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EuroTechTalk #3

» Magneto-active soft materials and structures «

In this joint seminar, we will present the complementary expertise and recent research of our two groups at Ecole Polytechnique (France) and EPFL (Switzerland) on magnetorheological elastomers (MREs); a novel class of active materials capable of exhibiting a coupled response under external magnetic and/or mechanical stimuli. These solids are composites comprising magnetic micron-sized particles embedded randomly in a polymer matrix. MREs can be categorized into soft- and hard-MREs. Soft-MREs are typically made of carbonyl-iron particles and tend to exhibit no magnetic dissipation, while they lose their magnetization when the magnetic field is switched off. Hard-MREs, which are made of permanently magnetizable particles (e.g., NdFeB), are dissipative magnetically and retain a remanent magnetization in the ground state; i.e., they are compliant permanent magnets. In this talk, we will focus on the fabrication, experiments, and modeling of MREs, especially in leveraging their instabilities for function, to deliver configurational and geometrical changes with minimal external magnetic fields. Examples of novel applications related to biomedical devices and soft robots will be discussed.

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