

**Title:**

Microstructure and mechanical properties of lightweight structural AZ31 alloy prepared by twin-roll casting method

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**Abstract:**

Microstructure of AZ31 twin-roll cast magnesium alloy was studied using light optical, electron and atomic force microscopy. The effect of annealing temperature on the microstructure was tested. Mechanical properties of a thin magnesium strip were investigated by means of microhardness tests and tensile tests at a relatively low strain rate  $10^{-3} \text{ s}^{-1}$ . Results show that the ductility of the twin roll cast strip increases with increasing deformation temperature, however, a remarkable decrease was observed at about 200 °C. This effect appears also in a conventionally cast ingot of a master alloy and is caused by a change of a deformation mode occurring at this temperature. Moreover, the effect of severe plastic deformation on the microstructure and mechanical properties was studied. Equal channel angular pressing was applied on magnesium strip samples and lead to a significant grain refinement accompanied by an unfavorable strengthening of the initial basal texture, which is effectively suppressed by a subsequent annealing. A constrained groove pressing was for the first time successfully applied on AZ31 twin-roll cast strip leading to an increase of microhardness and grain refinement. Also this technique strengthens the basal texture, which, however persists even after subsequent annealing. The results also showed that an initial microstructure and a predeformation imposed into samples during casting remarkably influences their final properties after intensive plastic deformation.