ABSTRACT

Research on binary alloys of Magnesium is gaining enormous traction because of their potential utility in automotive and aerospace industries. Present work focuses on developing a mechanism based strengthening model to predict the mechanical properties of age hardened Mg binary alloys. The model considers the contribution of several strengthening mechanisms to estimate the hardness of Mg-Al and Mg-Zn alloy systems that are precipitation hardened at different aging conditions. The proposed model uses input parameters that are obtained from a precipitation model implemented in FactSage (Paliwal and Jung [1]). Vickers micro-hardness experiments are conducted on aged binary Mg-Al (6 wt.% Al) and Mg-Zn (4.0 and 5.5 wt.% Zn) alloys. Verification and validation of the proposed model is carried out by comparing: a) the hardness measures from experiments with model predictions, b) the effective stiffness measures obtained from experiments with model predictions based on mean-field approach (Mori-Tanaka method) and c) the model predictions relative to those obtained from classical continuum theory (Cottrell and Bilby [2]) predictions. Present study also attempts to unify several of the model input parameters and successfully demonstrates the ability of the model to predict the hardness and effective stiffness properties.