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THERMAL SPRAY PROCESSING OF NANOSTRUCTURED MATERIALS

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The application of nanocrystalline materials used as powder feedstock for thermal spraying in recent years has been mainly facilitated by the wide range of powder sources available, including: *vapor condensation*, *solution precipitation*, *combustion synthesis*, *sol-gel processing*, thermochemical synthesis, and mechanical alloying/milling. The resultant thermal sprayed coatings have been shown to exhibit unique and often enhanced physical and mechanical performance properties in comparison to the coatings produced by current technology. Improvements in physical have been documented for several metallic and cermet based nanostructured coatings. However, the behavior of a nanostructured material during thermal spraying is rendered complex by factors such as morphology of feedstock powders; thermal stability of nanostructured powders; and thermal and momentum behavior of nanostructured powder. Optimization of chemistry, morphology and coating thickness, for example, should lead to the attainment of physical performance heretofore unattainable with conventional coatings. The present paper is to provide an overview of recent advancements in the field of high performance nanostructured coatings, paying particular attention to underlying fundamental issues. Examples of several metallic and cermet coatings will be used to demonstrate the influence of the morphology of nanostructured powders on the performance of the sprayed coatings.