عنوان مقاله:

The Influence of Heat Treatment and High Energy Ball Milling on the Density, Hardness, and Wear Behavior of Al ۷۱۵۰ Alloy via Hot Uniaxial Compaction

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خلاصه مقاله:

The effect of the milling time & ageing on the hardness, density, and wear characteristics of Al ۷۱۵۰ alloy specimens made via powder metallurgy has been studied. The different constituents of Al ۷۱۵۰ alloy were processed in a planetary ball milling set up with a BPR of ۱۰:۱ for ۵ hours, ۱۰ hours, and ۲۰ hours. At ۴۰۰ °C, the milled powders were subsequently hot compacted in a punch die setup. The hot-pressed specimens were solutionized initially, then aged artificially at ۱۱۵ °C for ۳, ۶, ۱۲, ۲۴, ۳۰, ۴۵, ۶۰, and ۹۶ hours. The relative density was inversely proportional to the milling time. Microhardness tests showed a maximum VHN of ۲۵۵ was measured for the ۲۴ h aged T۶ specimens produced from ۲۰ h milled powders whereas the non-aged specimens, made from unmilled ۷۱۵۰ alloy powders showed a VHN of ۴۰. However the samples showed a decline in microhardness beyond ۲۴ h of ageing. Under various conditions of sliding distance and loading conditions, the samples subjected to T۶ aging showed a reduced volumetric wear rate indicating the beneficial effect of artificial aging up to ۲۴ hours. The volumetric wear rate gradually declined for the samples aged beyond ۲۴ hours of aging. The HRTEM studies revealed a high density of uniformly scattered (MgZn۲) precipitates in the base matrix, as well as (MgZn۲) phases precipitating along grain boundaries. The presence of such second phase precipitates in the matrix improved the wear characteristics of the alloy matrix. The results showed that optimization of process parameters such as milling time, ageing as well as reducing the particle size of the base powders, the hardness and wear behavior of Al ۷۱۵۰ alloy may be improved.

کلمات کلیدی:

BALL MILLING, Al ۷۱۵۰, wear, aging, heat treatment