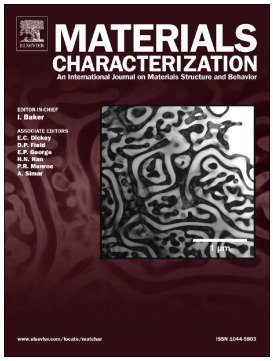

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Development of Microstructure and Texture during Single and Multiple Pass Friction Stir Processing of a Strain Hardenable Aluminium Alloy

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ABSTRACT

In the present study, microstructure and texture development during single and multiple pass friction stir processing (FSP) of a strain hardenable wrought Al-Mg alloy (AA5086) was investigated. Subtle differences were observed while comparing with heat treatable alloys in the nucleation mechanism of the recrystallized microstructure observed in the nugget zone. Strain induced boundary migration was the dominant mechanism of microstructure evolution in the alloy, which influenced the crystallographic texture development by weakening it. Micro-texture measurements reveal variations in the crystallographic texture along the thickness of the sample. Recrystallization texture components were observed in the nugget zone indicative of a pronounced static recrystallization in the alloy as compared to the heat treatable alloys. Bulk texture measurements within the nugget zone of the optimally processed sample reveal a relatively dominant C component of shear texture. Average grain size in the nugget zone remained the same and the bulk crystallographic texture components were retained during multiple-pass FSP. The lower strain energies retained and the enhanced recovery processes due to the high temperature materials processing of the alloy during FSP resulted in a stable microstructure and texture. In summary, FSP could be promoted as a competent and suitable secondary processing technique for the bulk production of ultra-fine-grained materials in strain hardenable aluminium alloys.