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Dynamic Analysis and Validation of Crack Propagation in Laminated Glass Using Peridynamics

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Abstract: *Use of glass is increased in almost every part of life. Glass undergoes from the various stages when it gets ready, and analysis of glass is one of the important stages. So in this project focus is concentrated on the analysis of glass by conventional FEA method and modern Peridynamic method.*
Glass is modelled in the Solid-edge Modeling software, then model is imported in the Hypermesh software and meshing is done. Later analysis is done by importing the meshed model in the LS DYNA software. First single layered glass is analyzed by applying the local FEA method (MAT_32 material model), as a result glass shown the deformation of 10mm which is not true. This happened because local FEA method uses differential equations (DE) to solve the model. And DE can be used only when there is continuity in the material. So later new card was introduced in the LS DYNA which replaced DE by Integro-Differential Equations which can be used for the discontinuous material also which has cracks. SECTION_SOLID_PERI control card is used and by this Peridynamics method the deformation observed was 3.8mm.
Later the analysis is extended to laminated glass (LG). The drop test was performed on the glass and results are taken. And with the same boundary conditions as that of experiments the analysis is carried, and the results are compared with experiment results. The kinetic energy, fractured area and the crack propagation matched to experiment one and hence non-local FEA method Peridynamics proves to be the best technique to analyse brittle fracture.

Keywords: Peridynamics, MAT_32, Laminated Glass, Crack Propagation, Horizon

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