

Topic Areas:	Experiments, Soft robotics, Actuation
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Prior Knowledge:	Engineering Mechanics

Artificial muscles based on electrostatic zipping represent a promising development in the fields of soft robotics and actuator technology (Fig. 1A). In this principle, an applied electrical voltage creates an electrostatic attraction between two electrodes, leading to a progressive, zipper-like contraction of the structure—known as "zipping" (Fig. 1B). This mechanism enables controlled, flexible movement with high efficiency and low energy consumption, making it particularly attractive for applications such as medical technology and biomimetic systems.

Kirigami is a Japanese paper art in which artistic patterns or shapes are created from a single sheet of paper through folding and cutting (Fig. 1C). Unlike origami, which involves only folding, kirigami allows strategic cutting to create complex designs. In this joint project between the University of Stuttgart and TU Dresden, a new design for an electrostatic muscle based on

kirigami patterns will be developed. To this end, we are advertising a student research position at each institution.

The goal of this Master's thesis is to identify suitable kirigami designs for electrostatic muscles and to characterize them experimentally. Specifically, the work consists of the following tasks:

1. Literature review to collect various kirigami designs.
2. Development of a manufacturing method for kirigami designs integrated with electrodes.
3. Fabrication of kirigami-based actuators.
4. Experimental characterization of the force-displacement curves of the kirigami-based actuators.

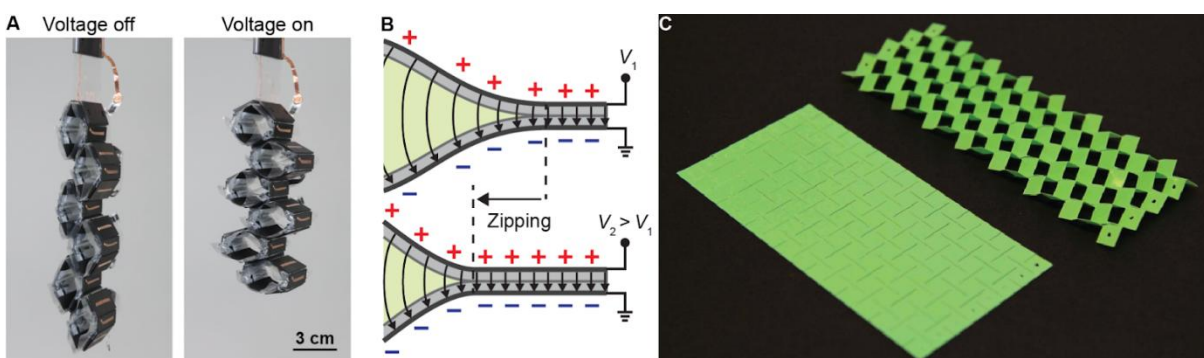


Figure 1. A) Electrostatic artificial muscle based on electrostatic zipping. B) Details of the electrostatic zipping process. C) Example of a kirigami design.