

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Mechanisms for Fragment Formation in Brittle Solids ARTEM LEVANDOVSKY, ANNA BALAZS, University of Pittsburgh — The fracture process is usually analyzed in terms the fractal dimension of a crack, the crack surface roughness, or fragment size distributions. It is established that relatively simple scaling laws exist for the crack surface roughness in mode I fracture and for the power law distribution for fragment sizes in fracture by impact. These two types of fracture are usually studied separately. Consequently, much less is known about the relationship between crack roughness and fragment size distribution. In this work, we study this relationship by developing a simple model of mode I fracture, which nevertheless produces sufficiently rich behavior in terms of crack roughness and fragment formation. Using this model, we show that different roughness in local regions of the crack path leads to different mechanisms for the subsequent fracture of those regions. We observe two robust power laws for the size distribution of smaller and larger fragments. We connect measurements in fragment size distribution with the local fractal dimension of cracks in the region of fragment formation.

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Date submitted: 25 Nov 2006

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