Porosity Control of the Boron Carbide Coatings Formed by Electromagnetically Accelerated Plasma Spraying


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Porosity control of boron carbide (B,C) coatings by changing both raw powder sizes and spray distances was investigated using the electromagnetically accelerated plasma spraying (EMAPS) method. Within the coating conditions using two differently sized raw powders (20 µm and 5 µm in median diameters) and different spray distances from the gun muzzle to the substrate surface (ranging from 10 to 50 mm), it was found that smaller powders and longer spray distances were more effective in forming a dense coating. The porosity in the coatings ranged from 7% under the conditions of 20 µm powder size and 10 mm spray distance to 2% under the conditions of 5 µm powder size and 50 mm spray distance. To understand the effects of these factors, the B,C particle velocity was measured using the rotating drum method. The results showed that a particle velocity of approximately 2.5 km/s, almost the same as that of the traveling plasma in the EMAPS method, was observed for the small-sized powder. The velocity of large-sized powder was found to be approximately 1.1 km/s. Such a large discrepancy in the powder velocities was considered to contribute to the difference in the densities of the B,C coatings from differently sized powders.

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