



Study on the Generation of Perfluorooctane Sulfonate From the Aqueous Film-Forming Foam

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Abstract

Perfluorooctane sulfonate (C₈HF₁₇SO₃) and perfluorooctane acid (C₈HF₁₅O₂) are artificial chemicals and have been used all over the world, mainly as water repellent agents, fluorochemical surfactants, coating agents etc. However, perfluorooctane sulfonate and perfluorooctane acid are environmental contaminants because of their stability, bio-accumulativeness, and long-term persistence in the ecological environment. At the present day, they are diffused all over the world. Lately, this diffusion is viewed with suspicion and there is a movement towards their restriction, even if the environmental fate of them is still under investigation. Fluorochemical surfactants are key compounds in the aqueous film-forming foam (AFFF) formulations. AFFFs are used for massive conflagration such as industrial fire and petroleum fire because of their efficient fire control. On the other hand, a lot of AFFFs are used in case of massive conflagration and most of them enter ocean and groundwater. Actually, perfluorooctane sulfonate and perfluorooctane sulfonate related substances were detected from the fire fighting facility of U.S. forces. Therefore, there is the possibility of generating perfluorooctane sulfonate and perfluorooctane sulfonate related substances from fluorochemical surfactants in the AFFFs. In this study, activated sludge added AFFF were analyzed for perfluorooctane sulfonate and perfluorooctane acid with time. And the perfluorooctane sulfonate was directly detected after 2 days using LC/MS. This shows that AFFF can be decomposed perfluorooctane sulfonate by microorganisms easily. However, perfluorooctane sulfonate would not decompose at all. Additionally, activated sludge added N-polyoxyethylene-N-propyl perfluorooctane sulfonamide which is one of the fluorochemical surfactants used in the AFFF was analyzed for perfluorooctane sulfonate and perfluorooctane acid with time and the perfluorooctane sulfonate was detected too.

Keywords: perfluorooctane sulfonate, perfluorooctane acid, aqueous film-forming foam (AFFF)