

Research and development of marine biodegradable plastics with degradation initiation switch function

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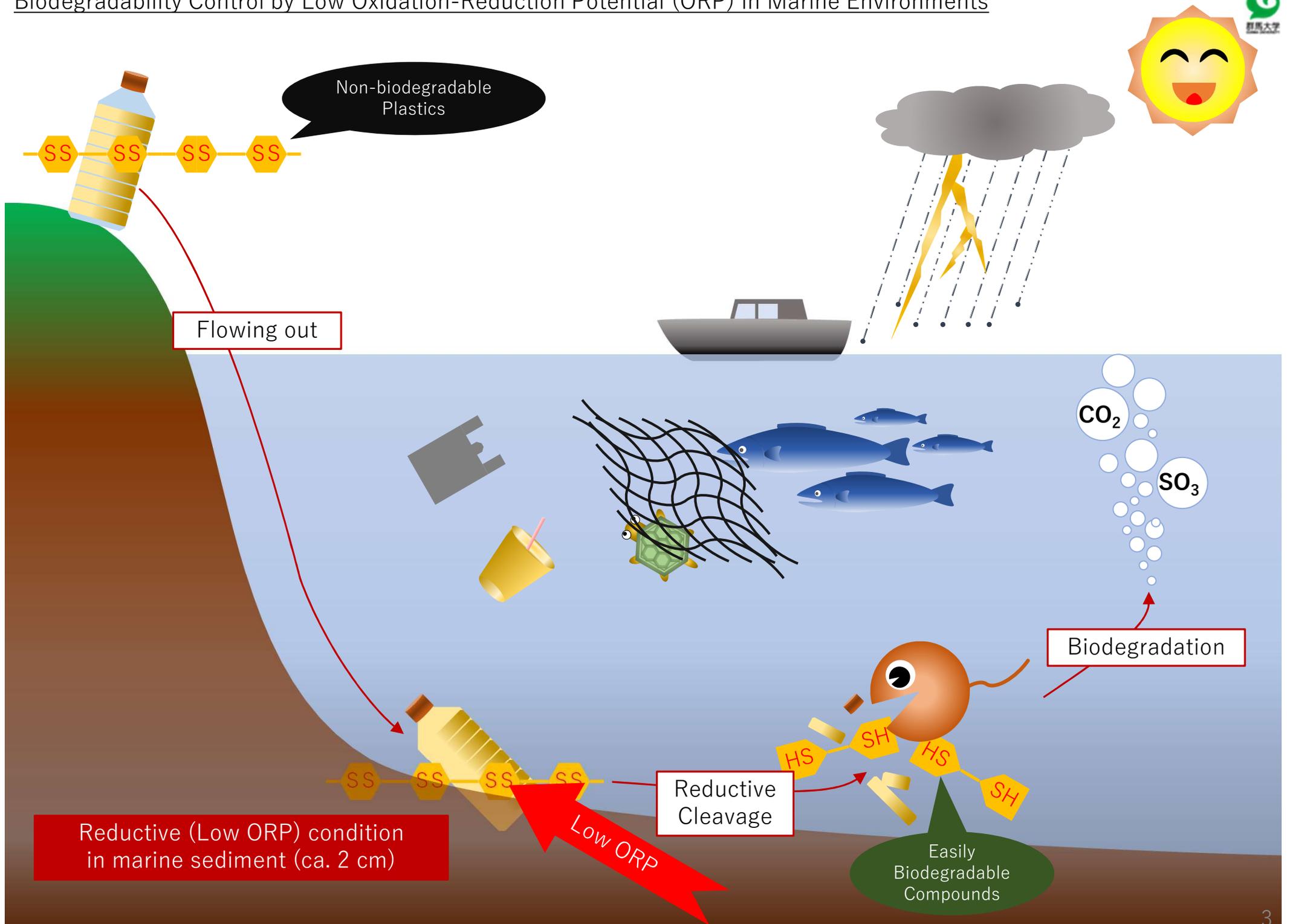
Implementing organizations : Gunma University, The University of Tokyo, Tokyo Institute of Technology, Institute of Physical and Chemical Research (RIKEN), Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

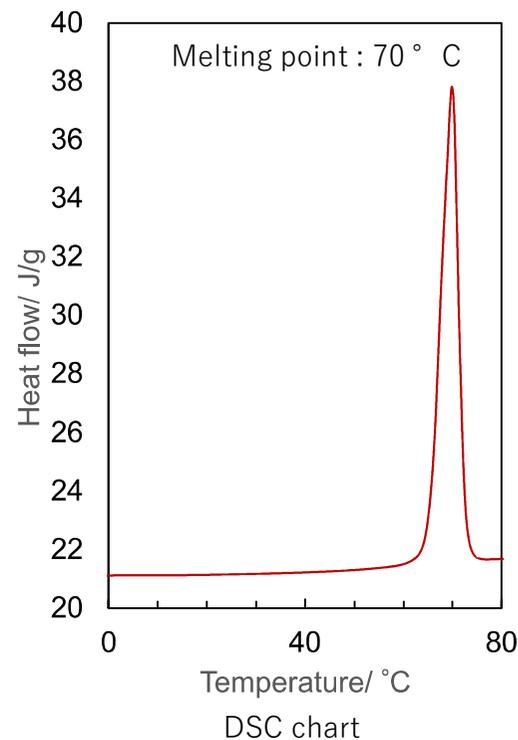
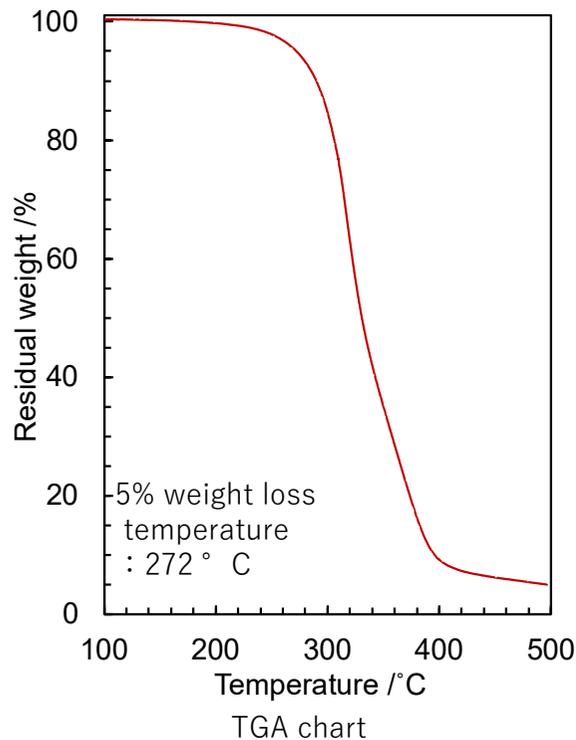
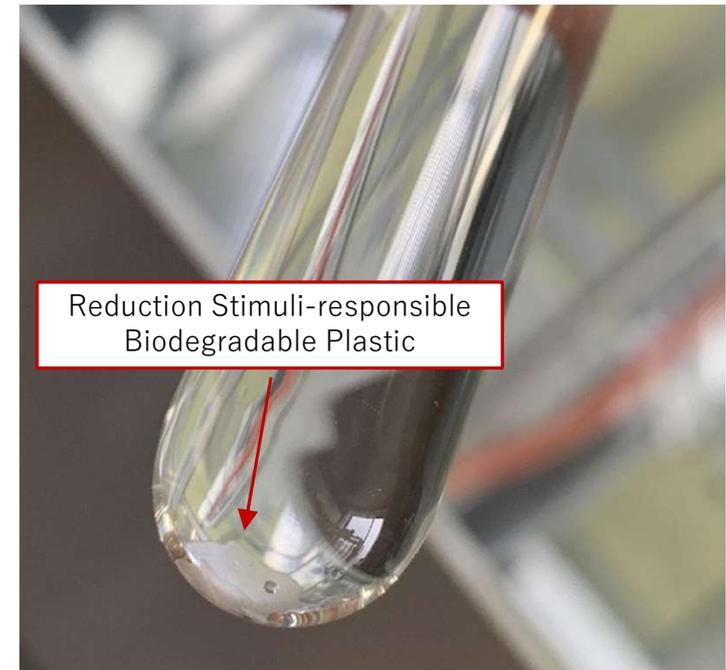
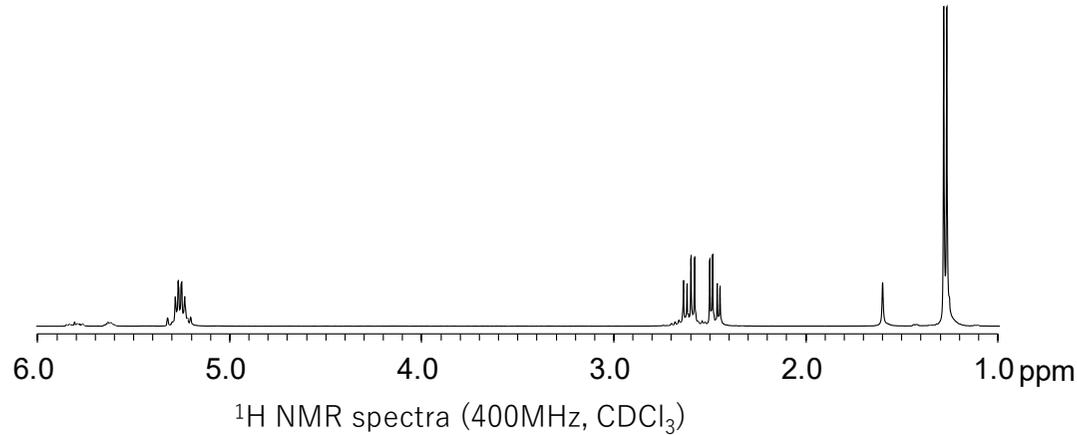
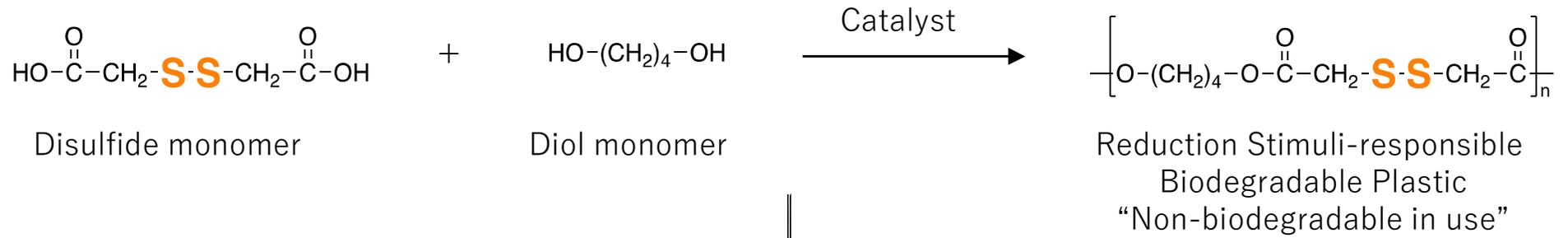
[GOAL in 2029 (Gunma University and Subcontractor)]

- Develop one or more marine degradable plastics, which has 90% biodegradability or similar biodegradability to positive control (cellulose, P(3HB), etc.) in marine during 6 month at 30 ° C after switching.
- Develop one or more marine degradable plastics, which has 10% biodegradability or similar biodegradability to positive control (cellulose, P(3HB), etc.) in marine during 6 month at 4 ° C after switching.

[R & D items]

- 2. Development of biodegradation start switch functions
 - Salt concentration switch
 - Oxidation-reduction switch (by ORP)
 - Wear switch (using endospore)
- 3. Biodegradation speed control of plastics in seawater
 - Development of technology to improve biodegradability speed in the ocean
- 4. Biodegradation evaluation of plastics in seawater
 - Analysis of microbiota regarding plastic biodegradation in actual marine environment
 - Establishment of evaluation method of plastic biodegradation in laboratory

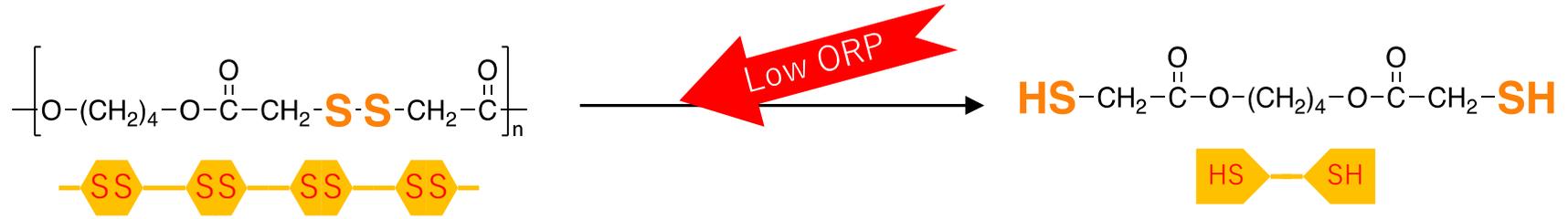




The plastic was submerged in artificial seawater

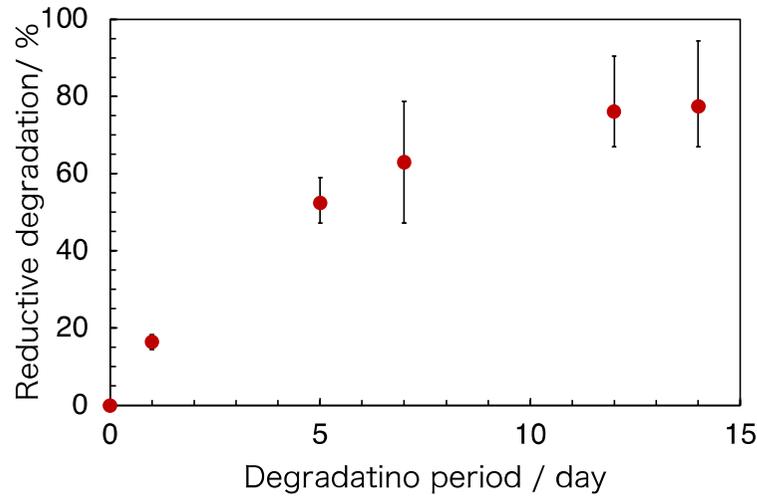
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Submersible in seawater
 Non-degradable just in seawater



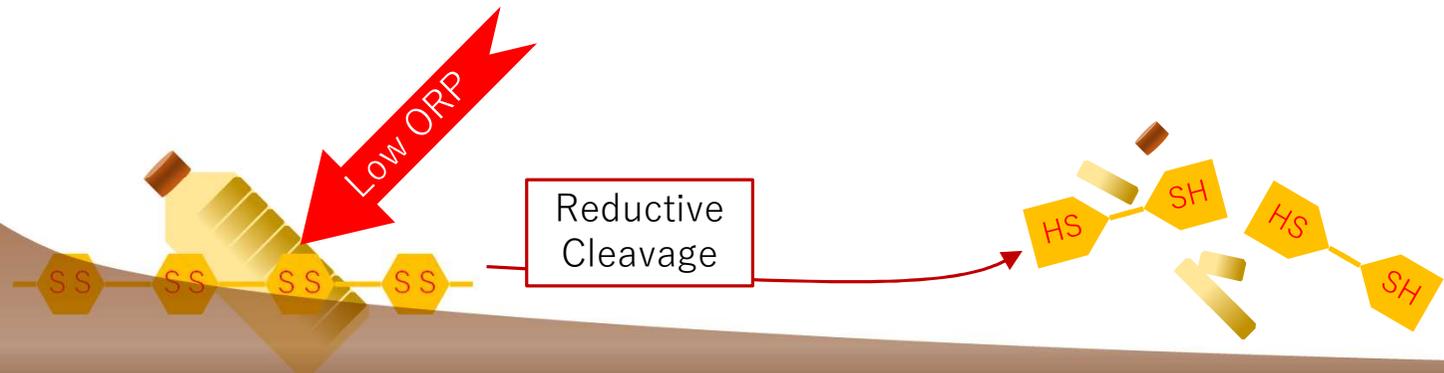
Reduction Stimuli-responsive
Biodegradable Plastic
“Non-biodegradable in use”

Degradation Compound
by Reductive Cleavage

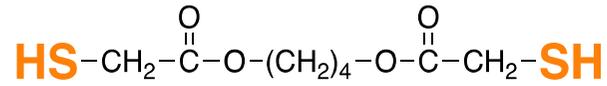


The rate of reductive cleavage was 16 %/ day.

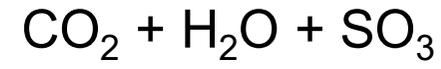
The plastic is non-biologically *degradable* in low ORP condition.



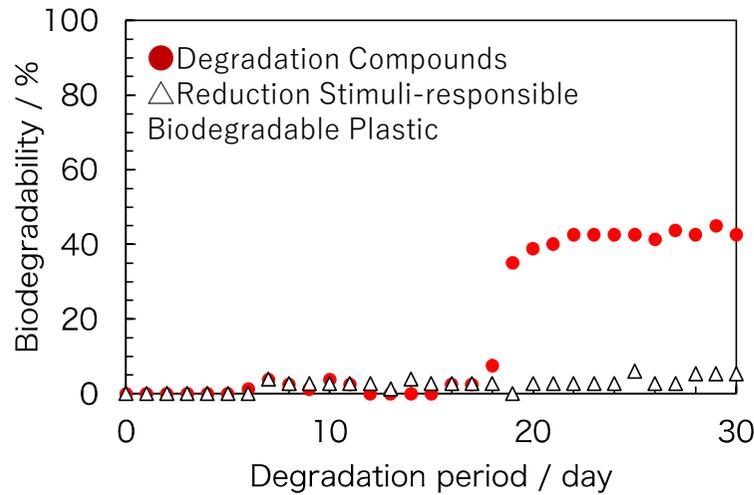
Biodegradation of reductively cleaved compounds



Degradation Compound
by Reductive Cleavage



Inorganic Compounds



Degradation Compound
was biodegradable in Natural Environment.

After reductive cleavage,
it's *biodegradable!*

