

## Kolloquium für Mechanik (Präsenz-Veranstaltung)

---

Referent: **Prof. Rafael Estevez**  
Université de Grenoble Alpes, Laboratoire SIMaP, France

Datum: Donnerstag, 11.11.2021  
Zeit: 15:45 Uhr  
Ort: **10.81, HS 62 (R 153) (3G-Regelung, 32 Teilnehmer möglich)**

Titel: **Crossed looks at (brittle) fracture descriptions: gaining insight from models confrontations (Coupled criterion, cohesive zone, phase field) and comparisons with experiments on PMMA**

---

### Abstract

Fracture tests are carried out on a plate containing rhombus or square holes under uniaxial compression or tension, of various geometries. The experiments are characterized by Digital Image Correlation (DIC) and identification of the material strength, toughness or generalized stress intensity factors are presented [1, 2, 3] and then analyzed within a coupled criterion (CC) analysis for the onset of failure from a notch [4]. In a second part, the CC approach is used as numerical experiments and its predictions is shown to provide insight and guidelines for the calibration of cohesive parameters [5]. This provides an alternative or complementary information to other identification protocol based on DIC measurements (for instance in [6]). In a last part, CC predictions are confronted to a phase field model of fracture and the interpretation of the underlying length scale in phase fields models is discussed [7].

What is learned from such “dialectic confrontations” between different descriptions of fracture mechanics and related experiments is then highlighted.

Keywords: DIC, Fracture, Coupled criterion, cohesive model, crack tip fields, inverse problem

### References:

- [1] A Doitrand, R Estevez, D Leguillon, 2019, Experimental characterization and numerical modeling of crack initiation in rhombus hole PMMA specimens under compression, European Journal of Mechanics-A/Solids
- [2] A Doitrand, D Leguillon, R Estevez, 2020, Experimental determination of generalized stress intensity factors from full-field measurements, Engng Fract Mech.

- [3] A Doitrand, P Cornetti, A Sapor, R Estevez, 2021, Experimental and theoretical characterization of mixed mode brittle failure from square holes, Int J Fracture
- [4] D Leguillon, Strength or toughness? A criterion for crack onset at a notch, Eur J Mech Sol, 2002, 21:61-72
- [5] A Doitrand, R Estevez, D Leguillon, Comparison between cohesive zone and coupled criterion modeling of crack initiation in rhombus hole specimens under quasi-static compression Theoretical and Applied Fracture Mechanics 99, 51-59
- [6] J Réthoré, R Estevez, Identification of a cohesive zone model from digital images at the micron-scale, J Mech Phys Sol., 61: 1407-1420
- [7] G Molnár, A Doitrand, R Estevez, A Gravouil, Toughness or strength? Regularization in phase-field fracture explained by the coupled criterion, Theoretical and Applied Fracture Mechanics, 102736

---

Alle Interessenten sind herzlich eingeladen.  
Prof. Dr.-Ing. Thomas Seelig