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## **Near Net Shape Forming of Hafnium-Based Ceramic Components: Synthesis and Characterization**

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Ultrahigh temperature applications such as combustion chamber liners, rocket thrusters, thermal protection systems for carbon/carbon composites and leading edges of the spacecraft require materials, which are protective and oxidation resistant at temperatures higher than 2000<sup>0</sup>C. Refractory ceramics such as hafnium diboride (HfB<sub>2</sub>), hafnium carbide (HfC) and hafnium nitride (HfN) are candidate materials because of their high melting points, low coefficient of thermal expansion, high erosion and oxidation resistance. Conventionally, processing of these ceramics has been very difficult and expensive due to their intrinsic brittle nature. Near net shape forming of these ceramics using vacuum plasma spray technique offers a cost effective method to fabricate structural components. In the present investigation, it has been demonstrated that HfB<sub>2</sub>, HfC and HfN can be spray formed to near net shapes. Microstructural characterization for density and phase distribution has been performed using scanning electron microscope (SEM). Phase identification and chemical characterization have been carried out using x-ray diffraction (XRD) and energy dispersive spectroscopy (EDS).