

Modelling viscoelastic dielectric elastomers

†*Choon Chiang Foo¹, Zhi-qian Zhang¹

¹Institute of High Performance Computing, A*STAR, 1 Fusionopolis Way, #16-16 Connexis
138632, Singapore.

*Presenting author: foocc@ihpc.a-star.edu.sg

†Corresponding author: foocc@ihpc.a-star.edu.sg

Abstract

Subject to a voltage, a dielectric elastomer membrane reduces thickness and expands in area, possibly straining over 100%. Such a phenomenon is being used to develop transducers for a wide range of applications, including soft robots, Braille displays, and power generators. To perform as a transducer, the dielectric elastomer is often subject to transient, time-dependent forces and voltages. In particular, experiments have shown that viscoelasticity may adversely affect the performance of a transducer and limit its application. In this talk, we present our modelling capability for viscoelastic dielectric elastomers. We describe a computational method implemented using a commercial finite element code, and show simulations related to recent experiments.

Keywords: dielectric elastomer, viscoelasticity, electromechanical coupling, finite element method