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# THE EFFECT OF HARDENING MODELS IN STEADY-STATE CRACK GROWTH

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The shielding ratio in crack growth has been studied through decades. In their seminal paper, Tvergaard and Hutchinson [2] considered different cohesive laws under various loading condition, but the effect of the material model that surrounds the cohesive zones is rarely investigated. The present work aims to investigate the influence of the hardening model (isotropic vs. kinematic) on the shielding ratio for a crack growing at steady-state.

To investigate the shielding ratio for a steadily growing crack, a numerical framework has been developed that builds on the spatial integration method first presented by Dean and Hutchinson [1]. Thus, the transient period is avoided and the steady-state solution is directly obtained. Here, the framework is combined with a cohesive zone model (following [2]) to evaluate the energy at the crack tip. To ensure fast and stable convergence the control algorithm exploited in Martínez-Pañeda et al. [3] has been employed.

The study is conducted for a traditional isotropic hardening model, to compare with previously published results, as well as for a kinematic hardening model to investigate the differences. When comparing the shielding ratio from the two models, it is clearly seen that a larger shielding ratio is obtained from the kinematic hardening model. Furthermore, for the kinematic hardening solid, the influence of the hardening is lower than for an isotropic material.

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