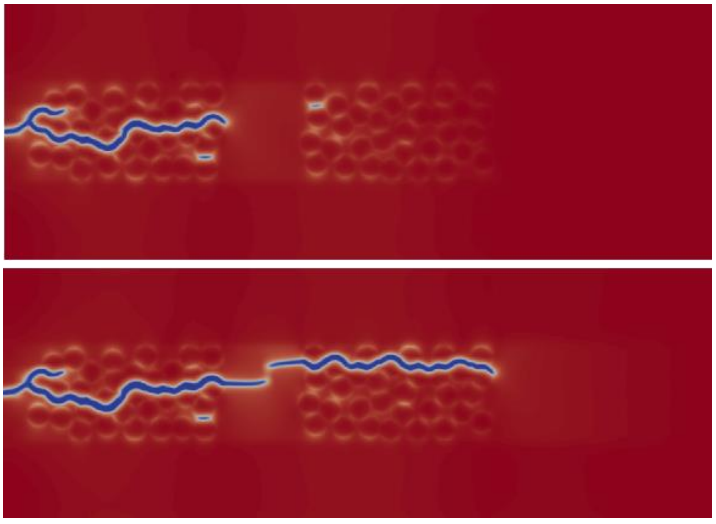
KTH SOLID MECHANICS SEMINAR; Thursday, May 19th, 15.15; KTH Solid Mechanics Seminar room

MARISOL KOSLOWSKI

"Modeling of damage and failure of fiber reinforced polymer composites"

There are several sources of variability in the microstructure of fiber reinforces polymer composites. Some of these microstructural fluctuations are the result of fiber misalignment, variability in fiber diameter, resin rich regions, microcracks, porous, and residual stresses. The analysis of composite laminates is in general performed using homogenized lamina moduli but the onset and evolution of damage is controlled by microstructural defects. Therefore, the use of deterministic approaches with average properties to study failure in these structures results in higher safety factors. The mesoscale behavior of fiber reinforced polymer composite materials is studied with a fracture mechanics approach using a phase-field damage model. The effect of porous and microcracks on failure by shear yielding and crazing in the polymer resin is analyzed and the damage model is calibrated against experiments. Simulations of crack propagation in particle-toughened fiber reinforced composite materials are demonstrated as a valuable tool that can be used to design these structures. The simulations show that the crack path is affected by i) particle/resin and fiber/resin bonding properties ii) particle distribution and iii) particle stiffness. In particular, in systems with high and low stiffness particles, the crack advances towards the ply causing debonding.



Marisol Koslowski's interest is in the area of the development of numerical tools and theories to understand the mechanical behavior of materials. She has made contributions in the area of deformation of metallic and molecular crystalline materials, polymer composites and solid-state transformations. Marisol Koslowski is an associate professor in the School of Mechanical Engineering at Purdue University. Prior to joining Purdue she was a Staff Member and a postdoctoral scholar in the Theoretical Division in Los Alamos National Laboratory. She received her B.S. degree in Physics in 1997 from the University of Buenos Aires, Argentina and her M.S in 1999 and her Ph. D. in Aeronautics in 2003 from the California Institute of Technology.

E-mail: marisol@purdue.edu