Referee Report on:

Scaling laws of shrinkage induced fragmentation phenomena

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This paper presents a model for surface cracking based on beams breaking between polygons. The authors determine a phase transition between a damaged and a fragmented surface and determine the critical exponents using finite size scaling. The obtained results are very interesting and the presentation is clear. There are just a few points that should be taken into account before publication.

Since the finite size scaling is performed by changing the system size just by a factor four and the sizes considered are rather small, the data collapse of Figs.7 and 8 is not very powerful. Therefore, I am convinced that the error bars given in Fig.11 for the exponents beta, gamma and nu obtained in Figs.7 and 8 are far too optimistic. The authors should present a more profound error estimation.

The authors claim that the obtained exponents are in the universality class of the 2d Ising model and state “the adhesion strength …. does not affect the universality class of the transition”. But in Fig.11 one can clearly see a strong dependence of gamma and nu on the adhesion strength (if one takes the error bars seriously).

The numerical evidence for the exponents being equal to the ones of the 2d Ising model is very weak, because of the large error bars discussed before, which allows for the numerical exponents to be in fact consistent with several other universality classes. A percolation transition would be expected if the bond breaking would be completely random. The elastic field induces correlations, which when reaching the critical point, become short range. So, percolation exponents seem a reasonable guess. The authors however put forward an argument for the Ising exponents, which is: “The reason of this universality is that cracks always advance through the failure of nearest neighbor cohesive contacts.” This argument is very superficial and applies equally well to percolation, 3 state Potts model, etc. The authors should remove this empty argument and eventually replace it, if they can, by a more convincing argument which should explicitly include the Ising interaction between binary variables.

The authors should define what is a “regularized Voronoi tessellation”.

The authors should add the missing references to the original work in which surface cracking was introduced for the first time as: P. Meakin, Thin Solid Films **151**, 165 (1987) or Colina et al Phys. Rev. B **48**, 3666 (1993).

Typos: loading -> leading, strength -> strengths (2x)