

Examining the Thermal Stability of an Al-Mg-Sc alloy processed by High-Pressure Torsion.

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An Al-3%Mg-0.2%Sc alloy was solution treated and subjected to 10 turns of high-pressure torsion. Thereafter, the HPT-processed material was annealed for 1 hour at temperatures ranging from 423 to 773 K and its mechanical properties and microstructural evolution were examined using microhardness measurements and EBSD analysis. The results demonstrate that the Al-Mg-Sc alloy exhibits an average microhardness of ~190 Hv and an average grain size of ~150 μm immediately after HPT processing and also after further annealing at 423 K. Conversely, it was verified that annealing at temperatures above 473 K leads to a substantial decrease in the hardness values as well as a sharp increase in the grain size of the material previously processed by HPT. In addition, detailed EBSD analysis revealed the formation of a bi-modal distribution of grains after annealing at temperatures from 623 to 773 K, and this becomes more uniform with increasing temperatures.