

Abstract

Zinc and its alloys are among the most used metallic materials in various applications such as technology, manufacturing, car manufacturing and in the last decades in robotics. In terms of mechanical properties with relatively improved mechanical bending strength after heat treatment. However, the imperative nowadays for metallic materials of high demands led to the development of various zinc alloys. This PhD thesis aims to study the structure and properties of zinc alloy (Zn-10Al-1.5Cu). Zinc alloys with similar percentage alloy additions have multiple technological applications. The addition of copper in aluminum zinc alloy (Zamak) improved the mechanical properties, especially its durability. Specifically, in the above alloy was initially control the structure and morphology of the cast alloy. Then studied microhardness, resistance in various corrosive environments, resistance to oxidation at different temperatures, wear resistant behavior under dry conditions and, finally, the flexural strength (bending behaviour) after heat treatment. The zinc alloy (Zn-10Al-1.5Cu) was found to consist of (a) aluminum-zinc solid solution, (b) zinc aluminum solid solution or an insoluble aluminum and (c) the intermetallic compound CuZn_4 .

As regards the strength of the alloy to corrosion found in larger solution temperatures and higher concentrations of solution erosion increases. The corrosion mechanism was found to be strong corrosion acicular and the phenomenon of intergranular corrosion. The oxidation behavior of zinc alloy (Zn-10Al-1.5Cu) was studied at different temperature gradients at different times. It was observed that the oxidation rate increases according to the increase of temperature and time. The wear behavior of zinc alloy (Zn-10Al-1.5Cu) was found to be affected by the increase in the applied load. In particular the alloy was found to be similar coefficient of friction (μ) of the pair of zinc alloy material (Zn-10Al-1.5Cu) - martensitic stainless steel. Finally, the effect of heat treatments on the bending strength. It was observed that there is variation in the behavior of the alloy in accordance with the heat treatment. In some cases the phenomenon of overaging for a given time and temperature existed under the examined conditions.