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**Voltage Induced Buckling Instability, a Means for Advanced Functionality within Soft Materials** BEHROUZ TAVAKOL, SARAH E. BEAUCHAMP, ASCHVIN CHAWAN, Virginia Tech, DOUGLAS P. HOLMES, Boston University — Instabilities within structures composed of soft materials may provide advanced functionality. We use the buckling of thin dielectric plates for pumping fluids and controlling the flow rate within microchannels. When exposed to an electric field, a confined dielectric plate buckles out of the plane, and this buckling can stop or enhance the flow rate of surrounding media. Compliant or grease electrodes have conventionally been used to aid in voltage application to both sides of the dielectric film. Here we introduce fluid electrodes, which make this mechanism embeddable into micro devices, enable the buckling at lower voltages, and significantly enhance the rate of deformation. We show that this mechanism can function as a microvalve to control the flow rate, or as a micropump to enhance the flow rate. We also examine buckled shapes of the dielectric film using a scaled-up version with fluid electrodes. These reversible, voltage-induced buckling instabilities can potentially be used in variety of different applications to control or enhance fluid flow in micro devices.

Behrouz Tavakol
Virginia Tech

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