

Magnesium Alloys Containing Y, Gd and Ca with Enhanced Ignition Temperature and Mechanical Properties for Aviation Applications

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Abstract : Mg-2Y-2Gd-1Ca and Mg-4Y-4Gd-2Ca alloys were processed by extrusion or equal channel angular pressing (ECAP) to analyse the effect of the microstructure on ignition temperature, mechanical properties and corrosion resistance. The alloys are characterized by good mechanical properties and exceptionally high ignition temperature, which is a critical safety measure. The effect of extrusion and ECAP on the microstructure, mechanical properties and ignition temperature was studied. The obtained results indicated a substantial effect of the processing conditions on the average grain size, the recrystallized fraction and texture formation. Both alloys featured a high strength, depending on the composition and processing condition, and a high ignition temperature of ≈ 1100 °C (Mg-4Y-4Gd-2Ca) and ≈ 950 °C (Mg-2Y-2Gd-1Ca), which was attributed to the synergic effect of Y, Gd and Ca oxides, with the dominant effect of Y_2O_3 . The achieved combination of enhanced mechanical properties and the ignition temperature makes these alloys a prominent candidate for aircraft applications.

Keywords : magnesium alloys, enhanced ignition temperature, mechanical properties, ECAP

Conference Title : ICMAT 2023 : International Conference on Magnesium Alloys and Technology

Conference Location : Ottawa, Canada

Conference Dates : July 03-04, 2023