

3M Advanced Materials Division

3M™ Enriched Boric Acid



Introduction

Ceradyne, Inc., a 3M company, 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.

Ceradyne 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)	3837	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

Typical Physical Properties Standard Material

(Not for specification purposes)

Characteristic	¹⁰ B Enriched Boric Acid	¹¹ B 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.
Silicon Dioxide	2 ppm max.	—
Sodium	2 ppm max.	3 ppm max.
Sulfates	0.12 ppm max.	1.5 ppm max.
Water Insolubles	10 ppm max.	40 ppm max.

Boron Enrichment Capabilities

Ceradyne 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, Ceradyne 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.

Warranty, Limited Remedy, and Disclaimer: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. User is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. User is solely responsible for evaluating third party intellectual property rights and for ensuring that user's use of 3M product does not violate any third party intellectual property rights. Unless a different warranty is specifically stated in the applicable product literature or packaging insert, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OF NON-INFRINGEMENT OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability: Except where prohibited by law, 3M will not be liable for any loss or damages arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

Technical Information: Technical information, recommendations, and other statements contained in this document or provided by 3M personnel are based on tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed. Such information is intended for persons with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information.



3M Technical Ceramics

Zweigniederlassung der 3M
Deutschland GmbH Max-Schaidhauf-
Str. 25, 87437 Kempten, Germany

Phone +49 (0)831 5618-0
Web www.3M.de/Technical-Ceramics

3M Advanced Materials Division

3M Center
St. Paul, MN 55144 USA

Phone 1-800-367-8905
Web www.3M.com/advancedmaterials

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

3M is a trademark of 3M Company. Used under license by 3M subsidiaries and affiliates.

Please recycle. Printed in USA © 3M 2017. All rights reserved. Issued: 10/17 12968HB 98-0050-0312-8 Rev B