

Chemitecture
Imparting new functions in digitalized polymers by bridging CHEMIstry with macroscopic archiTECTURE

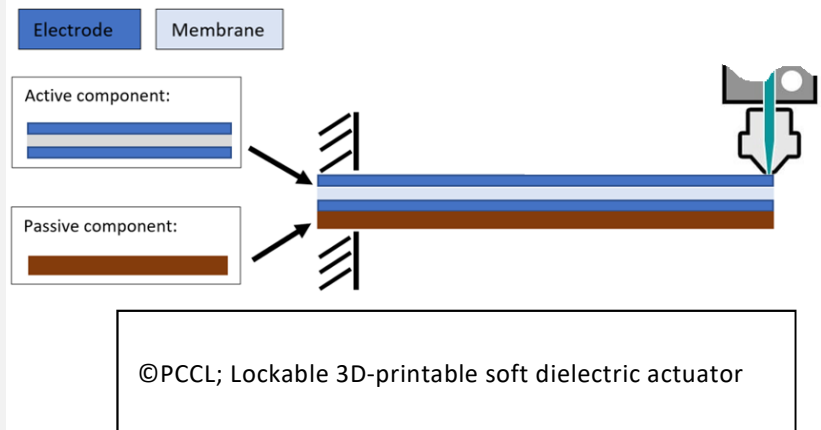
Programme: COMET – Competence Centers for Excellent Technologies

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Chemitecture
 Digital materials for a personalized world

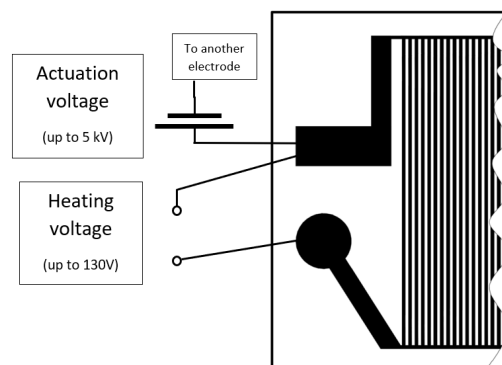


LOCKABLE 3D-PRINTABLE SOFT DIELECTRIC ACTUATOR

A NEW LOCKABLE BIMORPH SOFT DIELECTRIC ACTUATOR HAS BEEN DEVELOPED. ITS DESIGN ENABLES THE MANUFACTURING VIA 3D-PRINTING TECHNIQUES.

Traditional actuators are in many cases too rough for handling sensitive parts, due to their rigidity and incapability for shape adjustment. In contrast, soft actuators are highly adaptable and multi-functional active devices, which are safe to use in interaction with humans.

Within the COMET Module Project Chemitecture, we have further advanced the so-called soft dielectric actuator (DEA) principle. In this next generation of soft active devices, we fully printed DEAs by applying standard fused filament fabrication (FFF) machines. Both the dielectric membrane and the electrically conductive part can be printed, which is a significant progress, since it makes DEAs easily available and allows for a higher degree of freedom in design.



©PCCL; The electrical conductor that is used as a heater and high voltage electrode at the same time.

Although first prototypes were manufactured with a commercially available FFF 3D-printer, the acquired

SUCCESS STORY

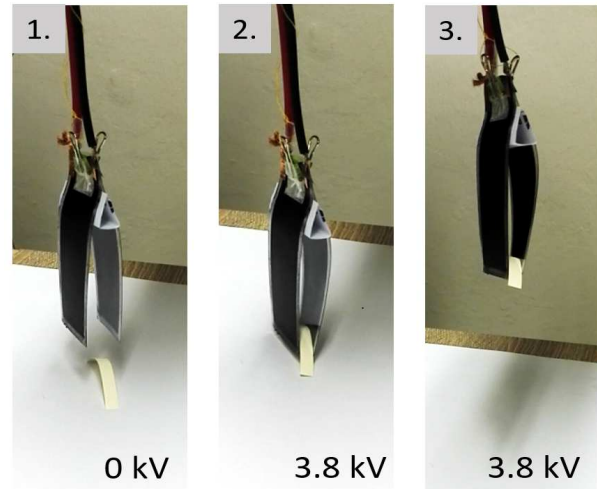
design concepts can be used for various 3D-printing processes with multi-material printing capability.

Our in-house designed DEAs additionally have a locking/unlocking function, implemented through the rigidity switching concept. The rigidity switching is realized through thermal activation with an implemented heating element. Its electric conductors are also used at the same time as one of the high voltage electrodes, which represents a versatile way to control the movement of the personalized DEAs.

Impact and effects

With the new lockable 3D-printed soft dielectric actuator, we are decreasing the usage of energy and significantly expand its application fields. Previous versions of DEAs needed to be actuated the whole time with high voltage, in order to remain in the desired position. Unlike this, the Chemitecture actuator can be locked in any position. This allows for our actuators to remain in the desired position for an extended time and makes them interesting for various future applications such as shape morphing structures. Here, a component has different (long

lasting) shapes, which can be transformed into each other via a set of actuators.



©PCCL; 3D printed soft dielectric gripper that is based on the developed lockable 3D-printable soft dielectric actuator. 1 – 3: steps of taking and pulling up of an object.

A patent for the designed soft dielectric actuator is pending (reference number: A 50790/2021). Moreover, a paper is planned to be submitted to a peer-reviewed journal in 2022.

Project coordination (Story)

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