

## **Practical Application Of NanoTechnology In Thermal Spray Coatings**

### **Abstract**

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In materials, there are two distinct usages of the term nanotechnology, which apply to achieving characteristic length scales from 1 to 100 nm. One class of materials is called Particulate Materials Nanotechnology (PMN) which involves producing materials or particles on a dimensional length scale that is nanoscale. The other class of materials is called Bulk Materials Nanotechnology (BMN) and involves refining the microstructural scale (i.e. phase / grain size) down to the nanoscale regime. Both material approaches have been utilized to develop nanoscale thermal spray coatings. In this talk, the focus will be on BMN and how utilizing solid-solid state transformations can be an enabling and robust approach toward developing nanoscale coatings. Further emphasis will be placed on the mechanism of microstructural refinement with an explanation of the detailed physical metallurgy describing how high performance nanoscale high velocity oxy-fuel (HVOF) and twin roll wire-arc coatings can be successfully applied regardless of whether under highly controlled conditions in the laboratory or in challenging conditions in the field. The BMN approach will be showcased as an enabling platform technology which represents a simple yet elegant solution to the complex technical problems of forming nanoscale structures in industrial products with material feedstock which is conventional in both size and form.