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Dynamic strength and failure of 430F stainless steel determined by combined experimental-numerical method VITALY PARIS, AMITAY COHEN, ELKANA PORAT, PINHAS FRIDMAN, ZVI HARPENES, ARNON YOSEF-HAI, Nuclear Research Center Negev, DAVID LEVI-HEVRONI, Ben-Gurion University — Dynamic flow stress of metals is well known to depend significantly on the strain rate. Strain to failure behavior of ductile metals can be influenced by both the stress triaxiality and the strain rate. While either compressive or tensile Split Hopkinson Pressure Bar system (SHPB) are commonly used to obtain flow stress and failure data for metals, experimental methodologies to obtain such data under conditions of shear loading are less based. In the present study we have investigated the effect of strain rate on the flow stress and strain to failure of 430F stainless steel at strain rates ranging from 400 to 16000 1/sec using shear disc specimens (SDS) incorporated into standard SHPB system. The SDS sample is a disc having axisymmetric slits on its both flat faces which is sheared during the test by ring and cylinder-shaped adaptors mounted between the bars. The analysis of the data was performed by matching the experimental signals with results of numerical modeling of the tests. The obtained flow stress versus strain rate data were fitted with Cowper-Symonds model. The results indicate strong dependence of flow stress of 430F steel on strain rate in the investigated range of rates. The strain to failure data demonstrates a noticeable decrease with increase of the strain rate.

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