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Biodegradation Rate of Biodegradable Plastics at Molecular Level

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Abstract

Plastics are solid materials where biodegradation happens on the surface. Only the surface is affected by biodegradation while the inner part should not be readily available for biodegradation. Thus, at a laboratory level, the biodegradation rate is expected to be a function of the surface area of the tested sample. The higher the surface area, the higher the biodegradation rate, all other environmental conditions being equal. In order to further explore the role of particle size on biodegradability, plastic pellets of polybutylene sebacate were milled and sieved into different particle sizes, thus obtaining four samples, pellets included, with different specific surface areas (33, 89, 193, and 824 cm^2g^{-1}). The surface areas were assessed through direct measurement (pellets) or a theoretical estimation followed by an image analysis. The different samples were tested for biodegradation in soil for 138 days. The rates calculated with a linear regression in the first part of the biodegradation process were related to the respective total available surface area. The data are well described by a linear regression