Variational models of material instabilities in nematic elastomers

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Nematic elastomers are polymeric materials which combine the elastic properties of rubbers with the optical properties of nematic liquid crystals. Their mechanical behavior is extremely rich, as a consequence of the symmetry–breaking phase transition which transforms the isotropic, high temperature phase into a uniaxial nematic phase. Typical equilibrium configurations exhibit fine–scale oscillations of the state variables. The free–energy density that has been proposed to model their behavior is not quasiconvex.

In this talk, recent results on the mathematical modelling of the soft elastic response of nematic elastomers will be reviewed, including the explicit evaluation of the quasiconvex envelope of the free–energy density (joint work with G. Dolzmann), and numerical simulations based on such envelope (joint work with S. Conti and G. Dolzmann)

Presented by A. De Simone