'Smart glass' micro-iris for smartphone cameras

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A small, low-powered camera component made from a "smart glass" material has been created by a group of researchers in Germany with the hope of inspiring the next generation of smartphone cameras.

The micro-iris is an electro-chemical equivalent to the bulky, mechanical blades that are usually found in cameras and has very low power consumption, making it an ideal component for a wide-range of camera-integrated consumer devices.

The device and the first results of its performance have been presented in a study published today, June 19, in the *Journal of Optics*.

In the human eye, the iris controls the diameter of the pupil and subsequently the amount of light that reaches the retina. The purpose of an iris, or aperture stop, in a camera is exactly the same; it controls the amount of light that reaches a camera's sensors, which affects the overall focus of the image.

Traditionally, cameras have contained a set of overlapping blades that are mechanically moved to change the size of the hole—or aperture—through which light enters. However, with the rising popularity of small, compact and lightweight consumer devices that are integrated with cameras, it has been almost impossible to miniaturise these mechanical systems.

The researchers, from the University of Kaiserslautern, have proposed

an alternative method using an electrochromic material. This material, which is often referred to as "smart glass", transforms from a transparent material into an opaque material when a small electrical voltage is applied to it.

In their study, the researchers fabricated a micro-iris using two glass substrates sandwiched together, and with each one carrying a thin film of electrochromic material, called PEDOT, on an underlying transparent electrode.

The micro-iris was 55 μm thick and could be switched into an opaque state using a current of 20 μA with a voltage of 1.5 V.

The micro-iris exhibited a memory effect and did not require a continuous current to maintain the opaque state, so its power consumption remained very small.

In addition to testing the intensity of light that passed through the micro-iris, as well as the amount of time it took to switch between different states, the researchers also examined the depth of focus that the micro-iris was able to impart in comparison to a traditional blade-based iris.

Lead author of the research Tobias Deutschmann said: "There is currently no technological solution available that meets all the demands of integrated iris apertures in smartphones.

"Many of the proposed devices require the motion of a strong absorbing material to block the path of light. Electrochromic materials, as used in this study, remain stationary whilst they change their absorption, so there is no need for any actuation. This allows for much smaller casings to fit around the devices and thus enables the integration into tiny camera systems.

"We will now further investigate the potential of optimized electrochromic materials, with a particular focus on improving the optical contrast and, in particular, the control of the depth of focus—this is the decisive hardware parameter which determines the success of next-generation models in the smart phone business."

More information: 'Integrated electrochromic iris device for low power and space-limited applications' DOI: 10.1088/2040-8978/16/7/075301. iopscience.iop.org/2040-8986/16/7/075301/article

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