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**On the sintering mechanisms and microstructure of aluminium – ceramic
cenospheres syntactic foams produced by powder metallurgy route**

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Abstract

Metal matrix syntactic foams of ceramic (mullite) cenospheres (10 – 40 % v/v) embedded in pure aluminium matrix, were fabricated by powder metallurgy technique at different sintering temperatures (610 °C to 710 °C). Density, vis-a-vis porosity and microstructural characteristics were examined by using scanning electron microscopy and energy dispersive X-ray spectroscopy. A first systematic description of the sintering mechanism of the composites is presented. The in situ reaction between silica (phase of mullite) and aluminium particles, apart from any degradation of the mullite cell wall and the precipitation of silicon in the matrix, changes the sintering mechanism of syntactic foams due to the formation of eutectic aluminium – silica liquid quantities. Transient liquid phase sintering, with surface material diffusion, and liquid phase sintering, with bulk diffusion, selected to be the main sintering mechanisms, are described in detail for sintering temperatures below and above the melting point of aluminium matrix, respectively.

Keywords: A. Metal-matrix composites (MMCs); D. Microstructural analysis; E. Sintering; E. Powder processing

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