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**Electromechanical instability in soft materials: Theory, experiments and applications**

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Subject to a voltage, a membrane of a dielectric elastomer reduces thickness and expands area, possibly straining over 100%. The phenomenon is being developed as transducers for broad applications, including soft robots, adaptive optics, Braille displays, and electric generators. The behavior of dielectric elastomers is closely tied to electromechanical instability. This instability may limit the performance of devices, and may also be used to achieve giant actuation strains. This talk reviews the theory of dielectric elastomers, coupling large deformation and electric potential. The theory is developed within the framework of continuum mechanics and thermodynamics. The theory attempts to answer commonly asked questions. How do mechanics and electrostatics work together to generate large deformation? How efficiently can a material convert energy from one form to another? How do molecular processes affect macroscopic behavior? The theory is used to describe electromechanical instability, and is related to recent experiments.