

**DEVELOPMENT OF NEAR NET SHAPE REFRACTORY METAL  
COMPONENTS UTILIZING VACUUM PLASMA SPRAY**

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The limitations of traditional alloys and the desire for improved performance for components are driving the increased utilization of refractory metals in the space industry. From advanced propulsion systems to high temperature furnace components for microgravity processing, refractory metals are being used for their high melting temperatures and inherent chemical stability. Techniques have been developed to produce near net shape refractory metal components utilizing vacuum plasma spraying. Material utilization is very high, and laborious machining can be avoided. As-spray formed components have been tested and found to perform adequately. However, increased mechanical and thermal properties are needed. To improve these properties, post processing thermal treatments such as hydrogen sintering and vacuum annealing have been performed. Components formed from alloys of tungsten, rhenium, tantalum, niobium and molybdenum are discussed and a metallurgical analysis detailing the results is presented. A qualitative comparison of mechanical properties is also included.