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NTST Hexagonal Boron Nitride (hBN) Coatings

General Information:

NTST has developed the unique capability to fabricate hexagonal boron nitride (hBN) coatings and composites. BN is extremely difficult to fabricate as a coating due to its tendency to sublime at high temperature. The hexagonal form is the most stable and softest among BN polymorphs, and is used as a lubricant in many applications. BN is currently utilized in a multitude of industrial applications because of its unique properties and versatility including electrical insulation, thermal conduction, high-temperature lubricity and inertness.

Boron Nitride Properties/Characteristics:

The benefits of hBN include low density, high thermal conductivity, high temperature stability and strength, low coefficient of thermal expansion, corrosion and oxidation resistance, and excellent thermal shock resistance. BN is an excellent electrical insulator at high and low temperature possessing a low dielectric constant. hBN is soft, lubricious (low friction), and non-toxic.

Boron Nitride Applications:

Major industries using hBN include the aircraft, aerospace, chemical, electronics, glass, military, medical, metals processing, packaging, paper, power, printing, steel, and transportation industries.

Due to the high thermal conductivity of BN, it is an excellent choice for applications requiring substantial thermal shock resistance and refractory heat transfer surfaces. BN is currently used in high power electronics applications to dissipate heat, and maintain electrical isolation. It serves as an insulator for vacuum furnaces and welding equipment. Molten metal applications include refractory wall liners and crucibles, nozzles for metal powder production, and rapid solidification process components. The aircraft industry and the military use BN for radar components and coatings for radomes, microwave windows and antenna parts, high frequency satellites, windows in aerospace re-entry vehicles, and clearance control applications.

Typical NTST hBN coatings are illustrated in Figure 1. Composite coatings of hBN are illustrated in Figure 2. Coating thicknesses of greater than 25 mils have been fabricated for this material. Materials characterization for NTST hBN coatings includes a Vickers hardness of 44 (1.5 Mohs), Ra surface roughness ranging from 235-375 microinches, bond strength greater than 3500 psia, and porosity less than 2%. Figure 3 illustrates the as-sprayed surface morphology of a typical hBN coating (160x).

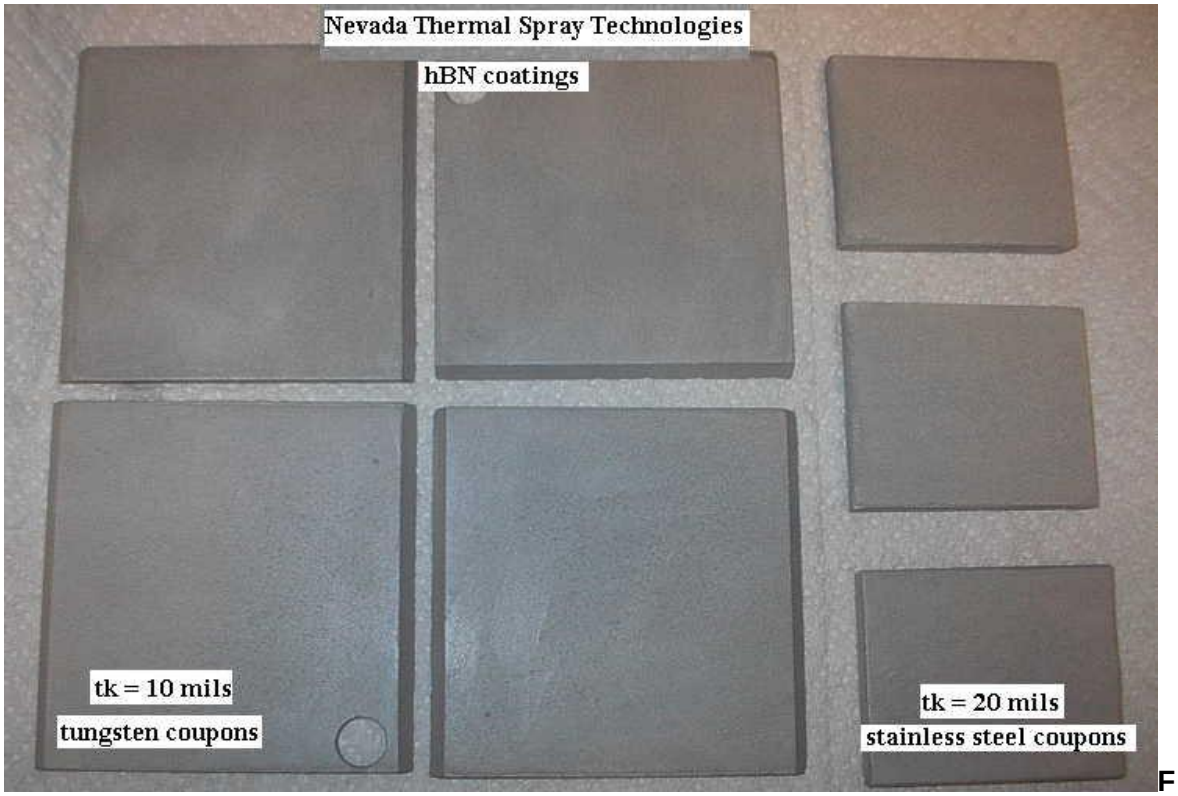

Figure 1. NTST hBN coatings.

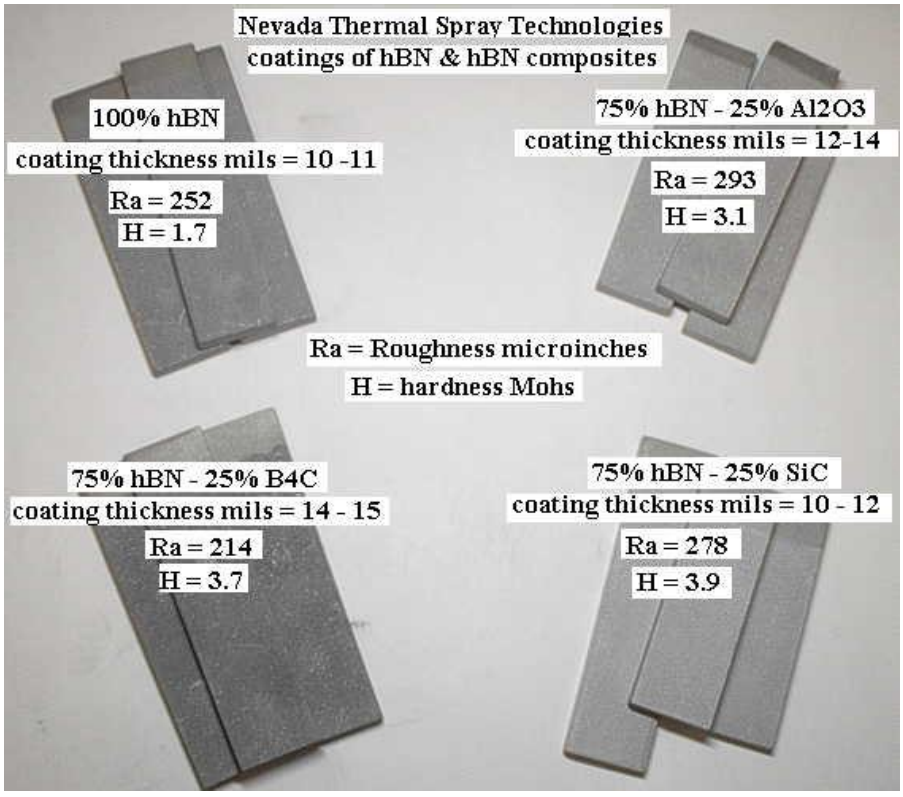

Figure 2. NTST hBN composite coatings

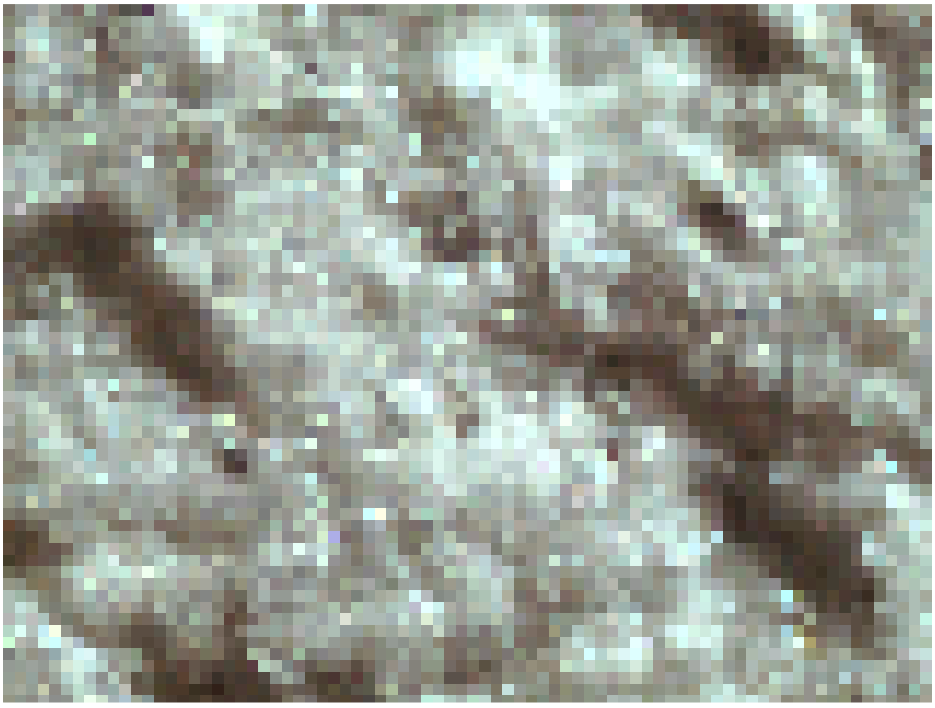

Figure 3. As-sprayed surface morphology of NTST hBN coating (160x).