8th International Conference on Physical and Numerical Simulation of Materials Processing (ICPNS)

14–17 October 2016

Seattle, Washington | Hosted by Purdue University

SESSION 6: LIGHT ALLOYS, MARITIME HALL

Co-Chairs: Qigui Wang, General Motors Company Pontiac; Tongmin Wang, Dalian University of Technology; Jianxin Zhou, Huazhong University of Science and Technology; Lianxi Hu, Harbin Institute of Technology

SATURDAY, OCTOBER 15, 2016

Adiabatic shear bands in magnesium alloys: Experimental and theoretical analysis

Pingli Mao, Shenyang University of Technology

ABSTRACT

Adiabatic shear bands (ASBs) or adiabatic shear localizations are a common phenomenon caused by thermal accumulation in a local area in metallic materials subjected to a high strain rates deformation. And the formation of ASBs depends on a number of metallurgical parameters, and their formation is often a precursor to catastrophic failures. In this paper, the Split Hopkinson Pressure Bar (SHPB) was used testing the ASBs behavior of magnesium alloys, and it was demonstrated that three types of ASBs featured by different microstructure appearance were found in magnesium alloys. The microstructure within ASBs in the first type is very fine equiaxed grain, and adjacent of ASBs, the microstructure consists of high density twins. The microstructure in second type of ASBs is featured by twinning bands. And these two types of ASBs were observed in AZ31 magnesium alloy. The third type of ASBs was found in Mg–Gd–Y rear earth beard magnesium alloys, and it is featured by white bands. The numerical simulation of the stress and temperature field during the adiabatic shear band formation was also conducted to assist the theoretical analysis of ASB in magnesium alloys.

KEYWORDS: magnesium alloy, adiabatic shear bands, numerical simulation