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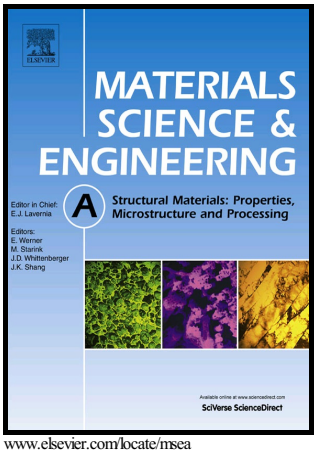

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Effect of pre-deformation cooling rate on age-hardening response of ultrafine grained AA6063

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Abstract

In this article, effect of pre-deformation cooling rate after solution heat treatment on the evolution of microstructure and tensile properties of AA6063 aluminum alloy is investigated. For this purpose, samples of AA6063 are solution heat treated at 550°C for 6 h. Followed by this treatment, some samples are furnace cooled (FC), some air cooled (AC) and the rest water quenched (WQ). After 2, 6 and 10 passes equal channel angular pressing (ECAP), significantly finer nanostructure was observed in the WQ samples. This was attributed to the effect of higher concentration of Mg in solid solution. In addition, the WQ samples showed higher initial tensile strength being attributed to the more enriched solid solution and more significant strengthening during severe plastic deformation which was attributed to higher dislocation density generated during deformation. In addition, it was found that the WQ samples in un-deformed and deformed conditions show a more significant response to aging in terms of strengthening. In fact, age hardening was observed for both AC and WQ samples in un-deformed