GRADUAL FRACTURE OF LAYERS IN LAMINATED GLASS PLATES UNDER LOW-VELOCITY IMPACT

Michal Šejnoha*

České vysoké učení technické v Praze - Fakulta stavební, Thákurova 7, Praha

Abstract

Modeling of gradual fracture of individual layers of a laminated glass produced by successive low velocity impacts is presented. This subject is first examined experimentally focusing on fracture sequence of the laminate composed of three or four glass layers bonded by PVB interlayers. While both laminate geometries, limited to four test samples, show a significant scatter in impact energies and breakage forces causing fracture as well as differences in fracture sequence with increasing impact height, they consistently support ability of partially damaged samples to withstand contact forces exceeding those leading to fracture of the previous glass layer. Also, the four-glass layer laminates seem to provide the post-fracture response consistent with the concept of a sacrificial-glass-ply design. Apart from experimental work the present topic is addressed also computationally. To this end, the results obtained via the LS-DYNA software are compared to those derived using the phase-field damage model. It is illustrated that properly tuned computational model may provide results, which are in accord with experimental observations both in terms of contact forces and the resulting fracture patterns.

* tel. +420 224 354 494, *e-mail*: sejnom@fsv.cvut.cz