3M Advanced Materials Division

3M™ 10B Enriched Borated Aluminum

Introduction
3M™ 10B Enriched Borated Aluminum is an alloy material incorporating enriched Boron $^{10}$B in standard aluminum compositions. Because of its high thermal conductivity, $^{10}$B enriched borated aluminum is useful in a number of specialized spent fuel storage and transportation applications.

For nonstructural applications, Alloy 1100 Al + $^{10}$B offers very efficient thermal neutron capture and is available in a variety of sheet and plate forms.

Typical Physical Properties
(Not for specification purposes)

<table>
<thead>
<tr>
<th>Properties</th>
<th>Alloy 1100 + B</th>
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</thead>
<tbody>
<tr>
<td>Typical Total Boron</td>
<td>0.5 to 4.5%</td>
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<tr>
<td>Minimum $^{10}$B Enrichment</td>
<td>95%</td>
</tr>
<tr>
<td>Equivalent Natural Boron</td>
<td>2.7 to 24.6%</td>
</tr>
<tr>
<td>Surface Finish</td>
<td>Ra = 125 μ in. (3.2 μm)</td>
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<tr>
<td>Dimensional Tolerances</td>
<td>Aluminum Association Standards</td>
</tr>
</tbody>
</table>

Neutronic Properties
Real time neutron transmittance and radiography are used to determine product acceptance. The minimum areal density based on the customer’s requirements and the material thickness is determined by the following formula:

$$A = W \rho ET$$

Where:
- $A$ = Areal Density, g $^{10}$B/cm$^2$
- $W$ = Weight % total Boron
- $\rho$ = Density, 2.7 g/cm$^3$
- $E$ = Enrichment, Weight % $^{10}$B
- $T$ = Thickness, cm

Acceptance is based on direct comparison with established neutron transmittance standards.

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 $^{10}$B and $^{11}$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.

Technical Services
Our ISO 9001:2008 and NQA-1 Quality Program is fully qualified, audited and approved by many worldwide customers. We control the entire value stream in the manufacture of these specialized materials, also offering qualification services for new designs and applications. Whether using natural boron carbide or enriched boron, we manufacture neutron absorber materials that meet or exceed stringent end user requirements. Under our ISO and NQA-1 programs, we provide best-in-class service to our customers covering all steps of neutron absorber manufacturing and processing.
Product Storage, Handling and Safety

Storage: Store away from heat. Store away from acids. Store away from oxidizing agents.

Handling: Avoid contact with oxidizing agents (e.g. chlorine, chromic acid etc.).

Safety: May present a hazard under certain handling conditions. See Article Information Sheet for additional information.

For more information on storage, handling and safety, an Article Information Sheet (AIS) is available upon request. You may request this by contacting us at boron@mmm.com.