

Dynamic Corrosion Resistance Test of ZYP's BN Coatings Conducted by the Edward Orton Jr. Ceramic Foundation, Westerville, OH December 2020

Test specifications:

- Duration: 100 hours
- Temperature: 800°C
- Cover gas: Argon
- Rotation rate: 2 feet/minute, switching directions every 30 minutes
- Depth of sample in molten aluminum: Approximately 3 ¼ inch
- Substrate = Pyrotek N-17 insulating board
<https://www.pyrotek.com/DeliverFile/0f51403449f0a76a2c036dc71c7f92d6>
- Aluminum = A356 Alloy [92% Al, 7% Si, 0.35% Mg, 0.2% Fe, 0.2% Cu, 0.1% Mn, 0.1% Zn]
- Rotating pins: 1 inch diameter, 4 inches length

Coatings used:

- BN Lubriccoat Blue
- BN Lubriccoat-ZV Blue
- BN Releasecoat Blue
- BN Hardcoat

The substrate used in this test was N-17 from Pyrotek, a significantly softer and more porous substrate than FS73 AL. The temperature of the aluminum melt was also increased from 720°C to 800°C. This was anticipated to be a more rigorous test for the BN coatings. As with the previous test on FS73 AL substrates, each coating protected the N-17 substrate without any reduction in the substrate diameter, within error. The primary differences between the four coatings are within the coatings' respective binder systems, which affects the adherence of the coating to the substrate. Given that this test was conducted under argon, the differences in relative adherence of the coatings were not a factor.

ADDITIONAL INFORMATION:

One ceramic pin was tested with each coating type. Pins for this follow-on test were 1 inch diameter versus ½ inch diameter for the prior test. Each pin was coated by brushing with two layers of the respective coatings, drying in between coatings. Argon cover gas was used in order to eliminate dross that would have added abrasion into the testing: the test was thus designed to evaluate corrosion resistance in a pool of molten aluminum alloy that is subjected to flowing metal for 100 hours at an aluminum melt temperature of 800°C.