The Influence of SPS Compaction Pressure onto Mechanical Properties of Al-20Si-16Fe Alloy Prepared by Mechanical Alloying

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The Al-20Si-16Fe alloy (wt.%) was prepared by a combination of short-term mechanical alloying and consequential compaction via spark plasma sintering. The compaction was done at two different pressures of 80 MPa and 6 GPa to describe the influence of pressure onto a resulting properties of prepared alloy. The microstructure of both the prepared compact alloys showed presence of sub-micrometre particles embedded in the Al-matrix while some residual porosity was also observed. This corresponded to the lower compaction pressure of only 80 MPa, which, in comparison to the 6 GPa allowed to retain some porosity. The higher compaction pressure of 6 GPa resulted in a increase of the compressive strength of 1426 MPa while the hardness was slightly lower reaching still high 348 HV 5. On the other hand, the sample compacted by a pressure of 80 MPa reached compressive strength of 758 MPa while showing higher hardness of 411 HV 5. The difference in the observed properties can be attributed to a different compaction temperatures of 500°C (for 80 MPa) and of approximatelly 600°C (for 6 GPa).

Keywords: Mechanical alloying, spark plasma sintering, mechanical properties, microstructure.

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