Effet d'Échelle dans la rupture quasifragile: étude théorique et simulations MZC

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Résumé :

La loi d'effet d'échelle de Bazant décrivant l'effet de la taille des structures entaillées constituées de matériaux quasifragile (béton, bois) sur leurs contraintes nominales est ici revisitée. Il est montré que l'effet de taille est transitionnel entre 3 régimes asymptotiques déterminés à partir des propriétés énergétiques du matériau et de la géométrie de la structure. L'existence de ces régimes est validée à partir de simulations numériques basées sur le modèle de zone cohésive.

Abstract :

Within the framework of Bažant's theory, the size effect on the ultimate fracture properties of geometrically similar notched structures is studied from an energy based asymptotic analysis in which the Resistance-curve behaviour is considered through an analytic expression. The scaling of the relative crack length at peak load as well as the size effect on the corresponding resistance to crack growth are investigated. If the size effects obtained for small and large sizes are in agreement with SEL's predictions, it is shown that, for intermediate structure sizes, there exists an additional asymptotic regime instead of a simple crossover regime as expected in SEL. The existence of this new asymptotic regime is proved from the results obtained from numerical simulations of geometrically similar notched structures of different sizes using the Cohesive Zone Modelling (CZM).

Mots clefs: R Courbe-R, effet d'échelle, quasi-fragile, modèles cohésives, zone de processus de rupture

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