

## Predicting the Lifetime of Weathered Polyolefins by Relating Mechanics to Microstructure

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**Abstract :** Designing polymers with a specific microstructure can affect how the polymer degrades once released in the environment. Not only the amount but also the distribution of different phases determines a polymers' degradability. The following research investigates the use of a combination of spectroscopy analysis and thermal analysis to study changes of polymers' amorphous and crystalline phases during degradation, comparing different microstructures of polypropylene and polyethylene. The use of nanoindentation helps study how degradation proceeds across a material by looking at changes in phases, while bulk tensile test describes when the material fails. The first results demonstrate that different microstructures have different degrading rates, with homopolymer having a linear and faster degradation compared to copolymers. The goal is to create materials that degrade at faster rates without releasing microplastics into the environment.

**Keywords :** degradation, microstructure, nanoindentation, Raman spectroscopy

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