

## Experimental and Numerical Investigations of Impact Response on High-Speed Train Windshield

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**Abstract :** Security journey is a vital focus on the field of Rail Transportation. Accidents caused by the damage of the high-speed train windshield have occurred many times and have given rise to terrible consequences. Train windshield consists of tempered glass and polyvinyl butyral (PVB) film. In this work, the quasi-static tests and the split Hopkinson pressure bar (SHPB) tests were carried out first to obtain the mechanical properties and constitutive model for the tempered glass and PVB film. These tests results revealed that stress and Young's modulus of tempered glass were weak-sensitive to strain rate, but stress and Young's modulus of PVB film were strong-sensitive to strain rate. Then impact experiment of the windshield was carried out to investigate dynamic response and failure characteristics of train windshield. In addition, a finite element model based on the combined finite element method was proposed to investigate fracture and fragmentation responses of train windshield under different-velocity impact. The results can be used for further design and optimization of the windshield for high-speed train application.

**Keywords :** constitutive model, impact response, mechanism properties, PVB film, tempered glass

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