Powder Metallurgy Prepared Al Alloys and Their „Self-Healing“ Possibilities

Alena Michalcová, Anna Knaislová, Ivo Marek, Zbyněk Veselka, Jaroslav Vavřík, Tadeáš Bastl, Tomáš Hrdlička, Daniel Kučera, Luana Luwan Sun, Dalibor Vojtěch
Department of Metals and Corrosion Engineering, University of chemistry and technology, Technicka 5, Prague 6, 16628, Czech Republic. E-mail: michalca@vscht.cz, vojtechd@vscht.cz

Microstructure and mechanical properties of powder metallurgically prepared AlSi24Fe3 alloy are presented in this article. The alloy was prepared in form of rapidly solidified ribbons by melt spinning process. Consequently, the ribbons were crushed into powder in a ball mill and compacted by spark plasma sintering. Grain size of prepared alloy was less than 1 μm, Vickers hardness HV0.1 reached value 214, yield strength and ultimate compressive strength were 611 and 778 MPa, respectively. To obtain material with possible self-healing proprerties, it was necessary to enrich material by fine dispersed Ag_2Al particles. The AlSi24Fe3 powder particles were sputtered by 5 nm layer of silver before sintering. The total amount of Ag in bulk sample was approximately 0.1 wt. %. The microstructure of Ag containing alloy was comparable to the basic one. The Ag nanoparticles were present on several particle boundaries. The influence of Ag presence on Vickers hardness of the material was not observed, as the values HV0.1 was 212. After a heat treatment (450 °C/ 1h), silver transformed to equilibrial Ag_2Al phase, present in material in form of nanoparticles no more decorating strictly the particles boundaries.

Keywords: Aluminium, microstructure, TEM, sputtering

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