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Production of CNT-bearing melt-spun Al-2Sc-0.05CNT alloys

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Abstract

In the present work, rapidly solidified Al–2Sc-XCNT (X= 0, 0.05) alloys were successfully fabricated by melt spinning under Ar atmosphere. The effects of addition of CNT on the microstructural, thermal, microhardness, and electrical properties were investigated by using scanning electron microscopy (SEM), X-ray diffractometer (XRD), differential calorimeter (DSC), Vickers microhardness testing and a four point probe resistivity tester. Experimental results illustrated that the addition of 0.05 wt. % CNT to melt-spun Al–2Sc alloys led to the formation of equiaxed globular-like morphologies with size from 0.3 to 2.7μm in. In the microstructure of Al-2Sc-0.05CNT alloy, CNTs covered by Al with size (width and length) changing from 40 to 55 nm and 255 to 295 nm, respectively, were observed. The addition of CNT led to a net increment (~25%) in microhardness values due to solitary strengthening of the carbon nanotubes, solute solution hardening and modification of the morphologies of Al_3Sc intermetallics. In addition, because of CNT addition there was a decrease in the electrical resistivity.

Keywords: Al–Sc alloys; Microstructure; Melt spinning; Microhardness, Carbon nanotube