11th International Conference on Advanced Materials
Rio de Janeiro Brazil
September 20 - 25
ICAM2009

Ceramic composites derived from $Ti/Al/Al_2O_3$-filled polysiloxane

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Abstract:

Studies have been developed in order to obtain Alumina-TiC based ceramic composites with good physical and mechanical properties. The results have indicated that the densification of those composite materials can be only realized in pressure assisted sintering or using high sintering temperatures [1-2]. Manufacturing of composite ceramic material derived from polymer reactive filler has been intensively investigated [3-4]. Polymer pyrolysis is a relatively new and very promising method for obtaining ceramic material in complex shapes. During pyrolysis the polymer decomposes and the solid and gaseous decomposition products react with the active fillers to form new carbides phases. The use of polymer and reactive fillers to produce ceramic composite materials has the advantage to decrease the sintering temperature, as compared to others processing methods. Ceramic matrix composites (CMC) were prepared by the active-filler-controlled polymer pyrolysis process (AFCOP) using a polysiloxane resin filled with titanium, aluminum and alumina powders. Samples containing 22 wt% of polysiloxane and 78 wt% of metallic and ceramic powders were homogenized, uniaxially pressed and pyrolysed in an alumina tube furnace up to 1100 ºC, under argon flow. The ceramic products were characterized by X-ray diffraction (XRD), porosity and flexural strength. The results indicated that is possible to obtain Alumina-TiC based ceramic composites by active-filler-controlled polymer process. Figure 1 and 2 shows the fracture surface of the samples without and with aluminum, respectively.

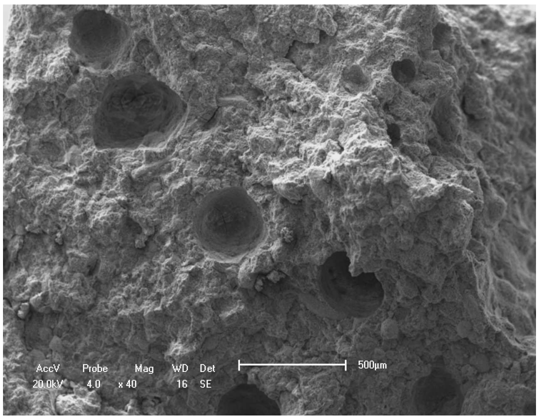

Figure 1: Fracture surface 1000 ℃ without Al.

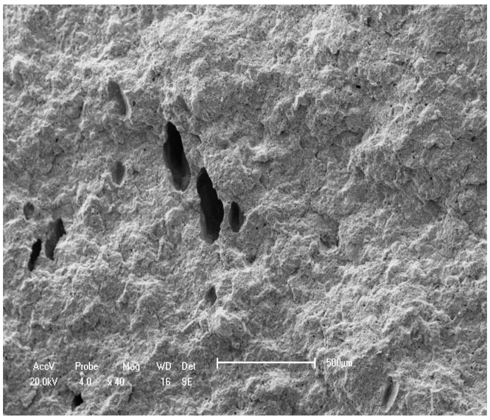

Figure 2: Fracture surface 1000 ℃ with Al.

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