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Leges Motus



Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Montag, **14.07.2014, 12:15 Uhr**, Egerlandstr. 5, Raum 0.044

Propagation of tensile planar cracks in heterogeneous media

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A qualitative view at the problem of crack propagation in a heterogeneous toughness map consists in considering the competition between elasticity and toughness heterogeneities: while material elasticity tries to maintain a straight crack front, local variations of toughness deform it. As a result, the front roughens and the macroscopic effective resistance of the material can be strongly modified. A quantitative approach to this problem is to find the perturbed front geometry that leads to equality between the local stress intensity factor and the local toughness along the crack front. In general, the geometry of the crack is not known a priori and must be determined as part of the solution. For a weakly heterogeneous toughness media, first order perturbation approaches (see e.g. Rice, 1985) are valid so that it becomes possible to derive analytical results on the front geometry at equilibrium (see e.g. Lazarus, 2011). Here, we study the impact of highly heterogeneous toughness fields on tensile crack propagation. First, we study the problem with second-order developments for half-plane crack propagating in some heterogeneous toughness field. Second, we study this problem numerically with take into account arbitrary crack front deformations induced by high toughness contrasts.

References

- [1] J.R. Rice
First-order variation in elastic fields due to variation in location of a planar crack front
ASME J. Appl. Mech., 52: 571-579, 1985
- [2] V. Lazarus
Perturbation approaches of a planar crack in linear elasticfracture mechanics: a review.
J. Mech. Phy. Sol., 59:121-144, 2010

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