

AN INTRODUCTION TO BIODEGRADATION IN THE CONTEXT OF THE DRAFT DETERGENTS REGULATION

Biodegradation is the process whereby organic (ie carbon-containing) matter is decomposed by the action of micro-organisms present in the environment which utilise the carbon as food. Depending on the nature of the micro-organisms, they may eat a part of the organic molecule only, destroying the intact parent substance in a process known as "*primary biodegradation*", or they may eat it completely in a process known as "*ultimate biodegradation*". In either situation, just as is the case for human beings, some of the carbon is "burned" to provide the energy necessary to sustain life and the rest is used to generate more micro-organisms in the process of cell growth. The energy-producing part of the metabolic activity consumes oxygen, resulting in the immediate formation of carbon dioxide, water and mineral salts in a process known as "*mineralisation*".

A range of laboratory tests has been developed to assess how readily organic materials will biodegrade under a variety of test conditions. Many of these have been developed into International Standard methods and are recognised by environmental scientists and regulators worldwide. The preferred biodegradability tests incorporated into the Draft Detergents Regulation are International Standard methods, which measure oxygen consumption or carbon dioxide production. Since the test substance is the only source of carbon, these provide a direct assessment of mineralisation; i.e. the conversion of the test substance into energy. However, since the test substance is the only source of carbon, some of it is used to build more bacterial cells as the bacteria multiply. This means that not all the test substance can be available to be broken down into carbon dioxide, water and mineral salts. In practice, a substance showing 60% biodegradability in a mineralisation test would be expected to be consumed (i.e. to biodegrade ultimately) in excess of 90% when allowance is made for incorporation of organic carbon into the growing bacterial population.

For the test methods proposed in the Detergents Regulation, there is international recognition that achievement of a threshold level of 60% of the theoretical oxygen consumption or carbon dioxide production in a 28-day period indicates a very high level of ultimate biodegradation. The suitability of these methods and the 60% mineralisation pass level is endorsed in the context of the Detergents Regulation by an Opinion of the Scientific Committee on Toxicology, Ecotoxicology and the Environment adopted at the 12th CSTE Plenary Meeting of 25 November 1999.

In practice, the performance observed for those detergent surfactants passing these mineralisation tests is very similar to that observed for glucose and other substances well known for their biodegradability and used as reference standards. This emphasises the very high mineralisation potential for surfactants in the environment. The 60% mineralisation threshold is far more demanding than the 90% primary biodegradation requirement of the existing detergents legislation and provides a much-enhanced level of environmental protection.