METALLURGICAL & MATERIALS ENGINEERING
COLORADO SCHOOL OF MINES

HOT SHEAR-COMPRESSION DEFORMATION AND ITS APPLICATION IN MICROSTRUCTURE SIMULATION

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4 P.M. THURSDAY, MARCH 3, 2016
HILL HALL 202

ABSTRACT

Thermo-mechanical processes such as friction welding and asymmetrical rolling involves large strains and transient deformation conditions including fast-heating, short-time dwelling and non-constant strain rate. Due to lack of physical simulation methods, it is difficult to reveal the microstructure development mechanisms in those thermo-mechanical processes. A novel shear-compression specimen (SCS) was developed firstly to study the cold deformation of metals at the conditions of large strains and strain rates. The feasibility of applying the SCS to hot deformation with large strain/strain rate is worthy of investigation. Thus, we developed a hot shear-compression deformation (HSCD) method to simulate the microstructure evolution in 7050 aluminum alloy and Fe-38Mn alloy during thermal-mechanical processing. The activation energy calculated from numerical simulation of HSCD method is comparable to the hot compression and hot tensile tests of the same materials. In addition, the HSCD method was adopted to simulate the thermal-mechanical conditions during linear friction welding of Titanium alloy. Similar microstructure characteristics in terms of texture and grain boundary misorientation distribution were generated between HSCD method and linear friction welding, which demonstrates the validity of HSCD simulation method.

ABOUT THE SPEAKER

Dr. Ruidong Fu received his master's degree in materials engineering in 1998 and PhD in materials science in 2003 from Yanshan University, China. He has worked at Yanshan University for 26 years. His research interests mainly focus on friction stir welding and processing, physical simulation of hot deformed microstructures, and strengthening and toughening of metals.