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Densification and microstructure of Si3N4-TiN ceramic composites

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Silicon nitride (Si3N4) is a ceramic material widely used in various structural applications at high temperatures owing to its excellent combination of mechanical and thermal properties. In order to increase the application field of silicon nitride, many researches have been developed to improve its fracture toughness and processing conditions. This work studies the sintering and microstructure of Si3N4-TiN composites, containing Al2O3 and Y2O3 as sintering aids Samples were obtained by the conventional method of mixing powders and sintered at 1750ºC / 1 hour and 1815ºC / 1 hour under nitrogen atmosphere. Density values of the different compositions were determined by the Archimedes method, reaching values between 96.9 and 98.0% of theoretical density, with an apparent porosity less than 0.5%, evidencing the efficiency of the sintering aids. Also, the sintered samples were analyzed by X-ray powder diffraction (XRD) and backscattered scanning electron microscopy (SEM). The results showed the materials developed a microstructure with TiN grains dispersed in a ?-Si3N4 matrix containing an amorphous intergranular phase, which was formed by the liquid phase solidification during the cooling step in the sintering process.