Thesis Title	Modeling of Manganese Aluminum Bronze Under Compression at High Temperatures
Thesis Credits	18
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Program	Master of Engineering
Field of Study	Materials Processing Technology and Manufacturing Innovation
Department	Tool and Materials Engineering
Faculty	Engineering
Academic Year	2014

Abstract

Manganese aluminum bronze or MAB alloy is a copper-based alloy, which is commonly applied in marine applications for its high strength and good corrosion resistance. The aim of this study was to investigate the plastic flow behavior of an as-cast MAB alloy under various compressive deformation conditions. The forming temperatures of 700, 750, 800 and 850°C and strain rates of 0.01, 0.1, 1.0 and 10 s^{-1} were examined. The higher strain rates and lower temperatures obviously led to increasing flow stresses. The resultant true stress-true strain curves exhibited dynamic recovery (DRV) and dynamic recrystallization (DRX). All of the stress-strain responses showed a single peak stress, which was an indication of that DRX occurred during hot deformation. The deformation behavior was described using a material models incorporating both work hardening and softening mechanisms. The applied constitutive equation was based on an Arrhenius model, for which the Zener-Hollomon parameter, in a hyperbolic-sine function, was incorporated. By this manner, the relationships between flow stress, temperature, strain and strain rate could be established. The model was used for FE simulations of the compression tests. An activation energy of 194 kJ/mol was used for the MAB alloy. The predicted force-displacement curves were compared with those from the experiments and the average relative error (ARE) were calculated. Moreover, the dynamic material model (DMM) was used to predict deformation behavior of material during hot deforming based on true stress-strain curves which temperature and strain rate of MAB alloy. In plastic deformation, resulting adiabatic heating increase MAB alloy with high strain rate as affect to softening mechanism and limited forming materials.

Keywords: Arrhenius equation / Compressive deformation / FE simulation / Manganese Aluminum Bronze / Flow behavior / Zener-Hollomon parameters