Natural Aging Behaviour of the EN AW 6082 and Lead Free EN AW 6023 Aluminium Alloys

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The natural aging behaviour of EN AW 6082 aluminium alloy and lead-free EN AW 6023 aluminium alloy with good free cutting machinability was investigated using Vickers microhardness measurements, tensile test analysis, and a light microscopy characterisation. The different chemical composition of the analysed alloys did not affect the alloys microhardness after quenching, but the solid solution grain sizes of the quenched alloys differed greatly. The microhardness and tensile strength of EN AW 6082 increased with aging time right after alloy quenching. On the contrary, microhardness and tensile strength of lead-free EN AW 6023 increased markedly until after 500 hours of natural aging. The natural aging of the 6023 alloy could be suppressed by the formation of Sn-vacancy pairs after alloy quenching that impede the strengthening clusters formation. Finer grains of solid solution that were found in the 6023 alloy microstructure resulted in higher tensile strength and lower ductility of the 6023 alloy compared to the 6082 alloy, even though the microhardness of the naturally aged 6023 alloy state was lower.

Keywords: AlMgSi alloy, Natural aging, Microstructure, Mechanical properties, Sn

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