Study of the dynamic response of novel laminated glass using transparent glass fiber-reinforced composite interlayer

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Abstract

Laminated glass typically consists of two glass plies bonded together with a transparent polyvinyl butyral (PVB) interlayer. This interlayer is used to absorb energy upon blast/impact and prevent the shattered glass fragments from flying off. This kind of laminated glass is usually heavy and thick. The thickness and weight of the laminated glass can be reduced by replacing the PVB interlayer with a transparent glass fiber-reinforced composite interlayer, because glass fiber-reinforced composites have high strength to weight ratio. In this paper, a novel laminated glass with a transparent glass fiber-reinforced composite interlayer was fabricated. The transparency of the composite interlayer and laminated glass was characterized using ultraviolet-visible spectrometer (UV-Vis spectrometer). The light transmittance of the composite interlayer and laminated glass is above 65% and 60% (estimated, still under test), respectively, when the light wavelength is above 530 nm. To evaluate and improve the blast resistance of the novel laminated glass, model-based simulation is conducted to investigate the dynamic response of the laminated glass subjected to blast loading. The midpoint deflections predicted by the model are in fairly good agreement with the experimental results, which confirms the validity of the established numerical model.