A rate-dependent constitutive model for PVB in the impact fracture simulation of laminated glass

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Abstract

This paper presents a rate-dependent constitutive model for polyvinyl butyral (PVB) which is an important component of automotive laminated glass. PVB is a rubber-like material whose behavior can be described approximately by using a three-term Mooney-Rivlin model. We develop a modified Mooney-Rivlin model to account for the rate-dependent effects of PVB. The improved model is applied to the cohesive-zone-based fracture simulation of laminated glass. The impact fracture behaviors of a laminated glass beam are simulated. The crack propagation sequence of glass observed in the simulation is found to be in good agreement with the corresponding experimental outcome. In addition, we investigate the influence of the mechanical property of PVB on the crack propagation of glass.

Keywords: Mooney-Rivlin, PVB laminated glass, Impact fracture, Cohesive zone model