

3M Advanced Materials Division

# 3M™ 10B Enriched Boron

## Introduction

With a high thermal neutron absorption cross-section and excellent gamma discrimination, 3M™ 10B Enriched Boron is an element suitable for applications in neutron detecting and shielding technologies.

## Crystalline Boron

3M™ Technical Ceramics uses a unique proprietary process to produce crystalline elemental boron enriched in either <sup>10</sup>B or <sup>11</sup>B. Because the material only contains boron, maximum utilization of isotope properties is possible.

Crystalline <sup>10</sup>B, with its high thermal neutron absorption cross section, high isotopic enrichment and lack of other elements in its composition, allows the material to perform at a higher level of thermal neutron absorption performance of any of the possible boron compounds. The high purity of <sup>10</sup>B also imparts excellent gamma discrimination. These characteristics make it well suited to neutron detection technologies. In addition, the material has the highest shielding performance of any other available product from 3M Technical Ceramics, and is useful in applications where limited absorber loading is necessary.

3M Technical Ceramics can produce a wide variety of enrichments in this crystalline material. We provide certified analytical reports on each lot of crystalline boron delivered.

## Typical Physical Properties

(Not for specification purposes)

Properties	Crystalline <sup>10</sup> Boron
Enrichment	≥ to 96%
Molecular Weight	10.02 for 99% <sup>10</sup> B
Crystalline Structure	Beta Rhombohedral
Density	2.17 g/cm <sup>3</sup> for 99% <sup>10</sup> B
Thermal (n,∞) Cross Section (Barns)	3837
Atomic Mass Number	10.01294

## Crystalline Boron Typical Impurities (by weight)\*

Element	Total Impurity (ppm)
Al, Ca, Cr, Cu, Fe, Mg, Mn, Na, Ni, Pb, Sn, Ta, Ti, Zn	<1000

\*Lot analysis will vary and may show trace quantities of additional elements

## Typical Particle Sizes:

- Chunks
- -140 mesh
- d90 <23 microns
- d90 <5 microns

## 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 <sup>10</sup>B and <sup>11</sup>B 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](mailto: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.



## Product Storage, Handling and Safety

**Storage:** Store away from heat. Store away from acids. Store away from oxidizing agents. See product Safety Data Sheet (SDS) for additional information.

**Handling:** Avoid breathing dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Avoid contact with oxidizing agents (e.g. chlorine, chromic acid, etc.). Dust clouds of this material in sufficient concentration in combination with an ignition source may be explosive. Dust deposits should not be allowed to accumulate on surfaces because of the potential for secondary explosions. Routine housekeeping should be instituted to ensure that combustible dusts do not accumulate on surfaces. Solids can generate static electricity

charges when transferred and in mixing operations sufficient to be an ignition source. Evaluate the need for precautions, such as grounding and bonding, low energy transfer of material (e.g. low speed, short distance), or inert atmospheres. See product SDS for additional information.

**Safety:** Handling of this product may be hazardous. May form combustible dust concentrations in air. See product SDS for additional information.

## Regulatory Summary

One or more components in this material are approved for specific commercial use under a U.S. EPA Low Volume Exemption. Approved commercial use:

### 1. Nuclear research

See product SDS for additional information.

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

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3M™ Technical Ceramics, Inc.

3250 S. 614 Road  
Quapaw, OK 74363 USA

Phone 918-673-2201  
Email boron@mmm.com  
Web www.3M.com/boron

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