

Influences of Microstructure, Alloying Elements and Forming Parameters on Delayed Fracture in TRIP/TWIP-Aided Austenitic Steels



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Shaker Verlag Nov 2012, 2012. Buch. Condition: Neu. Neuware - Hydrogen assisted delayed fracture is a non-negligible obstacle for fully application of the excellent formability of the TRIP or TWIP-aided austenitic steels. The current work compared delayed fracture behaviour in Meta-stable Austenitic Stainless Steels (MASS) and High Manganese Steels (HMS) by carrying out quasi-static tensile test, slow strain rate test and deep drawing test. In-depth investigation of the response of mechanical properties at different hydrogen levels elucidated the influences of hydrogen content, austenite stability, chemical composition and lattice defects on delayed fracture behaviour. Materials with lower austenite stability generally show higher susceptibility to delayed fracture. Austenite in MASS can be stabilized by alloying with Mn and N. Deformation twinning in HMS can be postponed by alloying with Al. Besides of austenitic stability, materials with non-beneficial hydrogen traps, such as coarse inclusions and rigid secondary phase, are quite susceptible to delayed fracture. Elaborate mechanical testing at different strain rates, forming temperatures and stress states also revealed the influences of the mentioned process parameters on fracture strength and strain after hydrogen degradation. Hydrogen-dislocation interaction is mostly enhanced at low strain rate and high tri-axial stressed condition. Furthermore, the damage mechanisms in the investigated materials were explored by observing the fracture surfaces and crack propagation under Scanning Electron Microscopy and Electron BackScatter Diffraction system. 227 pp. Englisch.



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