Preparation of calcium stabilized alpha-sialon ceramic and their (cBN/SiC) composites by spark plasma sintering

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Abstract

Numerous compositions of calcium alpha and alpha/beta sialon ceramics represented by the chemical formula of Cam/2Si12-(m+n)Alm+nOnN16-n were sintered at 1500 °C by employing spark plasma sintering tech-nique and nano-size oxi-nitride powder precursors. The identification of the al-pha/alpha + beta phase boundary (Figure 1) was followed by the synthesis of alpha-silaon cBN and alpha-silaon/SiC compo-sites. Ultrasonic probe sonication resulted in the homogenous dispersion of both the reinforcing particles (cBN and SiC) in the alpha-sialon matrices. Single phase alpha sialon sample depicted the Vicker's hard-ness of 19.22 GPa whereas Vickers hard-ness (H_{V10}) of 24.0 GPa was achieved for composite reinforced with cBN particles. However, a notable combination of hard-ness 24.53 GPa and fracture toughness 11.0 MPa m1/2 was achieved (H_{V10}) for the sialon composite reinforced with 30 wt% SiC. Crack deflection and bridging by the finely dispersed SiC particles were seen to be the primary mechanisms involved in the enhanced fracture toughness.

Biography:

Dr Abbas Saeed hakeem has over fifteen (15) years researcher experience. He has completed several multimillion Riyals projects as PI and as Co-I as well as many other client funded projects along with collaboration with multinational oil and gas companies including Saudi Aramco, Yokogawa, Halliburton, Baker Hughes.

He is the author of over 70 publications in ISI journals and 25 conference proceedings (excluding invited speaker at conference proceedings, workshops and seminars) and member of Engineering Council and various other international societies (ASME, ASM, PEC).

Speaker Publications:

1. Spark plasma method for making cBN/sialon ceramic, US Patent App. 16/189,517

2. Wear and friction behavior of Al6061 alloy reinforced with carbon nanotubes, Wear 297 (1-2), 752-761

3. Nitrogen-rich La–Si–Al–O–N oxynitride glass structures probed by solid state NMR, Journal of non-crystalline solids 354 (1), 49-60

4. La–Si–O–N glasses: Part I. Extension of the glass forming region, Journal of the European Ceramic Society 27 (16), 4773-4781

5. High efficiency graphene/Cu_2O electrode for the electrochemical reduction of carbon dioxide to ethanol, Journal of Electroanalytical Chemistry 785, 138-143

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