

**Thermal Spray Coatings: Research, Design and Applications**  
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**VPS Forming of Refractory Metals and Ceramics for  
Space Furnace Containment Cartridges**

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Vacuum Plasma Spray formed deposits of refractory metals are being characterized for fabrication of Space Shuttle crystal growth furnace containment cartridges. The cartridges provide containment for high temperature crystal growth experiments operating at temperatures as high as 1700C (3092F). To meet these requirements, non-metallic coatings (zirconia, alumina, etc.) are being applied to protect the refractory metal tubes from high temperature oxidation and corrosive attack from a variety of crystal growth materials. The microstructure was evaluated via optical microscopy in order to develop the parameters to spray these materials. The microstructures of the VPS formed materials have been evaluated for density, grain size, homogeneity and transition from ceramic to metallic material. Microstructural results of the metal and coated metal cartridges will be presented.