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BiCAT ® 8840

Technical Specifications

Bismuth	9.5 - 10.5%
Specific Gravity @ 25°C	1.05 - 1.25
Viscosity (Brookfield) @ 25°C	300 Pse

Product Number

4211

Description:

Liquid ranging in color from yellow to amber. Shepherd developed the first and only bismuth carboxylates that are truly stable in water.

Application:

Polyurethanes

Packaging:

200 kg- 55 gallon steel drum

Chemical Formula:

Manufactured under ISO 9001 registered quality management systems.

Description

Bismuth carboxylates accelerate the reaction between isocyanates and polyols (the urethane reaction) without promotion of any detrimental side-reactions (e.g. water-isocyanate reaction, hydrolysis of esters). As expected, the rate of the urethane catalysis is directly proportional to the concentration of bismuth in the system. We offer a range of bismuth carboxylate catalysts, with varying bismuth concentrations (from 16 wt% – 28 wt%) and varying ligands (2-ethylhexanoic acid, neodecanoic acid). Our bismuth carboxylate catalysts are environmentally benign options to industry standard lead, tin, mercury and tertiary amine catalysts. BiCAT® 8210 is our highest concentration bismuth carboxylate at 28 wt% bismuth. This material has been successfully used in one- and two-component systems for ambient or heat cure systems. Additionally, BiCAT® 8210 has been successfully used in HFO-based polyurethane spray foam systems.

Bismuth carboxylates are also interesting from a structural vantage point. With long-chain carboxylic acids they are often viscous liquids even at high bismuth concentration (e.g. bismuth 2-ethylhexanoate at 28 wt% bismuth is a liquid with a viscosity of ≤ 30 Poise at 25 °C). In 2009, we reported the molecular structure of our viscous bismuth carboxylates as part of a presentation on general metal carboxylate structure at the Spring 2009 Annual Meeting of the American Chemical Society. The structures of bismuth neodecanoate contain clusters, likely $\text{Bi}_2(\text{OOC}_{10}\text{H}_{19})_6$ and/or $\text{Bi}_4(\text{OOC}_{10}\text{H}_{19})_{12}$, that can reversibly polymerize when the free carboxylic acid concentration is reduced to a minimum (or, as the bismuth concentration is maximized). Bismuth 2-ethylhexanoate (Bi Oct, bismuth octoate) behaves similarly.

Interestingly, the bismuth carboxylates show long-range structure (based on X-ray scattering data) that is reminiscent of liquid crystals.

Many polyurethane systems require a significant amount of water in order to obtain the desired results (e.g. certain polyurethane foam formulations may include several weight percent of water). Unfortunately, bismuth carboxylates are sensitive to hydrolysis, readily forming bismuth trioxide (Bi₂O₃). In 2015, we filed the very first Shepherd Chemical patent application for the use of novel, hydrolytically-stable bismuth carboxylate materials as polyurethane catalysts. A year later, we were awarded the prestigious Polyurethane Innovation Award from the Center for the Polyurethane Industry for the development and implementation of these materials in polyurethane spray-foam formulations. In 2019, we were granted U.S. patent 10,414,891 for BiCAT® 8840, our hydrolytically-stable bismuth carboxylate-based polyurethane curative. This unique catalyst is soluble in both water and hydrocarbon-based solvents, allowing its use in a wide range of applications.

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The management system governing the manufacture of this product is ISO 9001:2015 and RCMS®:2013 certified.