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MECHANICAL PROPERTIES OF TWO Al-Mg ALLOYS MANUFACTURED BY ACCUMULATIVE ROLL BONDING (ARB) PROCESS

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Abstract

The influence of alloying on the mechanical properties of AA5083 type Al-Mg alloy sheets produced by accumulative roll bonding (ARB) process was studied. Two investigated Al-Mg alloys: commercial AA5083 alloy with 4.2% Mg, and modified AA5083 alloy with 5.1% Mg and addition of 0.5% Zn, were supplied by Impol-Seval Aluminium Mill (Sevojno, Serbia) as hot rolled thick plates. Hot rolled plates were further laboratory cold rolled up to 1 mm in thickness, and ARB processed at room temperature with ~ 50% reduction per each ARB cycle. It was possible to conduct up to maximum 6 ARB cycles for a commercial AA5083 alloy and 4 ARB cycles for modified AA5083 alloy.

Hardness and tensile properties of ARB processed multilayered sheets were significantly improved with Mg and Zn addition. In the initial annealed state, before ARB processing, yield strength of the modified AA5083 alloy was only 15-20 MPa higher than for a commercial AA5083 alloy. However, flow stress level and tensile strength became higher for nearly 100 MPa after each ARB cycle for the modified AA5083 alloy in comparison with standard AA5083 alloy. The elongation decrease value was high after the first ARB cycle, while after subsequent passes it stayed almost constant, and slightly improved with Mg and Zn addition. Resistivity level was also affected by chemical composition of the tested alloys. Higher resistivity level obtained for the modified AA5083 alloy was attributed to higher Mg content and addition of Zn.

Despite the fact that addition of Mg and Zn limited the possibility of joining through ARB processing, mechanical properties of the modified AA5083 alloy were superior over a commercial AA5083 alloy.

Keywords: Accumulative Roll Bonding; Al-Mg alloys; mechanical properties;