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MATERIAL MODELLING FOR METALS CONSIDERING DYNAMIC PLASTICITY

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Theoretical and experimental work in rate-independent and rate-dependent materials have been extensively discussed. Rate-dependent material behavior of metals and alloys deformed at high rates of strain have been studied. Progress in studying high-speed deformation has been in three main areas.

Firstly, it is important to consider advances in experimental methods, which have permitted the measurement of dynamic material response at both the macroscopic and microscopic level. The available experimental methods for the study of strain-rate effects have already described, and results have given for a variety of metals and alloys tested at strain rates in the previous researches [1, 2]. These results are discussed in terms of some of the more important rate-controlling mechanisms.

Secondly, the development of dislocation theory to provide models of the rate-controlling deformation processes is taken into account. Motion of dislocations causing the flow in the material such as a continuum or as a crystalline solid, results in inelastic deformation phenomenon.

Thirdly, the widening of macroscopic plasticity theory is considered to include rate effects.

The study is focused here on the stress-strain behavior of mild steel at different strain rates. Finite element analysis [3] is utilized for the analysis by adding the user defined codes into FEAP software.

Finally, several important practical problems in order to investigate the rate-dependent mechanical behavior are shown and compared with the current literature.

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