

Dynamic crack propagation and crack branching in brittle polymers

Martin Kroon¹

¹ Linnaeus University, Sweden. martin.kroon@lnu.se

Paper ID: 233

[Symposium S8: Fracture, and damage of materials](#)

Abstract

Dynamic crack propagation in polyoxymethylene (POM) plates is investigated. POM is a brittle polymer that is commonly used in consumer goods and other applications. Fracture mechanics testing is carried out, and compact tension (CT) and three-point-bending test specimens are used. A high-speed camera is used to video-record the tests, and estimates of the crack speed can be attained. Crack speeds of about 30-40% of the Rayleigh speed of the material were registered. Crack branching is observed in the CT specimens, and the diverted cracks make an angle of about 40 degrees to the original crack plane. The experimental tests are also simulated using both the standard finite element method as well as the phase field method in order to be able to simulate crack branching. From the finite element analysis, the value of the J-integral at initiation of dynamic crack propagation was estimated to about 3.0kJ/m².

Keywords:

fracture mechanics polyoxymethylene dynamic crack propagation crack branching