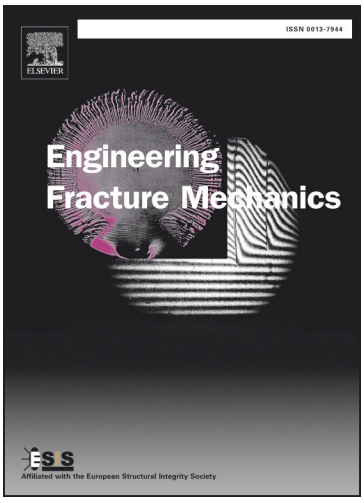

Influence of nanoscale deformation twins near a slant edge crack tip on crack blunting in nanocrystalline metals and ceramics

Tengwu He, Miaolin Feng

PII: S0013-7944(17)30709-9
DOI: http://dx.doi.org/10.1016/j.engfracmech.2017.08.007
Reference: EFM 5641

To appear in: *Engineering Fracture Mechanics*

Received Date: 6 July 2017
Revised Date: 1 August 2017
Accepted Date: 1 August 2017

Please cite this article as: He, T., Feng, M., Influence of nanoscale deformation twins near a slant edge crack tip on crack blunting in nanocrystalline metals and ceramics, *Engineering Fracture Mechanics* (2017), doi: http://dx.doi.org/10.1016/j.engfracmech.2017.08.007

Influence of nanoscale deformation twins near a slant edge crack tip on crack blunting in nanocrystalline metals and ceramics

Tengwu He[a], *Miaolin Feng*[a,*]

[a]*State Key Laboratory of Ocean Engineering, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China*

[*]*Corresponding author: mlfeng@sjtu.edu.cn; Tel: +862134204539; fax: +862134206334*

Abstract A theoretical model is developed that discusses the effect of nanoscale deformation twins on dislocation emission from the tip of slant edge crack in nanocrystalline materials. By combining complex variable method of Muskhelishvili and conformal mapping technique, the explicit solutions of complex potentials are obtained analytically. The critical stress intensity factors (SIFs) for the emission of first lattice edge dislocation from a slant edge crack tip are calculated. The effects of vital parameters such as the crack length, the inclined angle of the crack, the relative thickness of the nanotwin on critical SIFs for dislocation emission are evaluated in detail. The results show that the emission of lattice dislocation from the slant edge crack tip is significantly influenced by nanoscale deformation twinning. The smaller the inclined angle is, the more difficult it is for dislocation emission from the slant edge crack tip. Particularly, the dislocation near the tip of slant edge crack is prone to emit when the inclined angle of the crack is about 45°. As a special case, when the inclined angle α=0, the present results will reduce to those of the problem of nanoscale deformation twins interacting with mode I straight crack.

Keywords Slant edge crack, Deformation twins, Dislocation emission, Conformal mapping, Nanocrystalline materials, Stress intensity factors