

## NON-LINEAR CRACK INITIATION AND PROPAGATION

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### ABSTRACT

The XFEM has been widely developed in the framework of linear elastic fracture mechanics. It enables to solve challenging problems such as damage tolerance analysis, it is already implemented in general purpose codes and used in the industry.

The present contribution proposes an adaptation of these techniques to material and geometrical non-linearities as well as crack initiation and monotonic loadings. The objective is clearly to combine Continuum Damage Mechanics and Fracture Mechanics in order to represent a complete behavior from sane material to structural failure. This can be articulated around the following steps:

- local degradation of the material based on damage,
- crack insertion without mesh modification in the critical area,
- load continuation and crack propagation under damage and stress state criteria.

This strategy will be illustrated by multiple examples, on metals (Fig. 1) and composites (Fig. 2).

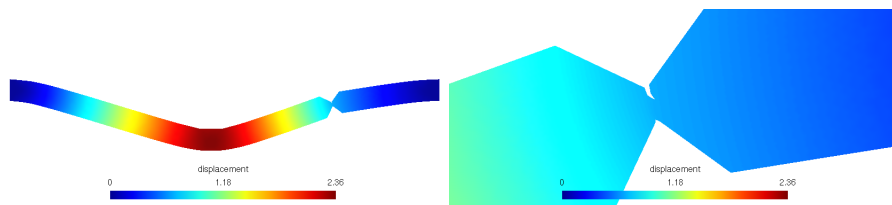


FIGURE 1. Decapping test: displacement, far view (left) and zoom (right)

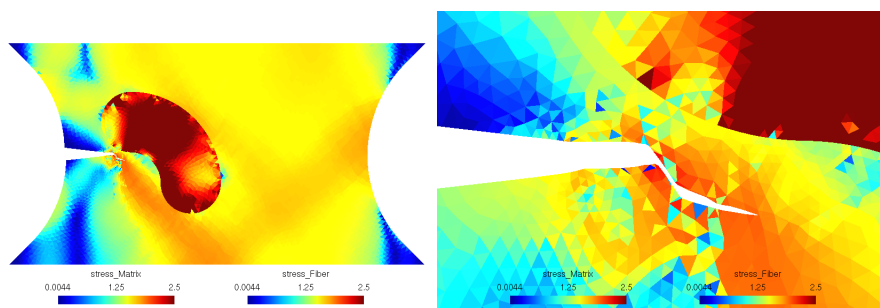


FIGURE 2. Fracture of composite with bean-shaped fiber, far view (left) and zoom (right)