

### Material Properties and Microstructural Characterization of Thermal Barrier Coating

Thermal Barrier Coatings (TBCs) are widely used in gas turbine hot section components such as burners, transition ducts, shrouds, blades and vanes. Extensive research is being carried out in the area of thermal barrier coatings (TBC). The use of TBCs began about three decades ago in applications such as aerospace and diesel engines which resulted in increasing the life of the parts by double. Thermal barrier coatings usually consist of two layers or a duplex structure. It consists of a MCrAlYX (M = Ni or Co or both; X = Hf, Zr, Si or other reactive elements) bond coat. The bond coat is used to provide good adhesion between the metal substrate and the ceramic topcoat. Such ceramic coatings are mostly made of yttria stabilized zirconia (YSZ). To improve performance and quality of the ceramic coatings the topcoat layer should be refractory having low thermal conductivity, porosity, low density, adherent and resistant to corrosion. In our research two thermal spray processes, Air plasma spray APS based technique will be employed for the coatings. Superalloy material of NiCr IN 738 composition will be used in Air plasma spray process (APS). Selected test samples of NiCr super alloys coated with the APS process ASM-LLC, Inc of substrate material IN 738 will be analyzed for the coating quality and microstructures. These substrate materials will provide typical microstructures suitable for high temperature thermal barrier YSZ coatings. The superalloy IN 738 material provides solid solution strengthening with dispersions of intermetallic phases that provide attractive high temperature properties. The APS processed specimens will be characterized and evaluated for bond coat and top coat effects and related characteristics.