



**POLITECNICO
DI TORINO**



Dipartimento di
Scienze Matematiche
G. L. Lagrange

ECCELLENZA 2018 • 2022

**Online
seminar**

Monday **April 26, 2021** at 16:30

Hosted on: **Zoom**

Shawn A. CHESTER

New Jersey Institute of Technology

Mechanics of Polymeric Gels

Prof. Grillo introduces the seminar.

Abstract

This talk discusses recent and ongoing research on the multiphysics response of polymeric gels. A polymeric gel is a polymeric material swollen by a fluid, and the intake or outflow causes large deformations. Also, many gels respond to environmental stimuli such as temperature, electric and magnetic fields, pH, and more. The responsiveness of polymeric gels to environmental stimuli has been widely employed in soft robotics, and the potential applications of soft robots are vast. The fast emerging development of gel-based soft robots makes understanding the mechanics of this class of material an important task for simulating their operation.

The talk begins with recent experimental observations on the mechanical behaviour of polymeric gels. Then a continuum level model for the coupled deformation-diffusion response of gels that incorporates anisotropy and inelasticity is summarized. That is followed by model calibration and attempts for validation on relatively simple gels. Numerical simulations are performed to show the behaviour of the model, and qualitative comparison are made to experiments of a soft robotic gripper. Results show that the behaviour of polymeric gels is even more dependent of fluid uptake than previously thought.

Biography

Shawn Chester is currently an Associate Professor in Mechanical Engineering at the New Jersey Institute of Technology. Shawn was previously a postdoctoral researcher at Lawrence Livermore National Laboratory. Prior to that he obtained his PhD in solid mechanics from the Mechanical Engineering at MIT, and obtained both his BS and MS in Mechanical Engineering from NJIT.

Shawn's research focus in the past few years has been the development of experimentally validated continuum level constitutive theories for large-scale deformation multiphysics behaviour of polymeric materials and the associated numerical implementation. His work spans most aspects of mechanics; experimental characterization, theoretical modeling, numerical implementation, and experimental validation. Shawn has been recognized by young investigator awards through an NSF CAREER, and ASME award.