

3M Advanced Materials Division

3M™ Enriched Boric Acid



Introduction

3M Technical Ceramics, Inc. specializes in isotopic boron products for specific applications. Our manufacturing systems give us the flexibility to customize isotopic composition to meet customer requirements. 3M™ Enriched Boric Acid is one of the basics of our product line, and is a precursor for most of our other boron containing chemicals. Enriched in either isotope to very high levels, our boric acid exceeds accepted standards of the nuclear industry throughout the world. In chemical reactions, our enriched products behave the same as their natural counterparts.

In a thermal neutron environment, Boron isotopes have opposing neutron capture cross sections. Whereas ¹⁰Boron is an extremely good neutron absorber, ¹¹Boron is considered to be neutron transparent.

3M Technical Ceramics manufactures a standard grade of 3M ¹⁰B enriched boric acid to satisfy many nuclear applications. For those applications where standard product characteristics are not suitable or where alternative purity is acceptable, custom materials are also available. Product data is available for standard products as well as customized products.

Typical Physical Properties (Not for specification purposes)

	Enriched 10 Boron	Enriched 11 Boron
Form	White Crystals	White Crystals
Enrichment	To 99+% Atomic	To 99+% Atomic
Molecular Weight	61.045 @ 99% ¹⁰ B	62.021 @ 99% ¹¹ B
Thermal Neutron Cross Section (Barns)	m3837	0.005
Natural Boron		
Density	1.52 grams/cm ³	
Heat of Formation	-262.16 kcal/mole	
Vapor Pressure @ 109°C	0.62 mm Hg	
Vapor Pressure @ 180°C	15.00 mm Hg	
Decomposes @	185°C	
Solubility in Methanol @ 25°C	173.9 g / L	

Standard Material Properties

Characteristic	10B Enriched Boric Acid	11B Enriched Boric Acid
Enrichment	96 wt% ¹⁰ B min.	To 99+ wt% ¹¹ B as desired
Equivalent Boric Acid	99.95 wt% min.	99.95 wt% min.
Impurities:		
Aluminum	1 ppm max.	—
Arsenic	0.2 ppm max.	—
Calcium	1 ppm max.	2 ppm max.
Chlorine	0.26 ppm max.	2 ppm max.
Fluorine	0.2 ppm max.	1 ppm max.
Heavy Metals (as Pb)	0.5 ppm max.	—
Iron	2 ppm max.	2 ppm max.
Magnesium	1 ppm max.	—
Phosphates	0.1 ppm max.	0.5 ppm max.
Total Silica	2.1 ppm max.	—
Sodium	2 ppm max.	—
Sulfates	0.12 ppm max.	1.5 ppm max.
Water Insolubles	10 ppm max.	40 ppm max.

Boron Enrichment Capabilities

3M Technical Ceramics is a leading global commercial processor of enriched boron, and is one of the largest boron isotope enrichment facilities in the world today. We focus on manufacturing optimized materials with an emphasis on stable boron isotopes. Our proprietary manufacturing processes allow ¹⁰B and ¹¹B enrichment from natural occurring ratios up to levels exceeding 99% isotopic purity. We offer secure supply, consistent product quality and the ability to custom engineer products for your unique applications. Our specialists are experts at solving materials-related problems in the demanding nuclear and semiconductor industries. For more information, contact us at boron@mmm.com.

Analytical Services

As a manufacturer of specialty, high purity chemical and isotopic products, 3M Technical Ceramics maintains sophisticated analytical and testing capabilities at its manufacturing facility in Quapaw, OK. Our analytical laboratories support on-site production activities and provide our customers with data and evidence that the products they receive meet or exceed their requirements. Our laboratories are fully equipped with current-generation instruments to perform

a full range of testing procedures, including: inductively coupled plasma mass spectrometry; atomic absorption spectroscopy; ion and gas chromatography; carbon/sulfur and oxygen/nitrogen analysis; particle size analysis and BET surface area measurement.

Packaging

Poly bottle or fiber drum, protected by vapor barrier bag. Certificate of Analysis provided with each shipment. Specific enrichments, purities and particle sizes are available to meet special requirements.

Product Storage, Handling and Safety

Storage: Keep container tightly closed. Store away from heat. See product Safety Data Sheet (SDS) for additional information.

Handling: Do not handle until all safety precautions have been read and understood. Do not breathe dust/fume/gas/mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Avoid release to the environment. Use personal protective equipment (gloves, respirators, etc.) as required. See product SDS for additional information.

Safety: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. See product SDS for additional information.

Regulatory Summary

¹¹B Enriched Boric Acid is approved for specific commercial use under a U.S. EPA Low Volume Exemption.

Approved commercial use: Precursor for other chemicals

Refer to SDS for additional information.

Product is manufactured and sold by 3M Technical Ceramics Inc.

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The management system has been certified according to DIN EN ISO 9001, DIN EN ISO 50001, DIN EN ISO 14001.

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