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Characterization, formability, various stresses and failure analysis on workability of sintered Mg-5%B_4C composite under triaxial stress state condition

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Abstract

The present study focuses on hardness and workability behavior of Magnesium (Mg) and Mg-5%B_4C composites using online Acoustic Emission (AE). The Mg preform and Mg-5%B_4C sintered samples are prepared by using Powder Metallurgy (P/M) route with the support of die-punch setup and Universal Testing Machine (UTM) having a maximum capacity of 1*MN*with an aspect ratio of one. The characterization of powders and composites are discussed using Scanning Electron Microscope (SEM), X-ray Diffraction (XRD) and Energy Dispersive Spectrum (EDS) analysis. Electron Back Scattered Diagram (EBSD) for grain size is carried out for the Mg and Mg-5% B_4C composite. The Cold upsetting process under triaxial stress state condition is preferred for the workability study. AE tests are conducted simultaneously to detect the crack initiation in the preform. The AE test result displays that Mg-5%B_4C composite has excellent AE waveform distribution owing to the presence of B_4C in the matrix. The effect of formability stress index factor (β_σ) and various stress ratio parameters ($\sigma_\theta/\sigma_{eff}$and σ_m/σ_{eff}) are established. The result exhibits that Mg-5%B_4C composite has greater hardness, higher workability parameter, triaxial stresses and initial relative density than the pure Mg preform due to the addition of the B_4C.

Key words: *workability, cold upsetting, triaxial stress, formability stress index, hardness.*

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