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Eccentric actuator driven by stacked electrohydrodynamic pumps

Key words:

Stacked electrohydrodynamic pumps; electrodes; HFE 7300; eccentric actuators.

Introduction

- In the last decades, many fluidic actuators have been developed for numerous applications, e.g., artificial muscles, soft spatial finger, soft robots and compliant gripper.

- Much effort has been devoted to realizing a simple fabrication process and easy operation for fluidic actuators.

- We propose a stacked EHD pump with a simple pattern of copper electrodes. The EHD pump is bendable and twistable because of the flexible materials of its cover and base

Design, liquid, and manufacture

- Hydrofluoroethers (HFEs) (HFE 7300) are often used as the medium for EHD pumps.
- The pump is using a digital manufacturing process.
- The tube is using replica molding process.

Results

- The maximum values of pressure and flow rate of a single layer of EHD pump were 3.2 kPa and 24.09 mL/min, respectively.
- The generated pressure and flow rates of the stacked pump achieved maximum values of 15.8 kPa and 37.02 mL/min, respectively.
- We employed stacked EHD pumps as eccentric actuators, and realized a bending angle of 240° in a short time of 8 s and a rapid return to the original position in 3 s.