



MME SEE

CONGRESS 2023

5th Metallurgical & Materials Engineering
Congress of South-East Europe
Trebinje, Bosnia and Herzegovina
7-10th June 2023

BOOK OF
ABSTRACTS

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INFLUENCE OF COLD ROLLING AND ANNEALING ON THE MECHANICAL AND CORROSION PROPERTIES OF AN AA5182 Al-Mg ALLOY

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Wrought Al-Mg alloys are an important and promising material for application in the transportation industry primarily due to their favorable strength-to-weight ratio. As a result of their usage in the field of transportation, the weight of vehicle constructions become reduced, resulting in a decrease in fuel consumption and carbon dioxide emissions. In addition to these advantages, one of the important demands on the application of Al-Mg alloys as a lightweight structural material is providing high strength, corrosion resistance, and good surface quality without relief caused by yield point phenomena and serrated flow. Such a good combination of properties can be achieved by a variation and optimization of thermomechanical processing parameters including a degree of deformation and annealing conditions.

In this study, we investigated the effect of cold rolling reductions and different annealing conditions, on the corrosion resistance and mechanical properties of an AA5182 type Al-Mg alloy. The material was industrially produced and supplied by Impol-Seval Aluminium Rolling Mill, Sevojno, Serbia, as hot rolled 12 mm thick plates. Further lab-processing of hot rolled plates included cold rolling with a 40-85% reduction in thickness, and annealing in the range of temperatures 280-350°C, in a different periods of time. Annealed specimens were used for room temperature tensile testing while corrosion testing was performed on the annealed and sensitized specimens. Intergranular corrosion (IGC) susceptibility was determined by nitric acid mass loss test (NAMLT) for the selected states.

The results showed that corrosion resistance, tensile strength, and yield point elongation were mostly affected by a degree of cold deformation. It was found that an increase in cold rolling reduction from 40-85% before annealing causes an improved strength level due to grain size refinement. However, yield point elongation became more pronounced and a tendency towards Lüdering as an undesirable surface appearance was increased. NAMLT testing showed that the material was corrosion-resistant in as-annealed conditions while it became susceptible to intergranular corrosion after sensitization treatment. IGC susceptibility of sensitized specimens increases with cold rolling reduction and a raise of annealing temperature.

Keywords: Al-Mg alloy, degree of deformation, strength, yield point elongation, corrosion resistance

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