FLEXIBLE ELECTRONICS

Unfolding electrodes for retinal implants

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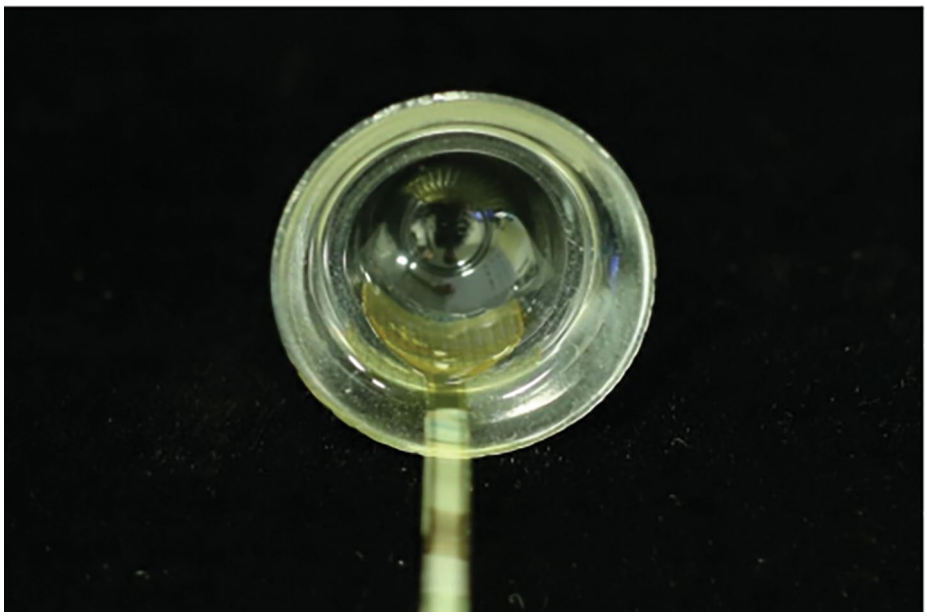

Credit: Wiley

Flexible microelectrode arrays that can be implanted into living tissues have already been used in various medical and therapeutic applications, including in retinal implants that can restore the vision of people with retinal degenerative diseases. Such implants would benefit from having a larger area (increasing the field of view) and having a higher density of electrodes (increasing the resolution), but this also increases their surgical invasiveness. Tianzhun Wu, Xuemin Du and colleagues have now developed flexible microelectrode arrays with a programmable shape memory, which allows the arrays to temporarily take a smaller shape and then controllably unfold post-implantation.

The researchers — who are based at Shenzhen Institutes of Advanced Technology — attach flexible microelectrode arrays, which are made of a polyimide layer containing titanium–platinum microelectrodes, to a shape-memory polymer. Below a transition temperature that was set at human body temperature, the device curls into a tube for implantation. It can then potentially be implanted into the eye through a small incision, before self-unfolding into its functional shape and adhering to the retina.

Wu, Du and colleagues tested the effects of deformation cycles on the electrode performance, and showed that a 126-channel flexible microelectrode array could be attached onto an eyeball template with a flat area of 10×10 mm^2 when unfolded, a fourfold increase over existing demonstrated retinal implants, but with a tube diameter of less than 2 mm. The increase in area of stimulation of the retina would result in an increased visual field.

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