Sodium tetraethylborate as a Derivatizing Agent for the Detection of Organotin, -lead, and –mercury

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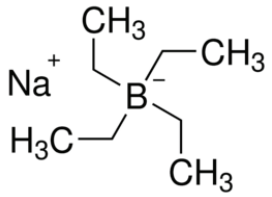
Catalog #

11-0575 Sodium tetraethylborate, min. 98%

CAS No. *[15523-24-7]*



Properties of Sodium tetraethylborate

Sodium tetraethylborate, $NaBEt_4$, is an air and moisture-sensitive pyrophoric crystalline white powder. It is highly reactive in the presence of various organometallic species and acts as an alkylating agent.

Why is Derivatization Required for the Detection of Organotin, Organolead, and Organomercury Species?

Organotin, organolead and organomercury species are known to be toxic to humans and plant and animal life. As a result, numerous analytical methods have been developed for the detection and quantitation of these compounds. Most are based on gas chromatography coupled with various sensitive and selective detection methods, such as atomic absorption spectrometry (AAS), atomic emission spectrometry (AES), pulsed-flame photometric detection (PFPD), and mass spectrometry (MS), among others.

For approaches based on gas chromatography, however, derivatization of the analytes is required in order to increase their volatility. Derivatization also prevents any interference from occurring during the analysis, and particularly at the detections stage. Clean and quantitative derivatization methods that do not result in losses or degradation of the analytes are critical for successful analyses. Hydride generation and alkylation using Grignard reagents or sodium tetraethylborate are most commonly used.

Sodium tetraethylborate as an Ideal Derivatizing Agent

Sodium tetraethylborate is convenient for the derivatization of aqueous samples containing organometallic analytes because the reaction can take place *in situ*, thus avoiding additional steps in the analytical procedure. The yield of ethylated products depends on the degree of substitution and the type of alkyl groups on the metal, the pH, and the reaction time. For organotin compounds, a pH of 4-5 appears to be most appropriate. Excess $NaBEt_4$ must be used due to consumption of the reagent by other reactive metals and components in the sample matrix (Ref 1).

Suitable for Use with Many Spectroscopic Techniques

Numerous methods for the analysis of environmental samples containing toxic organometal species that rely on derivatization with tetraethylborate have been reported in the literature. Selected examples are presented below.

"Determination of the acaricide fenbutatin oxide in water samples by automated headspace-SPME-GC/MS." C. Devos, L. Moens, P.Sandra*, J. Sep. Sci*. **2005**, 7, 665-8.

"Solid phase microextraction gas chromatography-glowdischarge-optical emission detection for tin and lead speciation." N.G. Orellana-Velado, R. Pereiro, A. Sanz-Medel, *J. Anal. At. Spec.*, **2001**, 16, 376-381.

"Determination of inorganic mercury and methylmercury in zooplankton and fish samples by speciated isotopic dilution GC-ICP-MS after alkaline digestion." L. Perna, A. LaCroix-Fralish, S. Stürup, *J. Anal. At. Spec.*, **2005,** 20, 236-238.

"Species specific isotope dilution with on line derivatisation for determination of gaseous mercury species." T. Larsson, Erik Björn, W. Frech, *J. Anal. At. Spec.*, **2005**, 20, 1232-1239.

"Determination of butyltin species in natural waters using aqueous phase ethylation and off-line room temperature trapping." K.C. Bowles, S.C. Apte, L.T. Hales, *Anal. Chim. Acta,* **2003** 477 (1), 103-111.

"The use of sodium tetraethylborate for the derivatization and analysis of selenium containing compounds." S. Clark, Steven, P.J. Craig, *Mikrochim. Acta,* **1992**, 109 (1), 141 – 144.

"Merging zones flow injection for the determination of ultratraces of bismuth by volatile species generation atomic absorption spectrometry using sodium tetraethylborate(III. M. de la Campa, F. Rosario, A. Sanz-medel, *J. Anal. At. Spec.* **1998**, 13(5), 431-435.

"Microporous membrane liquid–liquid extraction technique combined with gas chromatography mass spectrometry for the determination of organotin compounds". K. Ndungu, L. Mathiasson, *Anal. Chim. Acta, 2000,* 404(2), 319-328.

Reference:

1. R. Morabito, P. Massanisso. "Derivatization methods for the determination of organotin compounds in environmental samples." *Trends in Anal. Chem.*, **2000** 19 (2+3), 113-119.

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