Processing of Aluminium Alloys with High Content of Iron by Methods of Powder Metallurgy

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Powder metallurgy could be an alternative way to ordinary casting technologies in the processing of aluminium alloys with high content of iron. Far more attention is given especially to technologies capable to produce ultrafine microstructures leading to desired mechanical properties. Binary alloy of aluminium and iron (AlFe 17 wt. %) was prepared by mechanical alloying, centrifugal atomization and mechanical working followed by consolidation via spark plasma sintering and hot extrusion. Phase composition of the compact samples consisted of solid solution of iron in aluminium and of intermetallic phase identified as $Al_{13}Fe_4$. Very fine microstructure was achieved by combination of mechanical alloying and subsequent consolidation via spark plasma sintering and by combination of centrifugal atomization and hot extrusion. Compressive strength of these samples was 508 MPa and 637 MPa, respectively. Moreover, the AlFe17 alloy prepared by combination of centrifugal atomization and hot extrusion exhibited extraordinary ductility reaching almost 36 %.

Keywords: mechanical alloying, centrifugal atomization, spark plasma sintering, hot extrusion.

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