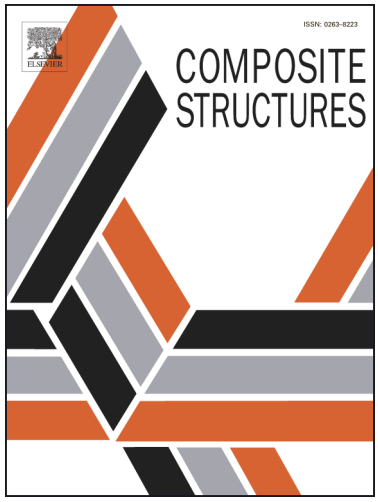

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AN ENHANCED CONTINUUM DAMAGE MECHANICS MODEL FOR CRASH SIMULATION OF COMPOSITES

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ABSTRACT

The ability to accurately predict the crashworthiness performance is crucial to the use of composites in the primary energy absorbing structures in vehicles. Such predictions require material models that consider not only the initial failure but also the responses of severely damaged composites. The latter requirement exceeds the boundary of any existing physics based models. To address this problem, an enhanced continuum damage mechanics (ECDM) model has been developed. ECDM employs two sub-models, i.e. a pre-failure model and a post-failure model, to describe the stress-strain behavior in the pre-peak and post-peak regions. This setup allows one to consider the growth of damage and irreversible strains in the two regions under different evolution laws corresponding to different damage/deformation mechanisms. The ECDM model was evaluated in quasi-static and dynamic tube crash simulations of triaxial braided composites. The results show that the irreversible strains and residual stiffness

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