
***Environmental Risk Assessment of Surfactants, Management
A research partnership of the detergent and surfactant industries in Europe***

ERASM Position Paper on Anaerobic Biodegradation

The anaerobic biodegradation of surfactants is used as an acceptability criterion in some environmental pieces of legislation (eco-label, risk assessment, etc.), without a proper evaluation of the relevance of such a characteristic.

Surfactants form a group of chemicals with considerable environmental importance due to their high volume consumption and widespread use as they are essential ingredients in most laundry and cleaning products. Since the major part of the biosphere is aerobic, priority has been given to the study and assessment of biodegradability under these conditions. Nevertheless there are environmental compartments which can be permanently (e.g. anaerobic digesters) or temporarily anaerobic (e.g. river sediments and soils) and surfactants do reach these.

Available screening test methods to assess anaerobic biodegradation do not simulate the real conditions prevailing in these anaerobic compartments but rather reflect more stringent conditions, due to the high test substance/biomass ratio, possibility of inhibitory effects and limited possibility for adaptation. Therefore positive results are indicative of a similar behaviour under environmental conditions, while a negative result cannot be necessarily interpreted as inherent anaerobic recalcitrance. In addition, low biodegradation results in these tests may be influenced by a limited bioavailability due to the formation of insoluble chemical species.

The relevance of anaerobic biodegradability cannot be separated from other important properties of surfactants such as sorptive behaviour, ecotoxicity profile and above all, aerobic biodegradation rate.

The majority of surfactants entering the environment will be exposed to and degraded under aerobic conditions, and only less than 20 % will potentially reach anaerobic, environmental compartments. In all but a few cases their presence in these will not be permanent.

A systematic evaluation of the risk to the structure and function of these compartments due to the presence of undegraded surfactants led to the conclusion that, in contrast to the adverse effects observed in the absence of aerobic degradation, the lack of anaerobic biodegradation does not seem to be correlated with any apparent environmental problem for most compartments. Particularly for the sediment compartment, data is lacking and it is recommended to fill the missing data gaps to assess structure and function.

In criteria for eco-labelling a conservative set of ‘scoring-‘ or ‘weighting’-factors, if any, for anaerobic biodegradability, should follow from a combination of the above characteristics, and it is suggested that these should be of the order of one tenth of the aerobic biodegradability value for readily biodegradable surfactants.

Consequently it is concluded that anaerobic biodegradability does not have the same environmental relevance as the aerobic one. Anaerobic biodegradability should not, therefore, be used as a pass/fail property for the environmental acceptability of surfactants which are readily biodegradable under aerobic conditions.