AA 7075 Ultrafine-Grained Alloy Prepared by Mechanical Alloying and Spark Plasma Sintering

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Constantly increasing demands on mechanical properties lead to the search for new materials production technologies. The improvement could be achieved by methods of powder metallurgy, especially the ones capable to manufacture materials with ultra-fine microstructure. The aluminium alloy 7075, which belongs to the one of the strongest commercial aluminium alloys, was prepared by mechanical alloying in combination with spark plasma sintering. The thus-prepared samples were analysed (XRD, XRF, SEM-EDS, compression stress-strain test, Vickers hardness) and compared to its commercially produced equivalent (AA 7075). Mechanical alloying led to complete dissolution of all alloying elements in the aluminium solid solution. After SPS consolidation, the very fine intermetallic phase $MgZn_2$ precipitated from the supersaturated solid solution and was distributed in the grain interior and at grain boundaries of the α-Al matrix. The very fine nature of the microstructure resulted in the increase of the compressive yield strength nearly 35 % to the commercial alloy and higher hardness.

Keywords: AA 7075, powder metallurgy, mechanical alloying, spark plasma sintering.

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