

Fabrication of Alumina Matrix Nanocomposites by Coating Alumina Powder with Metal Reinforcement Precursor

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Alumina is widely used as structural ceramic material because of its mechanical properties such as high hardness, strength, elastic modulus, and it has also low cost, good chemical and thermal stability; however, its use in many applications is limited by low fracture toughness and low strength. There has been research being done on alumina matrix composites in order to increase the fracture toughness and strength values. Nanocomposites which are produced by either adding a nano sized metal phase into the alumina or formation of a nano sized metal phase during/or prior to sintering, has an important place towards achieving this aim.

In this study, a nano sized metal phase will be incorporated into the alumina matrix in order to increase the fracture toughness and strength of alumina. Alumina powder will be coated with a phase which contains metal reinforcement (metal nitrates as precursor) by using heterogeneous precipitation method. An appropriate heat treatment will be followed to obtain nano sized metal coated alumina powder and this powder will be sintered in a controlled environment. Alumina matrix nanocomposite's microstructure will be characterized by X-ray diffraction, transmission electron microscopy and scanning electron microscopy methods. Mechanical properties will be characterized by Vicker's hardness and indentation fracture toughness tests. Nano metal phase ratio will be varied in order to study the effect of nano metal content on the microstructure and the mechanical properties.

Key Words: Alumina, Nanocomposite, Toughness, Microstructure, Processing

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