

3M Advanced Materials Division

# 3M™ 10B Enriched Zirconium Diboride

## Introduction

3M™ 10B Enriched Zirconium Diboride is produced by 3M Technical Ceramics Inc., for use as a neutron absorber and burnable poison for the nuclear industry. 3M 10B enriched zirconium diboride powder is available as a standard product defined by the following specifications or as a specially designed hot-pressed product to meet specific customer needs. Zirconium diboride combines an efficient neutron absorber with zirconium, a neutron-transparent metal used for many internal reactor components. This combination eliminates the addition of new elements to the reactor environment and helps to reduce the number of daughter products created.

## Typical Physical Properties

(Not for specification purposes)

| Characteristic                                 | Typical Range                 |
|--|-------------------------------|
| Boron Enrichment                               | Up to 99 wt % <sup>10</sup> B |
| Boron Content                                  | 17.15 to 20.15 wt%            |
| Theoretical Density (for hot-pressed products) | Up to 97%                     |

  

| Impurities  |                         |
|---|-------------------------|
| Al, Ca, Cr, Cu, Fe, Hf, In, Mg, Mn, Ni, Ti, W, Zn | Less than 1000 ppm each |
| Carbon  | Less than 10,000 ppm    |

## 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.

## Toll Pressing

3M Technical Ceramics owns and operates two of the largest vacuum hot presses in the United States. Designed to press powdered ceramic materials into highly dense shapes, these presses are capable of extremely high temperatures and pressures while maintaining the protection of a vacuum or inert gas atmosphere.

3M Technical Ceramics' toll pressing services utilize customer owned or provided starting material to

achieve final shapes and product characteristics. At these extreme conditions, only simple shapes such as blocks, cubes, plates and cylinders are possible. We have extensive experience pressing boron carbide, boron nitride, silicon carbide, titanium and zirconium diborides, aluminum nitride and several customer proprietary materials. The capabilities of these presses are as follows:

|                      |                                      |
|----------------------|--------------------------------------|
| Pressing Force       | 400 and 700 tons                     |
| Temperatures         | To 2200°C (3992°F)                   |
| Vacuum               | To 40 microns                        |
| Die Size             | 34 inches diameter<br>60 inches tall |
| Typical Die Material | Carbon/graphite                      |

## Packaging

Powders are packaged in fiber drums or poly bottles, protected by vapor barrier bag. Targets are packaged in a cardboard box according to size. Certified analysis furnished with every shipment. Specific enrichments, purities, and particle sizes are available to meet special requirements.

## Product Storage, Handling and Safety

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

**Handling:** Avoid contact with oxidizing agents (e.g. chlorine, chromic acid, etc.). See product SDS for additional information.

**Safety:** Handling of this product may be hazardous. See product SDS for additional information.

## Regulatory Summary

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

1. Sputtering targets for nuclear reactor use.

See product SDS for additional information.

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

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