
The Single-Edge Precracked Beam (SEPB) method to assess the fracture toughness, the fracture energy and the stress corrosion cracking of glass

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Abstract

We show that the Single-Edge Precracked Beam (SEPB) test is not only suitable to the determination of the fracture toughness (KIc) of glass, but also offers a unique opportunity to assess the slow crack growth behavior in a single experiment lasting for few minutes. Besides, we found that it is possible to get either a stable or an unstable final fracture regime (pre-cracked specimen) depending on the testing parameters, and that the unstable case is preferable for the estimation of KIc . The "pop-in" precrack was found mostly to close completely once the load was suppressed on the bridge-flexure device. This led to a reopening event on the loading curves. It is noteworthy that all these original observations were made possible thanks to the design of very stiff testing apparatus (6.7 MN.m^{-1}) allowing for a cross-head speed as small as $0.01 \mu\text{m.s}^{-1}$. Results obtained on four grades of commercially available glasses are compared to those stemming from Vickers indentation cracking and chevron notched experiments.

Keywords: Fracture toughness, Vickers indentation fracture (VIF), Chevron, Notched Beam (CNB), Single Edge Precracked Beam (SEPB), Stress corrosion

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