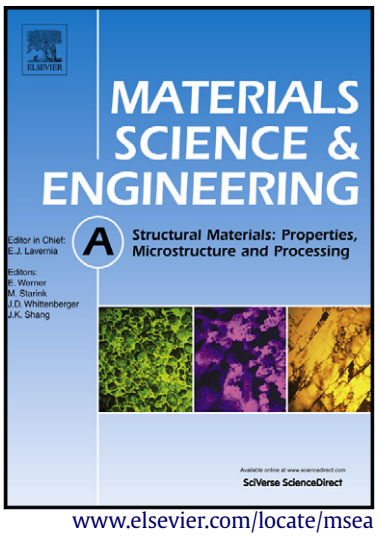


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# Effect of short-term annealing on the microstructures and flow properties of an Al-1% Mg alloy processed by high-pressure torsion

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**Abstract**

An Al-1% Mg solid solution alloy with an annealed grain size of ~400 μm was processed by high-pressure torsion (HPT) to produce a grain size of ~200 nm with a high fraction of high-angle grain boundaries. Tensile testing at room temperature showed this material exhibited excellent strength but with little or no ductility. It is demonstrated that a combination of reasonable ductility and good strength may be achieved by subjecting samples to a short term anneal of 10 minutes following the HPT processing. Annealing at 423 K increased the average grain size to ~360 nm, reduced the overall strength to a value that was ~75% of the value without annealing but gave reasonable elongations of up to >0.2. Both the initial unprocessed Al-Mg alloy and the sample annealed after HPT exhibited serrated flow due to the Portevin-Le Chatelier (PLC) effect. The results suggest that the introduction of short term annealing after HPT processing may be an effective and simple procedure for achieving a reasonable level of strength together with good ductility after processing by HPT.

*Keywords:* Al-Mg alloy; annealing; hardness; high-pressure torsion; Portevin-Le Chatelier effect.