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Biotransformation of the fluorotelomer 8-2 Telomer B Alcohol (8-2 TBA) in bacterial culture

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The 8-2 Telomer B Alcohol [$F(CF_2)_8CH_2CH_2OH$; CAS # 678-39-7] is a primary raw material and intermediate used in the synthesis of various telomer-based fluorinated surfactants and polymers which are used in a wide range of consumer products. This compound is postulated to be an environmental degradation product arising from telomer-based fluorinated surfactants and polymers. We have investigated the biodegradation of this substance to determine whether or not it is environmentally persistent and if metabolic pathways are available for its further biotransformation to other fluorinated species. The 8-2 Telomer B Alcohol is surface active, sorptive to certain surfaces, of low solubility in water and may be volatile. As such, test systems and sampling and analysis methods have been carefully established for these studies. Biotransformation with adapted and unadapted sludge cell cultures under modified aerobic ready and accelerated conditions have been investigated and analysis of transformation products conducted. The details of the test systems, substance handling and the results of the biotransformation studies under a range of test conditions will be discussed.

Title: Perfluoroalkylated Substances in the Environment: What are they? Where to the come from? Where do they go? and What do we know about them?

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Abstract
Perfluoroalkylated substances (PFAS) are specialty materials utilized in a wide variety of end-use applications which take advantage of the unique properties of the perfluoroalkyl functionality. These substances are manufactured by different processes and have functionality differences that influence their performance, toxicological and environmental behavior. To start, this paper will begin by reviewing the "classes" of PFAS and then proceed to discuss how these substances are used, their routes into the environment via these uses and provide an overview of what is known about their environmental toxicology and fate. Although only a limited number of essential physicochemical data are available, thus hampering a complete assessment of the environmental fate of PFAS, it has become clear that PFAS behave differently from other non-polar organic microcontaminants. Some PFAS have been identified in environmental media in urbanised areas with and without production sites nearby. For example, perfluorooctane sulfonate (PFOS) has been detected globally in a wide array of organisms as well as in non-exposed and exposed human populations. In general, PFAS acute and chronic ecotoxicity to aquatic organisms is moderate to low. Acute toxicity to rodents is also low. While no human health effects or increased cancer risk have been observed for PFAS, PFOS has been shown to effect development and reproduction while perfluorooctanoic acid (PFOA) has been found to be weakly carcinogenic in repeated-dose rat studies. This review will show the importance of filling in the current environmental fate and effects information gaps for PFAS. As such, areas for future research will be suggested.

Environmental fate studies of fluorotelomer intermediates, fluorosurfactants, and fluoropolymers.

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Fluorotelomer intermediates are used to manufacture fluorosurfactants and fluoropolymers, which provide unique properties in a wide variety of consumer products. Fluorotelomer intermediates were selected for study because they were expected to be among the possible compounds into which the fluorosurfactant and fluoropolymer products may potentially degrade. Our environmental fate research has focused primarily on the fluorotelomer intermediate 8-2

Telomer B Alcohol [8-2 TBA; $CF_3(CF_2)_7CH_2CH_2OH$], which we have shown to be hydrolytically stable ($t_{½}$ > one year) and non-toxic to microorganisms at concentrations greater than 100 mg 8-2 TBA L^{-1}. Results indicate, however, that the 8-2 TBA can undergoes transformations in the presence of adapted cultures of microorganisms. The 8-2 TBA appears to partition primarily to the solid and air phases but not to water. Our research in this area has now expanded to include environmental fate studies on the fluorotelomer-based fluorosurfactants and fluoropolymers. We will summarize the environmental fate studies conducted by DuPont on the 8-2 TBA, including an air/water/soil partitioning experiment. We will also discuss recent hydrolytic stability and biotransformation studies performed on the fluorotelomer-based fluorosurfactants and fluoropolymers.

Analytical challenges in determination of Telomer 8-2 Alcohol and Telomer-derived fluorosurfactants and polymers in biological and environmental matrices.

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