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An effective approach to reinforced closed-cell Al-alloy foams with multiwalled carbon nanotubes

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Abstract.

Exploring the reinforcing role of carbon nanotubes to obtain materials (polymers, metals, ceramics) with enhanced properties has been often attempted, but the success is strongly limited by the dispersing degree of carbon nanotubes. Here we report on an innovative colloidal approach to disperse the carbon nanotubes in the powders mixture of the precursor materials in order to profit from their reinforcing potential and obtain a new class of closed-cell metal foams. The feasibility of the proposed approach was demonstrated for aluminium foams reinforced with multi-walled carbon nanotubes. These nanocomposite metal foams synergistically combine the remarkable properties of both metal foams and carbon nanotubes. The results indicate that the tubular structure of carbon nanotubes is preserved throughout the entire the process. The carbon nanotubes are individually dispersed, stretched and randomly aligned in the aluminium-matrix of these closed-cell foams, thus potentiating their homogeneous 3D reinforcing role. Accordingly, the Vickers micro-hardness of the closed-cell foams was greatly enhanced.

Keywords. Aluminium alloy foams; Carbon nanotubes; Nanocomposite metal foams; Colloidal processing; Powder Metallurgy.

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