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MAGNETOMECHANICAL DEFORMATIONS AND INSTABILITIES IN SOFT MAGNETOACTIVE MATERIALS

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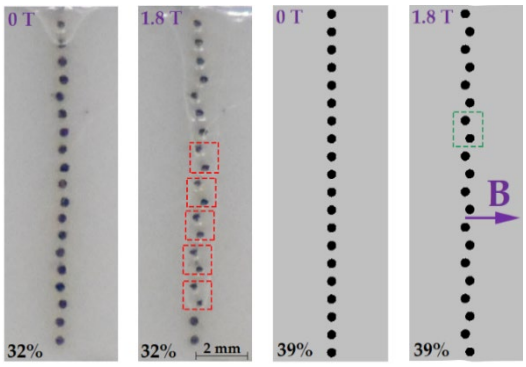
We study the behavior of magnetoactive elastomers (MAE) undergoing large deformations while exited by magnetic fields. We analyze the role of the microstructures in the overall performance and stability of the soft active composites. We examine the coupled behavior of the active composites with (i) periodically and (ii) randomly distributed active particles embedded in a soft matrix [1], and (iii) periodic laminate composites and anisotropically structured composites with chain-like structures [2-4]. We identify the key parameters governing the magneto-mechanical couplings. Moreover, we find advantageous microstructures that significantly enhance the coupling and actuation of the active materials [1]. Furthermore, we show that even very similar microstructures, such as periodic composites with hexagonal and rectangular representative volume elements, exhibit very different behavior in terms of their actuation and effective properties [1]. Next, we investigate the coupled magneto-elastic instabilities MAE. These instabilities may occur at different length scales [3, 5], and, potentially, they may be exploited to achieve new functionalities such as tunable band-gaps [6].



We explore the role of external magnetic fields, microstructure parameters, and consentient properties on the multiscale instabilities.

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