

# 3M™ Advanced Metal Matrix Composite

## Introduction

3M™ Advanced Metal Matrix Composite (AMMC) is an Aluminum-Boron Carbide ( $B_4C$ ) Neutron Absorber with an integral aluminum cladding. This highly dense MMC has been developed by 3M Technical Ceramics, Inc., guided by principles and processes of its leading Quality Assurance System. This next-generation neutron absorber differs from 3M™ Neutron Absorber Composites (formerly known as Boral® Composites) with its excellent clad-to-core bonding, manufacturing processes and minimal porosity (see Table 1). Water absorption observed with AMMC is dramatically lower than the formerly named Boral composites. This product has been developed to be a highly effective neutron absorber for use in any fresh or spent fuel applications. It meets the key desired characteristics of an efficient neutron absorber by:

- High  $^{10}B$  areal density
- High thermal conductivity
- Excellent clad-to-core-bonding
- Very low porosity

With production entirely at 3M Technical Ceramics' facility, lead times and minimum order quantities can accommodate most customer needs.

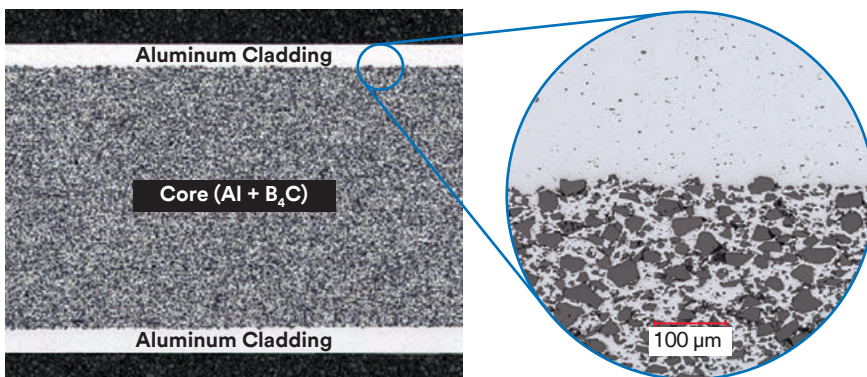


Figure 2. 3M™ Advanced MMC Metallography

The superior clad-to-core bonding of 3M AMMC is explained by the absence of large open porosity (black spots in Figure 3) at the clad-core interface.



Figure 1. 3M™ Advanced Metal Matrix Composite (AMMC)

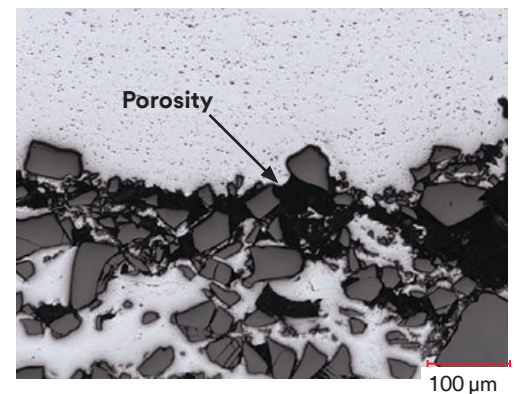


Figure 3. Metallography of 3M™ Neutron Absorber Composite (formerly known as Boral® Composite)

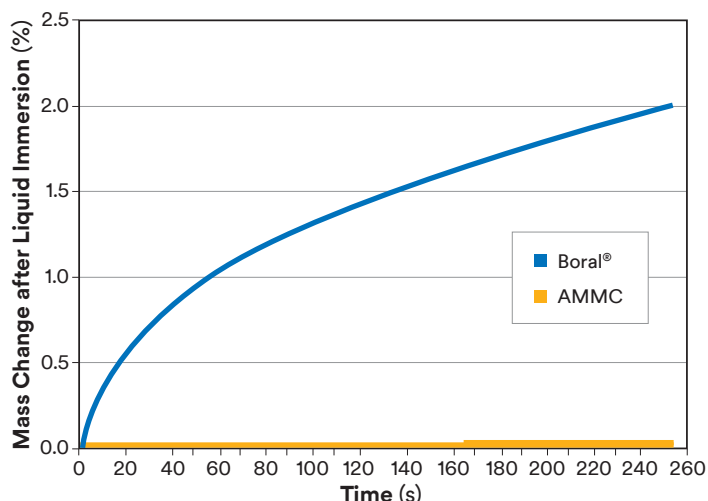


Figure 4. Water absorption comparison (AMMC vs formerly named Boral® Composite)

### Product Storage, Handling & Safety

**Storage:** Packages should be stored in a dry area with good ventilation to ensure stabilization of the packages. Temperature and humidity variations within the warehouse should be kept to a minimum to avoid staining due to condensation between plates.

**Handling:** Keep product flat to avoid damages.

Figure 4 illustrates water absorption in 3M™ Advanced Metal Matrix Composite (AMMC) as compared to the formerly named Boral® Composite. Tests were based on ASTM B311. Samples were taken from standard production runs of both materials. Samples tested represent similar performance requirements. All samples were subjected to identical test conditions. The Boral composite samples’ water absorption ranged between 1.6% wt. to 2.2% wt. over the duration of the test. The 3M AMMC showed no weight% gain. The weight accuracy during the test was ±0.001 g.

Products	Average Interconnected Porosity Per ASTM B963
3M™ Advanced MMC	≈0.3%
3M™ Neutron Absorber Composite (formerly named Boral® Composite)	≈10.0%

Table 1. Interconnected porosity values for 3M AMMC and formerly named Boral® Composite

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3M Technical Ceramics  
3250 S 614 Rd.  
Quapaw, OK 74363

Phone 418-693-0227  
Email boron@mmm.com  
Web www.3M.com/boron

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