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Effects of Defects Distribution on Fragment Size of Dynamic Fragmentation

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Dynamic fragmentation of brittle bar with initial defects is investigated using the numerical method of characteristics with a linear decreasing cohesive law to describe the behaviors of damage and fracture. This approach can conveniently deal with the initiation, opening, fracture and closure of cracks (see Refs. [2][3]).

Fragment size at different strain rate under four modes of defect distribution according to the location and cohesive strength of the defects(fixed location and fixed strength, fixed location and random strength, random location and fixed strength, random location and random strength) is studied. Numerical simulations are conducted for a wide variety range of defect number and different strength of uniform and Weibull distribution. The numerical results indicate that random mode of location and strength has different effects on the curve of average fragment size versus strain rate. These results suggest that the influence of cohesive strength on the fragment size decrease at high strain rate. It is also found that defect number changes the relationship of fragment size and strain rate significantly. The number of fragments is not monotonically varying with number of defects. A transition defect number exists, at which fragment number is minimum. When the number of defects increases we do not find a steady fragment number in the range of our simulations, but differences between several distribution functions of cohesive strength increase with high defect density.

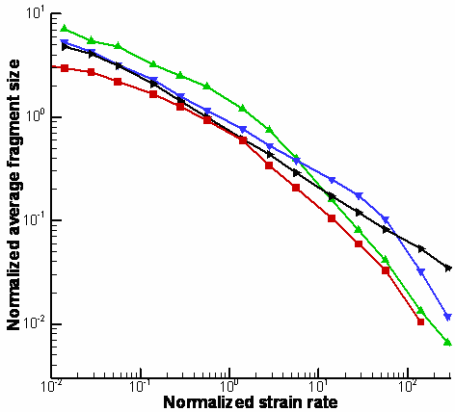

Fig.1 Normalized average fragment size vs. normalized strain rate

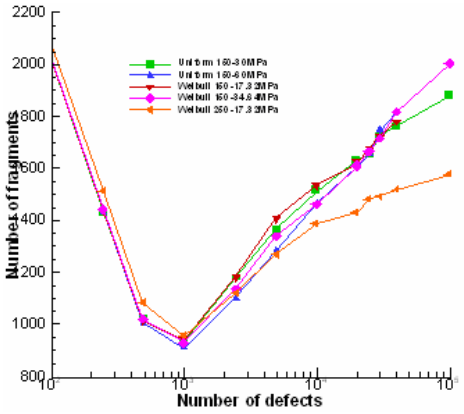

Fig.2 Evolution of the number of fragments with number of defects

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