

Hot rolling effects on as-cast aluminum matrix nanocomposites reinforced by nano-sized ceramic powders

S. S. Behnamfard ¹, R. Taherzadeh Mousavian ^{2, a)}, R. Azari Khosroshahi ¹, D. Brabazon ²

1: Faculty of Materials Engineering, Sahand University of Technology, Tabriz, Iran

2: Advanced Processing Technology Research Centre, School of Mechanical & Manufacturing Engineering, Dublin City University, Dublin 9, Ireland

^{a)} Email: rezataherzadeh.mousavian@dcu.ie

Tel: +353 894441268

Abstract. In this study, aluminum matrix nanocomposites were aimed to be produced by the semi-solid stir casting process. For this purpose, alumina and SiC nanocomposite superstructures were prepared using ball-milling of alumina and SiC nanopowders with micron-sized copper powders, respectively, to reinforce A356 aluminum alloy as the matrix. In fact, copper powders were used as a carrier agent of ceramic nano-powders to increase their wettability by the semi-solid melt. Afterward, as-cast nanocomposites were exposed to hot rolling process to find the effects of high temperature deformation on their microstructure and mechanical properties. The experimental results indicated that as-cast products consisted various types of pores as well as cracks. Also, severe agglomeration of nanopowders were detected on as-cast products, showing that copper presence could not be completely effective to avoid agglomeration and poor wettability of nano ceramic powders. It was obtained that hot rolling process reduced the amounts of pores and a better dispersion of nano ceramic clusters were observed with improved mechanical properties for hot-deformed products. Finally, it was shown that the type of nano ceramics did not affect the performance of the hot rolling process.

Keywords: Aluminum; Nanocomposites; Stir casting; Alumina; SiC