Low-Velocity Impact Cracks in Glass and Laminated Glass Based on Peridynamics

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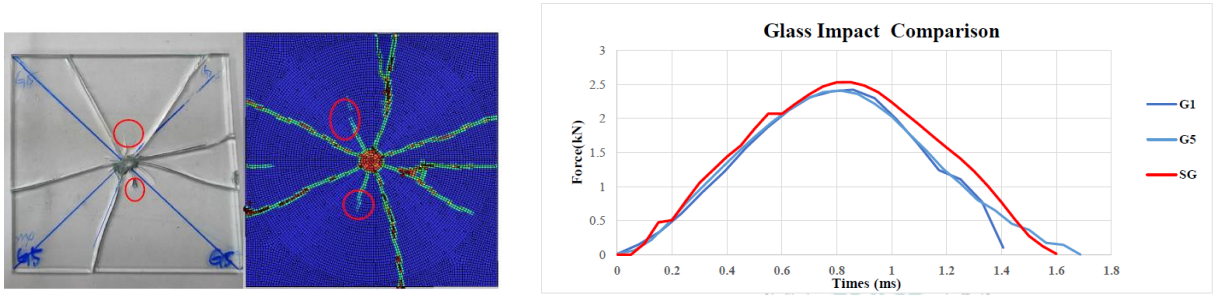
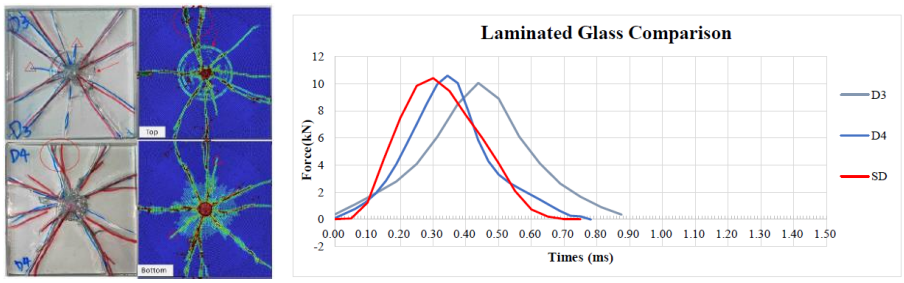
Glass is commonly used in building and daily life. However, due to its brittle property, its use needs carefully considered. To improve this property, safety glass or laminated glass is popular in buildings, vehicle engineering and aviation industry. To safely use these two types of materials, their ability to suffer the impact of foreign object is major tropic. The object of this work to invest the low-velocity impact of these two materials by both experiment and simulation approaches. In the experiment, the free fall of a small object with the mass of 618 g was executed under different heights to create the impact cracks on both the glass and the laminated glass. In the simulation approach, the peridynamic finite element method was selected to create the cracks during the impact. Figure 1(a) compares the fracture pattern of glass under the impact energy of 3 Joures. The measured force with respect time and the simulation result are compared in Fig. 1(b). Under the same impact energy, the crack pattern of the laminated glass is compared in Fig. 2(a), and the comparison between the experiment and the simulation is shown in Fig. 2(b). These comparison indicates the good results from the peridynamic finite element method.



(a) Fracture pattern (b) Force-time curves under impact

Figure 1. Fracture pattern and force-time curve of glass under impact.



(a) Crack pattern (b) Force-time curves under impact

Figure 2. Crack pattern and force-time curve of laminated glass under impact.

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