

# Society of Environmental Toxicology & Chemistry

## Summary of DuPont Presentations

### SETAC North America November, 2003 Austin, TX

#### **Development of analytical methodology for determination of Telomer B alcohols, Telomer-derived anionic, nonionic fluorosurfactants, and polymers.**

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Telomer B Alcohols are intermediates in the manufacture of broad range of anionic and nonionic fluorosurfactants and polymers. Analytical methodology for determination of the Telomer B alcohols and Telomer-derived fluorosurfactants and polymers in environmental matrices is not well established. The presentation will discuss determination of Telomer B Alcohols by GC-MS and LC-MS techniques in environmental matrices. In addition, Telomer-based fluorosurfactants are complex multi-component mixtures of chemical species that possess no chromophores making traditional spectroscopic detection for LC separations not feasible. Determination of individual components of fluorosurfactants poses challenging analytical problem in respect to separation, detection, and quantitation. Two classes of fluorosurfactants will be discussed: anionic fluoroalkylphosphate surfactant and non-ionic ethoxylate fluorosurfactant. The presentation will describe our investigation of these two groups of fluorosurfactants mainly by liquid chromatography-mass spectrometry. Chromatographic separation of the components of these complex mixtures, their identification, establishment of figures of merit for mass spectrometric detection, and development of analytical methodology for analysis in aqueous matrices will be discussed. Also, analytical methodology suitable for determination of two types of Telomer-containing polymers: acrylate and urethane in environmental matrices will be presented.

#### **Biotransformation of the $^{14}\text{C}$ -labeled fluorotelomer 8-2 Telomer B Alcohol (8-2 TBA)**

Wang N.<sup>1</sup>, Folsom P.W.<sup>1</sup>, Berti W.R.<sup>1</sup>, Szostek B.<sup>2</sup>, Sulecki L.M., Capka V.<sup>2</sup>, Gannon J.T.<sup>1</sup>, and Buck R.C.<sup>3</sup>  
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The 8-2 Telomer B Alcohol [ $\text{F}(\text{CF}_2)_8\text{CH}_2\text{CH}_2\text{OH}$ ; CAS # 678-39-7] is a key raw material and intermediate used in the manufacture of sales products such as telomer-based fluorinated surfactants and polymers. Using  $^{14}\text{C}$ -labeled 8-2 TBA, we have investigated the biodegradation potential and transformation products of this substance with microcosms from a POTW and an industrial wastewater treatment facility. The details of the test systems, substance handling, sample preparation, analytical methods, and the results of the biotransformation studies under various test conditions will be discussed.

#### **Early-Life Stage Toxicity Testing of Fluorotelomer-based Surfactants Using Rainbow Trout, *Oncorhynchus mykiss*.**

Hoke, R.A., Szostek, B., Turner, J.T., Sr., Bouchelle, L.D., Ferrell, B.D., Prickett, K.B. and Buck, R.C.

Fluorotelomer surfactants are an important class of industrial specialty chemicals because of their unique properties. They provide superior wetting action compared to non-fluorinated surfactants and are stable in harsh chemical and thermal environments. Their unique properties and use as surfactants, with accompanying potential for environmental release, makes aquatic hazard assessment an integral part of product stewardship and risk assessment. Acute and chronic toxicity tests were performed with fish to assess the aquatic hazard of two fluorotelomer-based surfactants; one anionic and the other nonionic. Non-GLP acute screening studies and GLP rainbow trout early-life stage studies conducted according to regulatory test methods were used to assess the toxicity of both surfactants. The results of the acute and chronic hazard testing are presented along with illustrations of the novel challenges presented in the aquatic toxicity testing and associated chemical analysis of these compounds.

#### **Bioconcentration Screening of Fluorinated Compounds Using Fathead Minnows.**

Hoke, R., Gibson, W.R., Good, R.M. and Buck, R.C.

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Perfluorinated compounds have been the a focus interest for regulatory agencies and the industries that manufacture these compounds. The unique properties of many of these compounds have raised questions about their potential environmental stability and resulting effects, including the potential for bioaccumulation in fish. Regulatory bioconcentration testing is expensive and resource intensive, therefore, an initial evaluation of potential bioconcentration of several perfluorinated compounds in fish was conducted using a screening test design and total fluoride analysis of whole fish. Compounds evaluated included a positive control (an electrochemical fluorination-derived perfluorinated sulfonate), a fluorotelomer intermediate, a fluorotelomer polymer, and two fluorotelomer surfactants; one anionic and the other nonionic. The compounds were evaluated at a single concentration in a study composed of a 15-day uptake phase and a 14-day depuration phase. The unique challenges associated with screening the bioconcentration potential of these compounds and results are presented along with a discussion of the potential implications of the results for risk assessment.

### **Biodegradation studies of fluorotelomer-based surfactant and polymer products.**

W.R. Berti<sup>1</sup>, N. Wang<sup>1</sup>, B. Szostek<sup>3</sup>, S.M. Kennedy<sup>3</sup>, J.T. Gannon<sup>1</sup>, and R.C. Buck<sup>2</sup>

Fluorotelomer-based surfactant and polymer products provide unique properties to a wide variety of consumer products. We are studying their environmental fate by testing their potential to biodegrade using microbial inoculum from soil and from activated sludge of municipal waste-water treatment facilities. Carbon dioxide evolution, disappearance of dissolved oxygen, or disappearance of dissolved organic carbon from the liquid phase are being used as surrogate measurements to monitor changes in the test materials (i.e., the fluorotelomer-based surfactant or polymer products) during the course of the experiments. Fluoride concentrations are periodically measured in the test solutions to assess defluorination of the parent material. Results indicate that for the two surfactant products, the composition of which includes hydrocarbons, about 50% and 85% of the total carbon measured in the parent materials mineralized to CO<sub>2</sub>. For polymer products used in the tests, less than 20% of the total carbon measured in the products mineralized. The production of CO<sub>2</sub> from the polymer products was most likely from the hydrocarbon surfactants used to disperse them in water. No significant fluoride production (<0.8% of the measured total) was observed in any of the tests to date. We are analyzing test solutions collected during the studies to determine what, if any, transformation products have been formed. The chemical analyses will focus on the possible production of fluorinated acids.

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