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PARAMETERS AFFECTING GRAIN BOUNDARY CHEMISTRY of SiAlON CERAMICS

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It is well known that β-SiAlON is a strong engineering ceramic with good oxidation and creep resistance up to 1300°C. α-SiAlON has excellent hardness, but slightly worse strength, toughness and oxidation resistance than β-SiAlON. It is possible to obtain composite materials, consisting of both α and β-SiAlON, whose properties can be optimized by controlling the ratio of α and β-SiAlON. The properties of a silicon nitride based materials are strongly affected by the amount and crystallinity of the grain boundary phase, as well. For the wear behavior in machining applications the grade of crystallinity and the type of crystalline phases are critical factors.

In this study, α-β SiAlON compositions were designed with different type of cations and at different molar ratios. The effect of Y, Ce, Sm, Er, Yb and Ca and mixtures of them on the composition, the type of intergranular phase (amorphous or crystalline), the development of the resultant microstructures following gas pressure sintering and further heat treatment under different conditions will be presented. The influence of the intergranular phase chemistry and microstructure especially on the machining behavior will also be discussed.

Keywords: SiAlON, cations, crystallinity, microstructure, machining performance

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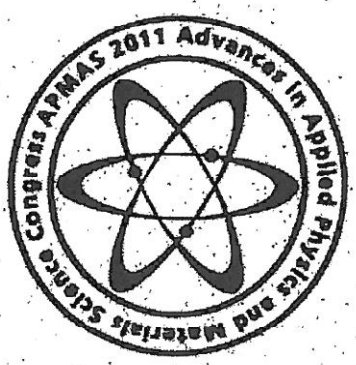

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