Evaluation of behavior of aluminium-CNT composite on the Equal-Channel Angular Extrusion

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Keyword: aluminium, carbon nanotubes, angular channel, extrusio.

Abstract:
Metal matrix composites (MMCs) are relatively new materials on science and materials engineering. In this work was used single-walled carbon nanotube (SWCNT) as reinforcement in an aluminum matrix. For this purpose, 0.75% (by weight) of SWCNT were dispersed with isopropanol using an ultrasonic tip and mixed with Al powder particles. The mixtures with and without SWCNT were dried and compacted at room temperature with a pressure of 400 MPa to obtain samples with 4,8x4,8x25,0 mm³. These compacted samples were then subjected to Equal-Channel Angular Extrusion - ECAE (?=90 °) at room temperature. The influence of the presence of SWCNT, the number of extrusion passes (0, 1, and 3 passes) and the use of back pressure (0-65 MPa) in densification and hardness of the composite samples were evaluated. Optical and scanning electron microscopy were used to characterize the morphology of the grains of the Al matrix and the dispersion of SWCNT and pores present in the samples. The results indicated that the density and hardness of the samples are increased with the increase in the number of extrusion passes, and the use of back pressure during extrusion. The microstructures showed alignment of grains in the matrix pores of the agglomerates and the NTC in the direction close to the shear imposed by the ECAE process, and a microstructural refinement.