USE OF FIB TO STUDY THE IMPACT PROPERTIES OF MATERIALS

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Abstract

The microstructure of impacted metallic materials is characterized by the development of narrow bands known as adiabatic shear bands (ASB). In this study, a new approach using focused ion beam (FIB) was applied for preparing thin foil sections from adiabatic shear bands in selected impacted steel specimens for transmission electron microscopy examinations. The narrow nature of the shear bands renders microscopic examination more difficult because the perforation produced using conventional thin foil preparation techniques such as double-jet polishing and ion milling generally do not coincide with the shear band area. To better select the shear band regions, without adding more stresses or distortions to the shear band structure, an FEI Quanta 200 3D Dual Beam Focused Ion Beam (FIB) was used to prepare thin foils of shear band regions for TEM analyses to determine the mechanism of formation of adiabatic shear bands. The use of the focused ion beam (FIB) as well as other conventional microscopical techniques allow for a more comprehensive investigation of the microstructural mechanisms of formation of adiabatic shear bands in the steel. It was found that the emergence of dislocations, carbide dissolution, evolution of subgrain/subgrain boundaries and dynamic recovery/recrystallization, contribute simultaneously to the formation of adiabatic shear bands in quench-hardened steels.