
Plastics — Assessment of the intrinsic biodegradability of materials exposed to marine inocula under mesophilic aerobic laboratory conditions — Test methods and requirements

Plastiques — Évaluation de la biodégradabilité aérobie inhérente et de la sécurité environnementale des matériaux non flottants exposés à des inocula marins dans des conditions de laboratoire et mésophiles — Méthodes d'essai et exigences

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Foreword

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This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 14, *Environmental aspects*.

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Introduction

Biodegradation (i.e. biodegradation level and biodegradation rate) of a plastic product in any given environment is basically the result of three conditions:

- a) the intrinsic (i.e. potential) biodegradability of the material;
- b) the available surface and the shape of the product;
- c) the environmental conditions where the product is located.

A material's intrinsic biodegradability provides that its chemical structure is susceptible to enzymatic attack so that enzymes can cleave its chemical bonds. Under aerobic conditions (in the presence of O₂) the ultimate biodegradation of a material only leads to the formation of CO₂, H₂O, mineral salts and biomass.

Biodegradation of plastic materials is generally a bio-erosion process happening at the interface between the solid phase and the liquid phase where microbes live. It is a heterogeneous reaction. It is the surface rather than the concentration that controls the biodegradation rate. Thus, the higher the available surface the higher the biodegradation rate.

Environmental conditions determine the biodegradation rate as well. Temperature, nutrient availability, pH and the existing microbial population affect the biodegradation rate. Biodegradation can be slowed or even stopped if environmental conditions are not favourable, even if the material is intrinsically and ultimately biodegradable.

This document covers condition a) mentioned above.

The fate of plastics in the environment is considered important information. The contamination of seas with plastic waste is a relevant problem that should be controlled not least by means of leakage prevention measures such as mandatory collection of plastic items used in marine environments and environmental education. However, in some cases, the dispersal of plastic (waste) is almost unavoidable. For example, plastics are used to make fishing gears and products for fish, mussels, and oysters farming which are prone to be left or lost in the sea. In these cases, the possibility of using products made with biodegradable plastics might be contributing to reducing the risk linked with the dispersion of solid waste. In order to carry out a proper product design and in order to assess impact and risk of leakage, it is important to know whether a plastic material is intrinsically biodegradable when exposed to marine inocula.

