

LAB PRESENTATION

Fracture in brittle heterogeneous materials

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Lab link: <https://compmech.ethz.ch>

- Phase-field simulation of brittle fracture in heterogeneous materials
- Material characterization tests combined with Digital Image Correlation
- Fracture tests combined with Digital Image Correlation

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Fracture in brittle heterogeneous materials

Description: The effect of heterogeneity is crucial for a large class of mechanical problems, e.g. those involving composite materials, biological tissues and metamaterials. The evolution of cracks in these materials follows complex patterns that challenge many modeling and computational approaches. Also, the characterization of heterogeneity and of the resulting mechanical behavior requires accurate experimental procedures.

Scope & Market: With our simulations and experimental tests, we can characterize the role played by heterogeneities on the mechanical behavior of brittle materials. This is important for different engineering applications, ranging from mechanical and aerospace engineering (e.g. composites, 3D-printed materials), to biomechanics (biological tissues, e.g. bones), to civil engineering (e.g. concrete).

Innovation & Benefits: Phase-field simulations can naturally handle arbitrarily complex crack paths, which is especially important for fracture in presence of heterogeneities. Our experimental setups enable us to visualize and characterize the mechanical behavior (including fracture) of heterogeneous materials in great detail, thanks to Digital Image Correlation and to a very stable loading setup.