THE ROLE OF HETEROGENEITIES ON STRAIN LOCALIZATION AND FRACTURE IN LARGE-SCALE DYNAMIC SIMULATIONS

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Dynamic simulations often involve a nominally homogeneous material deformation that transitions to heterogeneous deformation and eventually to fragmentation. Mott [1] recognized the importance of a distribution of material imperfections and was successful in predicting fragment size statistics. Including similar distribution concepts in large scale numerical simulations facilitates predictions of patterned strain localization and fracture. The traversal time of the interacting stress relief waves emanating from the localizations sets the length scale. The material imperfections are assumed to have their origin in the microstructure either in the form of local grain orientations or the distribution of second phase particles. Effects of such microstructure features are demonstrated in large scale simulations using a polycrystal plasticity constitutive relation and a simple fracture model. Identifying how local variations in microstructure translate to distribution functions used in the models is a fertile area for future research.

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References

[1] N. F. Mott, "Fragmentation of Shell Cases," *Proc. R. Soc. London*, **189**, 300-308, 1947.

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