Eyeglasses that turn into sunglasses—at your command

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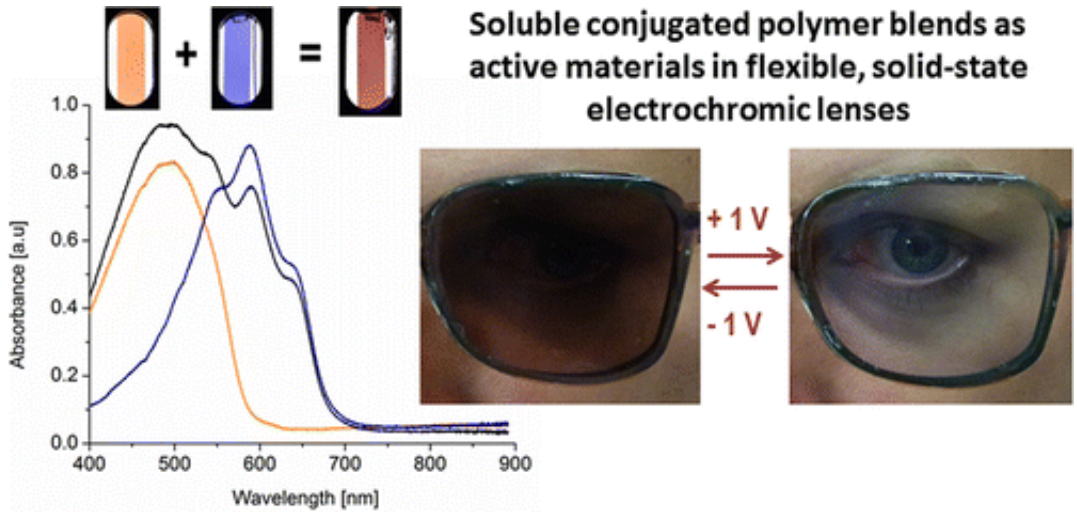

Imagine eyeglasses that can go quickly from clear to shaded and back again when you want them to, rather than passively in response to changes in light. Scientists report a major step toward that goal, which could benefit pilots, security guards and others who need such control, in the journal *ACS Applied Materials & Interfaces*.

In the study, led by Anna Österholm in John Reynolds' group at the Georgia Institute of Technology, the researchers point out that most transitional lenses now on the market don't meet many users' needs. When wearers are driving or wearing a baseball cap, for example, the

lenses stay clear rather than switching to a darker shade even in broad daylight. Also, the majority of available versions don't block out the harshest light, such as bright light reflected off snow. And the change from colored to clear can take several minutes, which has safety implications for certain users including airline pilots. Reynolds' team wanted to find a way to solve these issues.

The researchers designed a new kind of lens that can switch within seconds from clear to darkly shaded and back again in response to a small electrical charge that a wearer could control. They can also fine-tune the color of the lenses to match the full range of hues used in commercial sunglasses. To make the lenses, they say they used a method that could be easily scaled up for manufacturing.

More information: Four Shades of Brown: Tuning of Electrochromic Polymer Blends Toward High-Contrast Eyewear , *ACS Appl. Mater. Interfaces*, 2015, 7 (3), pp 1413–1421
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Abstract
We report a straightforward strategy of accessing a wide variety of colors through simple predictive color mixing of electrochromic polymers (ECPs). We have created a set of brown ECP blends that can be incorporated as the active material in user-controlled electrochromic eyewear. Color mixing of ECPs proceeds in a subtractive fashion, and we acquire various hues of brown through the mixing of cyan and yellow primaries in combination with orange and periwinkle-blue secondary colors. Upon oxidation, all of the created blends exhibit a change in transmittance from ca. 10 to 70% in a few seconds. We demonstrate the attractiveness of these ECP blends as active materials in electrochromic eyewear by assembling user-controlled, high-contrast, fast-switching, and fully solution-processable electrochromic lenses with colorless transmissive states and colored states that correspond to commercially

available sunglasses. The lenses were fabricated using a combination of inkjet printing and blade-coating to illustrate the feasibility of using soluble ECPs for high-throughput and large-scale processing.

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