

Thermophysical Properties of Ultrafine-Grained 1060 Aluminum Fabricated by Equal Channel Angular Pressing

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Equal Channel Angular Pressing (ECAP) has an advantage of being capable of achieving an ultrafine grain size. Aluminum 1060 is close to pure aluminum. This material is used for power plants because of very low electrical conductivity. The electrical conductivity is affected by the composition of chromium, manganese, vanadium, zirconium, titanium. However, the weak strength of the aluminum has limited its applications. In this study, 1060 Al alloys made by ECAP were investigated to determine thermal conductivity and electrical conductivity. ECAP were conducted through the die having a channel angle(Φ) of 90° and a corner angle (Ψ) of 20° at a temperature of 473K with a strain rate of 2 mm/s; the specimen was processed with 1~8 passes in the method of route Bc that rotates 90° . In the case of 8 passes, the grain size was reduced to as small as 200 nm. As a result of the ECAP, the strength was changed from 70 MPa to 135 MPa and the electrical conductivity was not significantly different from 0.3468 MS/cm to 0.3395 MS/cm after 8 passes. The thermal conductivity was gradually decreased with ECAP pass, because the grain size was decreased by ECAP.