Research Center for Negative Emission Technologies, Kyushu University
Structure and Properties of Multi-lock Biopolymer during the Environmental Degradation

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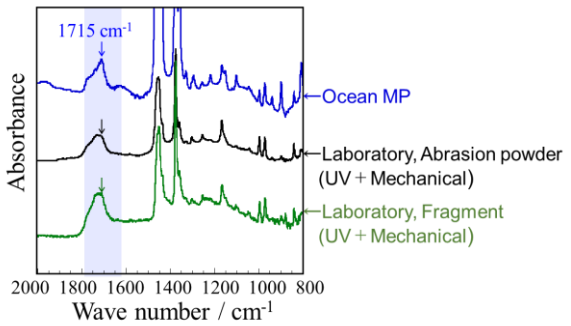
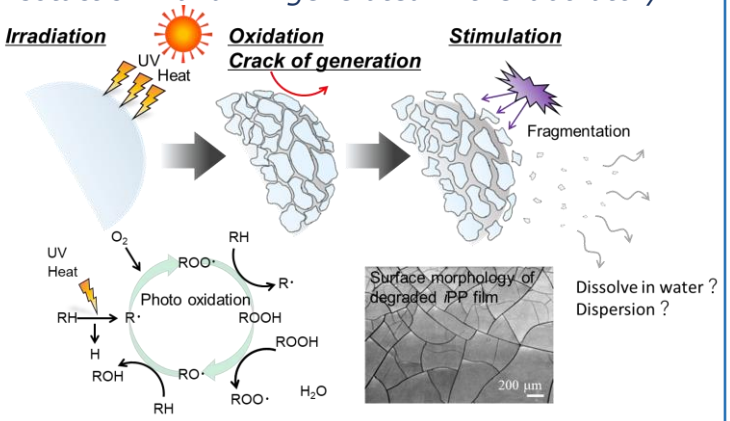
The structure and physical properties of the sample identified as *isotactic* polypropylene (*i*PP) in microplastic (MP) collected from the surface layer of the sea near Japan were characterized. It was revealed that the oxidation proceeded from the surface layer, making the sample brittle. In order to reproduce the MP formation in the environmental decomposition process in the laboratory, the *i*PP film was irradiated with ultraviolet(UV)-rays in the wavelength range of 300-400 nm using a weather meter. In the microscopic image of the *i*PP sample after the weathering test, many cracks were observed on the surface due to photooxidative degradation as the UV irradiation time increased. In addition, as the photooxidation proceeded, carbonyl groups were formed and the sample became embrittled. A mechanical stimulus was applied to this sample, and MP-sized fragment formation was confirmed. Furthermore, infrared absorption spectroscopic experiment revealed that there is a good agreement in oxidation state of ocean MP with MP reproduced in the laboratory.



Infrared spectra of ocean microplastic identified as isotactic PP and MP generated in the laboratory



Mechanism of microplastic formation process

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