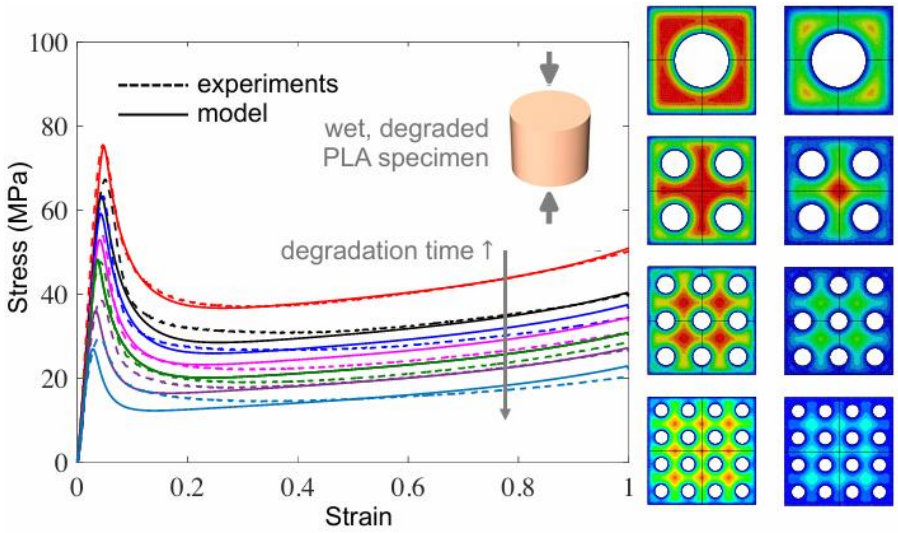
KTH SOLID MECHANICS KEYNOTE SEMINAR; Thursday, February 12th, 16.15; https://kth-se.zoom.us/j/69297748947

Laurence Brassart

"Chemo-mechanics of biodegradable polymers"

Biodegradable polymers are materials designed to degrade and ultimately disappear after completing their structural function. They are increasingly developed for engineering and biomedical applications, where simultaneous control over mechanical performance and degradation behaviour is critical. Many biodegradable polymers primarily degrade via hydrolysis, in which water molecules react with susceptible backbone bonds (e.g. esters), leading to chain scission. Chain scission in turn impacts the thermo-mechanical properties and causes mass loss. Conversely, mechanical stress can also impact the degradation kinetics.

In this talk, I will describe our recent efforts to investigate the coupled chemo-mechanical behaviour of degradable polymers in aqueous environments. I will present experimental results for poly(lactic acid) (PLA) and poly(caprolactone (PCL) degrading with and without applied mechanical loads, which demonstrate the influence of applied forces on degradation kinetics. I will then introduce a constitutive modelling framework for hydrolytic degradation coupled with viscoplastic deformation of glassy polymers. Finally, I will discuss our work on the constitutive modelling of degradable rubbery networks, such as biodegradable hydrogels, with an emphasis on the role of network topology in governing the evolution of mechanical properties and degradation behaviour.



Laurence Brassart is an Associate Professor in the Department of Engineering Science at the University of Oxford. She received her PhD in Engineering Sciences from the University of Louvain in 2011. She then successively held postdoctoral positions at Harvard University and the University of Louvain. From 2015 to 2019, she was a Senior Lecturer in the Department of Materials Science and Engineering at Monash University, Australia. She is the recipient of an EPSRC New Investigator Award (2021) and a UKRI Future Leaders Fellowship (2022). Her research focuses on the development of micromechanical and constitutive modelling approaches for engineering materials, including polymers, composites, soft materials, and energy materials, with emphasis on multiscale and multiphysics aspects.