Characterization and simulation of fracture in architectured brittle materials

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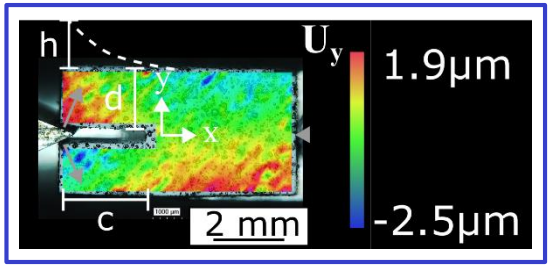

Fig.2: In-situ wedge splitting test with DIC for fracture parameter identification

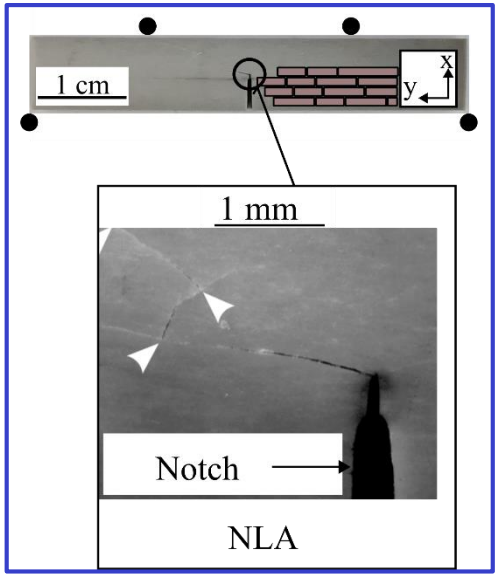

Fig.1: NLA under 4-pts bending showing crack deviation

Nacre-like alumina (NLA) is a composite made of alumina platelets and glass. The arrangement of its microstructure gives to the material an anisotropic fracture behavior due to an important crack deviation by the alumina platelets (see Fig. 1). Initial attempts to characterize NLA fracture were unsuccessful in estimating the material toughness and understanding the effect of the microstructure on the NLA fracture behavior.

Consequently, a numerical-experimental dialog was implemented to overcome these two issues. This dialog is based on finite element calculations on the one hand and *in-situ* measurements (*e.g.*, DIC, Raman spectroscopy, computed tomography, see Fig. 2) on the other hand . The dialog has allowed several new crack initiation resistance mechanisms to be determined and NLA fracture to be fully characterized.

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