

Digital image correlation and Fracture mechanics: Brittle Fracture of Ceramics and Refractories

François HILD

LMT, ENS Paris-Saclay / CNRS / Université Paris-Saclay

Abstract:

One of the key mechanical properties of ceramics and refractories is their toughness. The latter is evaluated via specific (and sometimes standardized) mechanical tests. In many cases, global measurements (e.g., load, displacement crack mouth opening displacement) are used to determine stress intensity factors and energy release rates. The aim of the presentation is to introduce digital image correlation as a generic tool to measure displacement fields. Various examples will illustrate its use for the determination of fracture mechanics parameters for brittle materials.

Suggested reading list:

Forquin et al., A method to determine the macroscopic toughness scatter of brittle materials. *Int J of Fracture*. Vol 125. Num 1-2. Pages 171-187. 2004

Roux et al., Stress intensity factor measurements from digital image correlation : post-processing and integrated approaches. *Int J of Fracture*. Vol 140. Num 1/4. Pages 141-157. 2006

Réthoré et al., Extended digital image correlation with crack shape optimization. *International Journal for Numerical Methods in Engineering*. Vol 73. Num null. Pages 248-272. 2008

Roux et al., Digital image correlation and fracture: an advanced technique for estimating stress intensity factors of 2D and 3D cracks. *Jal of Physics D: Applied Physics*. Vol 42. Num 214004. 2009

Saracura et al., Surface crack network detection on MgO-based refractory castable by digital image correlation. *China's Refractories*. Vol 24. Num 1. Pages 32-37. 2015

Hild et al., Damage Measurements via DIC. *Int J of Fracture*. Vol 191. Num 1-2. Pages 77-105. 2015

Vargas et al., Analysis of Wedge Splitting Test on Refractory Castable via Integrated DIC. *Jal of the European Ceramic Society*. Vol 36. Num 16. Pages 4309-4317. 2016