

Shape instabilities, growth and morphogenesis in nematic polymer networks

Silvia Paparini¹, Giulio Giuseppe Giusteri², L. Angela Mihai³

¹ Università degli Studi di Padova, Italy. silvia.paparini@unipd.it

² Università degli Studi di Padova, Italy. giulio.giusteri@unipd.it

³ Cardiff University, United Kingdom. MihaiLA@cardiff.ac.uk

Paper ID: 345

[Symposium S7: Mechanics of soft materials and structures](#)

Abstract

Nematic polymer networks are stimuli-responsive materials formed from polymeric chains cross-linked with rod-like mesogenic segments, which, in the nematic phase, align along a non-polar director. The nematic interaction competes with polymer elasticity possibly leading to the loss of stability of local minima of the elastic energy. We investigate this phenomenon for situations in which the director field displays different topological defects and find that the shape of unstable perturbations closely resembles experimental observations. Moreover, it has been experimentally observed that nematic phases can appear in cellular aggregates to guide growth and morphogenesis. We thus present a model to describe the growth of nematic polymer networks and investigate how nematic stresses can drive the evolving shape of the material.

Keywords:

Nematic polymer network Topological defects Shape change