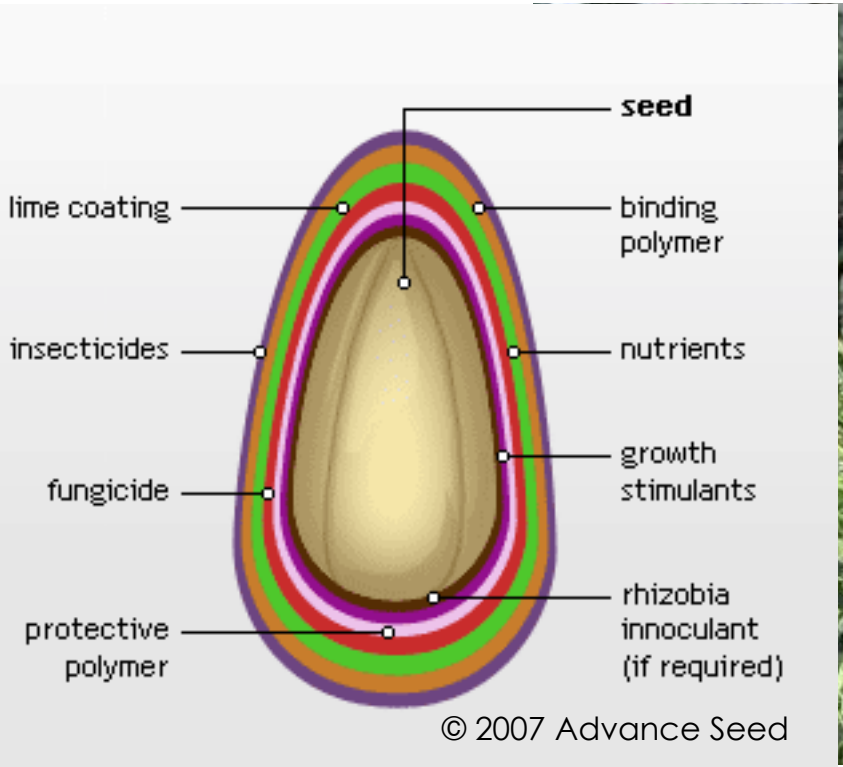
Potential categories:

"Fast":
weeks

"Medium":
months to years

"Slow":
years - decades

Cartridge cases



Seed coating

Geotextiles

Steps forward

Account for variations within and between receiving environments and prevalent conditions.

Singapur

Regulatory aspects

Time frame for acceptable extent of biodegradation to be achieved

3

8

Variations in biodegradation potential among different 'open environments'

soil

≠

sediment

≠

river

≠

lake

≠

ocean

Steps forward

Develop missing standard test methods and specifications

Current status

Standard test methods:

- Some exist for marine systems,
- fewer for soil,
- two for freshwater.

Standard specification:

- One specific applications in soil (mulch foil).

Steps forward

Standardise labelling & clear communication

Current status:
Confusion (and uncertainty) about …

- … which plastics biodegrade in which receiving environment!
- … how fast specific plastic biodegrades in given receiving environment!

Conclusion

Q: Biodegradable plastics **a** solution?

A: Yes (but not **the** solution) !

Not in violation of *waste hierarchy* concept!

Precautionary principle requests that biodegradation thoroughly tested and regulated.

Requires stringent tests to ensure that products are environmentally benign (and to prevent misuse).

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