



BIODEGRADATION OF ALPHA OLEFIN SULFONATES (AOS)

Applicable to these current Stepan products:

BIO-TERGE® AS-40	BIO-TERGE® AS-40 CG	BIO-TERGE® AS-40 CG-K
BIO-TERGE® AS-40 CG-P	BIO-TERGE® AS-40 CG-PN	BIO-TERGE® AS-40 HA
BIO-TERGE® AS-40 HP	BIO-TERGE® AS-40 LV	BIO-TERGE® AS-40A
BIO-TERGE® AS-40K	POLYSTEP® A-18	STEPANTAN® AS-12 46
STEPANTAN® AS-1216	BIO-TERGE® AS-90 BEAD	POLYSTEP® A-18S
POLYSTEP® A-18-LV	STEPANTAN® AS-12	STEPANTAN® AS18

Applicable to these inactive Stepan products:

STEPANTAN® 39N	STEPANTAN® AS-40	1618 AOS
STEPANFLOW® 30	STEPANFLOW® 70	

Biodegradation Information:

Alpha Olefin Sulfonate (AOS) surfactants have been commercially available in the United States since 1965. They have been formulated into a variety of detergents and shampoo products. AOS surfactants are often selected as replacements for linear alkylbenzene sulfonates, due to their biodegradation, foaming, detergency, and mildness properties.

The Stepan AOS products identified above are linear in structure, with carbon chain lengths ranging from C12 to C18. Published information on AOS surfactants shows that primary biodegradation of these compounds can reach 100% in 3 to 5 days under laboratory conditions. AOS surfactants have also been found to undergo extensive biodegradation in both freshwater and seawater ($\geq 70\%$ biodegradation in 28 days) when tested by strict European Organization for Economic Cooperation and Development (OECD) methods (301 B,C,D). OECD Modified Sturm (OECD 301 B) testing of one of Stepan's BIO-TERGE AS-40, showed this product to be "readily biodegradable," achieving $\geq 80\%$ biodegradation in 28 days.

Several studies have investigated the fate of AOS compounds under actual environmental conditions. In a one year sewage treatment plant study, performed by Sekiguchi, Oba, et al., the average level of AOS in the plant's incoming waste stream was determined to be approximately 2%. Methylene blue active/substances (MBAS) and Infrared Spectroscopy (IR) analyses of the water following activated sludge treatment showed that AOS had been completely removed. The findings of this study and the numerous laboratory studies which have been performed over the years show

that AOS surfactants are environmentally compatible.

The listed products comply with the EU Detergent Regulation (EC) No. 648/2004.

References:

*Stepan Co. OECD Methods 301B and 306 for BIO-TERGE® AS-40 (Stepan Study Nos. 93-007A, 03-012A).

*ECHA REACH dossier for Sulfonic acids, C14-16 (even numbered)-alkane hydroxy and C14-16 (even numbered)-alkene, sodium salts (CASRN 68439-57-6, EC no. 931-534-0).

*Alkyl Sulfonates and Alpha-Olefin Sulfonates: SIDS Initial Assessment Report (HPV), 2007.

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