

PROCESSING OF HIGH ENTROPY CARBIDE-BASED CERAMICS

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Material requirements for ultra-high temperature applications include high thermal and dimensional stability, good thermal shock resistance, low reactivity and low coefficients of thermal expansion. The development of ultra-high temperature materials with both high thermochemical stability and appreciable mechanical properties (ductility, toughness, etc.) has continued to be a research challenge. The advent of the high entropy design paradigm has significantly expanded the composition space for a class of such materials, Ultra-High Temperature Ceramics (UHTCs), providing the potential to tune compositions for the needed material properties. One strategy is via the application of valence electron concentration (VEC) considerations. This is, however, critically dependent on the formation of complete solid solutions. To evaluate VEC rule adherence, four-component carbonitride compositions were fabricated and characterized in this study. Results from the investigation of solid solution formation using X-ray diffraction and electron microscopy will be presented.