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Key parameters in testing biodegradation of bio-based materials in soil

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Abstract

Biodegradation of plastics in soil is currently tested by international Standard testing methods (e.g. ISO 17556-12 or ASTM D5988-12). Although these testing methods have been developed for plastics, it has been shown in project KBBPPS that they can be extended also to lubricants with small modifications. Reproducibility is a critical issue regarding biodegradation tests in the laboratory. Among the main testing variables are the soil types and nutrients available (mainly Nitrogen). For this reason, the effect of the soil type on the biodegradation rates of various bio-based materials (cellulose and lubricants) was tested for five different natural soil types (loam, loamy sand, clay, clay-loam, and silt-loam organic). It was shown that use of samples containing 1 g of C in a substrate of 300 g of soil with the addition of 0.1 g of N as nutrient strongly improves the reproducibility of the test making the results practically independent of the soil type with the exception of the organic soil. The sandy soil was found to need addition of higher amount of nutrients to exhibit similar biodegradation rates as those achieved with the other soil types. Therefore, natural soils can be used for Standard biodegradation tests of bio-based materials yielding reproducible results with the addition of appropriate nutrients.

Key words: biodegradation in soil, bio-based materials, soil types, testing method, plastics, lubricants

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