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Strain rate effects on fracture behavior of Austempered Ductile Irons ANDREW RUGGIERO, NICOLA BONORA, DOMENICO GENTILE, GIANLUCA IANNITTI, GABRIEL TESTA, University of Cassino and SL, MAGNUS HÖRNQVIST COLLIANDER, Chalmers University of Technology, STEFANO MASAGGIA, FEDERICO VETTORE, Zanardi Fonderie S.p.A. — Austempered Ductile Irons (ADIs), combining high strength, good ductility and low density, are candidates to be a suitable alternative to high-strength steels. Nevertheless, the concern about a low ductility under dynamic loads often leads designers to exclude cast irons for structural applications. However, results from dynamic tensile tests contradict this perception showing larger failure strain with respect to quasistatic data. The fracture behaviour of ADIs depends on damage mechanisms occurring in the spheroids of graphite, in the matrix and at their interface, with the matrix (ausferrite) consisting of acicular ferrite in carbon-enriched austenite. Here, a detailed microstructural analysis was performed on the ADI 1050-6 deformed under different conditions of strain rates, temperatures, and states of stress. Beside the smooth specimens used for uniaxial tensile tests, round notched bars to evaluate the ductility reduction with increasing stress triaxiality and tophat geometries to evaluate the propensity to shear localization and the associated microstructural alterations were tested. The aim of the work is to link the mechanical and fracture behavior of ADIs to the load condition through the microstructural modifications that occur for the corresponding deformation path.

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