Polymers show promise for lab-on-a-chip technology

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Researchers are touting the use of liquid crystalline polymers (LCP) as a viable tool for use in devices such as the sought-after lab-on-a-chip technology.

University of Alberta researchers, collaborating with colleagues at the Eindhoven University of Technology and Phillips Research Laboratories in the Netherlands, have shown that LCP, when formed into a thin film on a glass backing, can be fabricated and patterned on a microscale. The research was published recently in the *Journal of Material Chemistry*.

"Based on our research of liquid crystalline polymers, we anticipate the emergence of exciting new techniques in microfabrication that can be used to cheaply and efficiently pattern response materials," said Anastasia Elias, a PhD student in Dr. Michael Brett's group in the U of A Department of Electrical and Computer Engineering and the first author of the paper.

LCPs are often described as "artificial muscles" that can convert thermal, chemical and electromagnetic stimuli into mechanical energy, Elias said. LCPs are polymers made from liquid crystalline molecules, which are well-known for their use in display applications, such as laptop computer screens, where they are used for their unique optical properties.

Elias and her colleagues conducted a number of preliminary LCP experiments on a microscale in order to better understand and describe the material's mechanical properties. They believe the material holds promise as a microscale building block. It's now up to other engineers and scientist to take this knowledge and create useful microscale devices.

The most commonly cited goal among micro- and nanoscale researchers is to create a lab-on-a-chip – a tiny system that could be used, for example, to analyze blood samples and biopsies much faster, cheaper and more comprehensively than current methods.

In the past, most microscale research and development funds have targeted silicon, the fundamental material in the semiconductor industry. But LCPs are less brittle and more pliable than silicon, Elias said, adding that LCP devices could be tailored to respond to specific external stimuli, such as temperature changes and UV radiation exposure, which could makes them easier to activate than silicon. And, perhaps most importantly of all, LCPs are less expensive than silicon and potentially easier to process, Elias said.

"Ultimately, we believe liquid crystalline polymers will be fully integrated in microelectromechanical systems, such as the emerging lab-on-a-chip applications," she said.

Source: University of Alberta

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