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Effect of applied pressure on microstructure development and homogeneity in an aluminium alloy processed by high-pressure torsion

Piotr Bazarnik^{a*}, Barbara Romelczyk^a, Yi Huang^b, Malgorzata Lewandowska^a, Terence G. Langdon^{b,c}

^a Warsaw University of Technology, Faculty of Materials Science, Woloska 141,
02-507 Warsaw, Poland

^b Materials Research Group, Faculty of Engineering and the Environment,
University of Southampton, Southampton SO17 1BJ, UK

^c Departments of Aerospace & Mechanical Engineering and Materials Science,
University of Southern California, Los Angeles, CA 90089-1453, USA

Abstract

An investigation was conducted to evaluate the influence of applied pressure on the processing of an aluminium 5483 alloy by high-pressure torsion (HPT). Discs were processed by HPT through 1/4 to 5 revolutions at room temperature using the two different applied pressures of 1.0 and 6.0 GPa. Samples were examined after HPT using microhardness measurements and transmission electron microscopy. Colour-coded maps were constructed to show the hardness distributions and the mechanical properties were evaluated by tensile testing. It is shown that the results are dependent upon the applied pressure such that a higher pressure enhances the accumulation of defects and leads to a more rapid grain refinement. The effect of pressure is especially visible in the early stages after fractional numbers of turns since the microstructure and properties tend to homogenize at high numbers of turns.

Keywords: Al-Mg alloy; Applied pressure; Grain refinement; High-pressure torsion; Microhardness.

*Corresponding author: Piotr Bazarnik (p.bazarnik@inmat.pw.edu.pl)

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