A compact and fast responding thermofluidic actuator for soft robotic application

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ABSTRACT

Soft actuators that can produce large motion in limited time is mainly based on fluidic system consists of bulky and heavy components like motor, compressor, many tubes, valves, and electronic flow control units. Here, we propose a fast responding large-amplitude soft bending actuator based on a liquid-gas phase transition, for a lightweight and compact system. Without any motor, the actuation pressure is generated solely by the electrically induced phase transition of a fluid in a cavity. We discuss the major design variables to improve the performance and propose a new design for the electrodes. Our bending actuator produces large motion in less than 10 seconds using a low voltage source (less than 50V), which is much faster than some previously reported soft actuator based on similar technology. This design strategy could be used for numerous soft robotic application such a gripping, walking or climbing.

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