



LMS Seminar

25 May 2023 at 2:00 pm - Room Jean Mandel

On the shakedown response of an auxetic structure

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ABSTRACT

Cyclic elastoplastic shakedown is an understudied mechanical behavior whereby limited plastic deformation in the early stages of cycling gives rise to internal residual stresses that arrest the plastic response. As a result, purely elastic behavior is recovered upon further load cycling. This presentation is a study to map out the benefits of alternative resilient plastic design approaches that employ shakedown and that go beyond the traditional yield-limited approaches for metallic structures in a variety of industries. The focus is on auxetic structures that exhibit effective negative Poisson's ratio. This unconventional behavior can improve energy absorption, anchoring capabilities, and failure resistance, including under cyclic loadings. The presentation highlights a case study of the full-field characterization and measurement of shakedown for an auxetic structure.

BIOGRAPHY

Professor Vermaak earned her doctorate in Materials (2010) from the University of California Santa Barbara with Professor Anthony G. Evans. Before joining Lehigh University in 2013 as an Assistant Professor, she served as a postdoctoral scholar at the Institut National Polytechnique in Grenoble, France. Her research interests include multifunctional architected materials and structures; application of mathematical optimization techniques for the design of material composition, microstructure and structural topology; modeling thermostructural and materials degradation and durability; design and optimization of bio-inspired actuators and sensors; ultra-light weight aerospace structures; thermoacoustics; and integrated computational materials engineering.