

Instability-driven soft robots

Fluidic soft actuators are enlarging the robotics toolbox by providing flexible elements that can display highly complex deformations. Although these actuators are adaptable and inherently safe, their actuation speed is typically slow because the influx of fluid is limited by viscous forces. To overcome this limitation and realize soft actuators capable of rapid movements, we focus on spherical caps that exhibit isochoric snapping when pressurized under volume-controlled conditions. First, we note that this snap-through instability leads to both a sudden release of energy and a fast cap displacement. Inspired by these findings, we investigate the response of actuators that comprise such spherical caps as building blocks and observe the same isochoric snapping mechanism upon inflation. Last, we demonstrate that this instability can be exploited to make these actuators jump even when inflated at a slow rate. Our study provides the foundation for the design of an emerging class of fluidic soft devices that can convert a slow input signal into a fast output deformation