More Flexible Microlens Assembly

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Technology description

'Variable-focus' lenses are lenses that have adjustable focal lengths. Liquid-based, miniaturized lenses of this type are useful in photonics, display systems and biomedical tools. However, they are limited to flat surfaces.

For example, electrowetting microlenses typically are fabricated on glass, silicon or other flat rigid substrates. These lenses are extremely promising because they are filled with fluid and can be tuned via an electric field that alters surface tension. Making them more flexible could transform optical technologies from cell phone cameras to medical probes. UW–Madison researchers have developed an electrowetting liquid lens assembly that can be wrapped onto a curved surface.

The lens is made of two immiscible fluids, such as water and silicone oil, and is contained within a chamber. This chamber sits on a flexible polymer base that takes stress off the lens and allows it to be mounted onto a non-flat surface.

Voltage can be applied to electrodes set within the chamber. This causes the curvature of the water-oil interface to change, thereby adjusting focal length.
The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing variable-focus liquid lenses that can be mounted on a curved surface.

Additional Information

Li C. and Jiang H. 2012. Electrowetting-Driven Variable-Focus Microlens on Flexible Surfaces. Applied Physics Letters. 100, 231105.
Li C. and Jiang H. 2012. Electrowetting-Driven Variable-Focus Microlens on Flexible Surfaces. Applied Physics Letters. 100, 231105.

For more information about microlenses that use hydrogels to adjust focal length, see WARF reference number P05131US.
http://www.warf.org/technologies/summary/P05131US.cmsx

Application area

Small lenses and microlenses for optical analysis
Cell phone cameras

Advantages

Allows flat components to be wrapped and curved
Enables greater field-of-view
Focal adjustment is fast and takes very little space
Compact and easily fabricated

Institution

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