Surfynol® Additives
Multifunctional Problem Solvers

SURFYNOL® SURFACTANTS
Biodegradation and Toxicity Information

Overview

Biodegradation and toxicity characteristics can be used to assess the potential environmental impact of chemicals. The following biodegradation and toxicity information has been assembled for Surfynol 104 surfactant and the Surfynol 400 series.

Surfactant biodegradation and toxicity are defined and determined in many ways using numerous testing procedures, including those developed by regulatory bodies, such as the OECD (Organization for Economic Cooperation and Development). We have defined the pertinent terms and testing procedures for the data included here.

Biodegradation Data

Surfynol 104 surfactant is inherently biodegradable since it reaches an average daily % degradation > 20% according to tests completed following the OECD 302A protocols. Surfynol 104 is not readily biodegradable as defined in the protocol of OECD 301D. The Surfynol 400 series surfactants are inherently biodegradable based on screening tests conducted following a modified OECD 301D method. The % biodegradation of the Surfynol 400 series increases with an increasing degree of ethoxylation. Data are summarized in the table below.

Surfynol 104 and Surfynol 400 Series
Biodegradation Data

Surfactant	Test	% Biodegradation	Comments
Surfynol 104	OECD 301D	0	After 28 days
Surfynol 104	OECD 302A	25.4	Daily degradation
Surfynol 440	Modified OECD 301D	0	—
Surfynol 465	Modified OECD 301D	16	—
Surfynol 485	Modified OECD 301D	31	—

Toxicity Data

Surfynol 104 exhibits very low mammalian toxicity, low aquatic toxicity and is not inhibitory to biomass conversion. The Surfynol 400 series demonstrates very low aquatic toxicity in screening tests. Acute aquatic toxicity of the Surfynol 400 series decreases with an increasing degree of ethoxylation.

Surfynol 104 and Surfynol 400 Series
Toxicity Data

Surfactant	Measurement	Toxicity
Surfynol 104	Oral LD_{50} rat	4600 mg/kg
Surfynol 104	96 hr LC_{50} (fathead minnow)	36 ppm
Surfynol 104	48 hr LC_{50} (dapnnia magna)	88 ppm
Surfynol 104	Microtox EC_{50}	191 mg/L
Surfynol 104	OECD 209 Inhibition	680 ppm
Surfynol 440	Microtox EC_{50}	207 mg/L
Surfynol 465	Microtox EC_{50}	846 mg/L
Surfynol 485	Microtox EC_{50}	7896 mg/

Biodegradation Definitions

- Biodegradation: The breakdown of chemicals by microorganisms.
- Ready biodegradation: OECD definition for highly biodegradable substances. Readily biodegradable substances degrade > 60-70% within a 10 day window over 28 days. Due to the stringent nature of these tests, substances which are not "readily" biodegradable may be biodegradable in practice.
- Ready biodegradation tests: Protocols defined in OECD 301A-F
- Inherent biodegradation: OECD definition for substances that exhibit sufficient degradation to suggest they will not persist in the environment. Inherently biodegradable substances exhibit either >20% daily degradation or >70% degradation in 28 days.
- Inherent biodegradation tests: OECD 302A-C

Toxicity Definitions

- Toxicity: The potential of a substance to produce adverse effects during normal use.
- Acute Toxicity: Short-term toxicity effects. Examples include oral and dermal mammalian toxicity and fish, crustacean or algae aquatic toxicity.
- Chronic Toxicity: Cumulative toxic effects due to long-term exposure.
- Microtox: Screening test for acute aquatic toxicity using photoluminescent bacteria. Measured via ASTM standard D-5660.
- Inhibition: Repression of activated sludge metabolism. Substances that are inhibitory at low levels may adversely affect wastewater treatment. Measured via OECD 209 test.

For Samples or More Information

If you would like additional information or technical assistance in preparing specific formulations, write or call Air Products and Chemicals, Inc. at the following locations.

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