Experimental validation of an asymptotic model to predict crack trajectories influenced by voids

Diego Misseroni[1], Alexander Movchan[2], Natasha Movchan[2] and Davide Bigoni[1]
[1]*DICAM, University of Trento, via Mesiano 77, I-38123 Trento, Italy*
E-mail: diego.misseroni@unitn.it, bigoni@ing.unitn.it

[2]*Department of Mathematical Sciences, University of Liverpool, UK*
E-mail: abm@liverpool.ac.uk, nvm@liverpool.ac.uk

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A two-dimensional asymptotic model (both plane stress and plane strain) for the determination of the crack trajectory interacting with elliptical inclusion has been developed in the analytical form by Movchan and his co-workers (see [1], [2], [3]). Their model assumes a semi infinite crack growing quasi statically in an infinite, brittle, isotropic and linear elastic body under pure Mode-I loading (KII=0) and interacting with isolated defects 'far' from the straight trajectory that would be followed by the crack in the absence of disturbances.

Systematic experiments and computational simulations were performed to investigate the validity of the above asymptotic model to predict crack trajectories in brittle materials containing isolated voids. The experiments were performed by the quasi-static loading of v-shaped notched plates of brittle material under Mode-I. We have also identified both large holes and the dynamic regime where fracture surfaces show kinking and roughness as the limitations of the considered models.

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