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Experimental study on fracture propagation in glass plates by use of high-speed photography and point tracking methods

Daniel López Amenedo[1], Jonas Rudshaug[2], Tore Børvik[3], Odd Sture Hopperstad[4]

[1] Norwegian university of science and technology, Spain. daniel.l.amenedo@ntnu.no
[2] Norwegian University of Science and Technology, Norway. jonas.rudshaug@ntnu.no
[3] Norwegian University of Science and Technology, Norway. tore.borvik@ntnu.no
[4] Norwegian University of Science and Technology, Norway. odd.hopperstad@ntnu.no

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Extended Abstract

Abstract

Glass is a transparent material typically used in buildings and vehicles. In situations where glass is required to carry loads of a structure, fracture poses a safety risk as its linear elastic behaviour is followed by brittle and fast fracture. Fracture initiation is driven by the presence of flaws in the shape of microcracks on the glass surface which makes the fracture mechanism into a stochastic phenomenon. Owing to the stochastic and transient nature of glass fracture, experimental studies have been performed on a variety of specimen types and loading conditions. Typical studies use of high-speed photography to capture crack propagation in specifically designed specimens where the fracture initiation is forced into a predefined point on the specimen's edge. Consequently, they do not fully account for the stochastic nature of glass failure and its potential effect on fracture propagation. To bridge this gap, the present study considers crack propagation on monolithic and laminated glass specimens subjected to out-of-plane quasi-static loading that allows for free fracture initiation and propagation. Crack propagation is captured by high-speed photography and measured with automated point tracking methods which allow the gathering of large quantities of data. The statistical analysis of the measurements indicate that cracks propagation is driven by a front,

which originates at the fracture initiation point and propagates at a constant speed of 1500 m/s regardless of fracture conditions, layer thickness and plate type.

Keywords:

Crack propagation Soda-lime glass Laminated glass Point tracking Ring-on-ring Experimental High-speed photography