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Enhanced strength and electrical conductivity of Al-Mg-Si alloy by thermo-mechanical treatment

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Abstract

In the present work, two types of thermo-mechanical treatments were performed to enhance the mutually contradictory strength and electrical conductivity of Al-Mg-Si alloy. The microstructures, conducting and mechanical behavior of the alloy during conventional artificial aging treatment (solution treating, aging) and thermo-mechanical treatments (solution treating, cold rolling, aging and solution treating, pre-aging, cold rolling, re-aging) were investigated. The results indicate that the Al-Mg-Si alloy after 70% cold rolling and aging at 180°C for 6 hr reveals higher ultimate tensile strength and electrical conductivity (being 267 MPa and 58.2 %IACS) than the conventional peak-aged alloys do (being 248 MPa and 54.8 %IACS). Further simultaneously enhanced ultimate tensile strength and electrical conductivity, as high as 301 MPa and 58.9 %IACS, respectively, can be acquired for the alloy after pre-aging at 180°C for 2hr and then 70% cold rolling followed by re-aging at 180°C for 6 hr. With the aid of the microstructure evolution, the factors which lead to the simultaneously enhanced strength and conductivity of the alloy are discussed in detail.

Key words: aluminium alloys, thermo-mechanical processing, mechanical properties, electrical conductivity, microstructure

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