

Fractures in Layered Media: Toughness & Roughness

Prof. Laura Pyrak-Nolte, Distinguished Professor of Physics & Astronomy, Purdue University, West Lafayette, Indiana

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Dr. Laura Pyrak-Nolte, Distinguished Professor of Physics & Astronomy, Purdue University, will speak on Thursday, April 15, 2021.

The topic is “Fractures in Layered Media: Toughness & Roughness.”

Abstract

Many geodynamical processes disturb the Earth’s crust and alter the connectivity, permeability and strength of mechanical discontinuities such as micro-cracks, fractures, joints and faults. The key link among fracture properties is the deformed fracture topology that results from the contact of two rough surfaces under stress. A key question is what affects fracture geometry during formation under tensile failure conditions.

In this presentation, we examine the role of depositional layers and mineral fabric orientation on tensile crack formation and geometry using geo-architected samples created through additive manufacturing. The relative orientation between the layering and mineral fabric creates an orthorhombic material and determines whether corrugated surfaces are generated, suppressed or enhanced during fracturing. The generation of corrugated surface roughness leads to anisotropic fracture flow paths. These results suggest that careful examination of in-layer mineral fabric is important during the design of subsurface strategies to maximize production or inhibit flow

Biography

Dr. Laura J. Pyrak-Nolte is a Distinguished Professor of Physics & Astronomy, in the College of Science, at Purdue University. She holds courtesy appointments in the Lyle School of Civil Engineering and in the Department of Earth, Atmospheric and Planetary Sciences, also in the College of Science. Currently she is the President of the International Society for Porous Media, Vice-President for North America for the International Society of Rock Mechanics and Rock Engineering, and Past-President of

the American Rock Mechanics Association. Prof. Pyrak-Nolte is a member of the National Academy of Engineering, a fellow of the American Association for the Advancement of Science, a Fellow of the American Geophysical Union, recipient of the Reginald Fessenden Award from the Society of Exploration Geophysicists, and a Fellow of the American Rock Mechanics Association. Her interests include applied geophysics, experimental and theoretical seismic wave propagation, laboratory rock mechanics, micro-fluidics, particle swarms, and fluid flow through Earth materials.

Acknowledgements and Collaborators

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