material to pull together rather than separate apart under an applied force. Depending on the kind of microstructure evolution occurring, external loads ranging from hundreds of MPa to GPa triggered the crack closure.

"A lot of work has already been done on self-healing of soft matter such as polymers and biomaterials, which are generally weak in comparison to metals or ceramics," Demkowicz said. "Our finding is interesting because it's a mechanism that allows for self-healing in much stronger materials."

Demkowicz and Xu are only in the very early stages of investigating this phenomenon, but they can already imagine several possible applications the finding may open in the future. One is to try to design materials with microstructures that use the mechanism to heal internal damage. If typical wear-and-tear could be prevented or arrested, fatigue—one of the most common forms of failure in metal components—may be reduced. The mechanism may also help prevent surface cracks from forming in harsh environments, such as in the deep-sea oil wells that Xu and Demkowicz were originally investigating. Thinking even further down the line, the energy stored within disclinations may even be harnessed to help modify other material properties, such as strain hardening, they said.

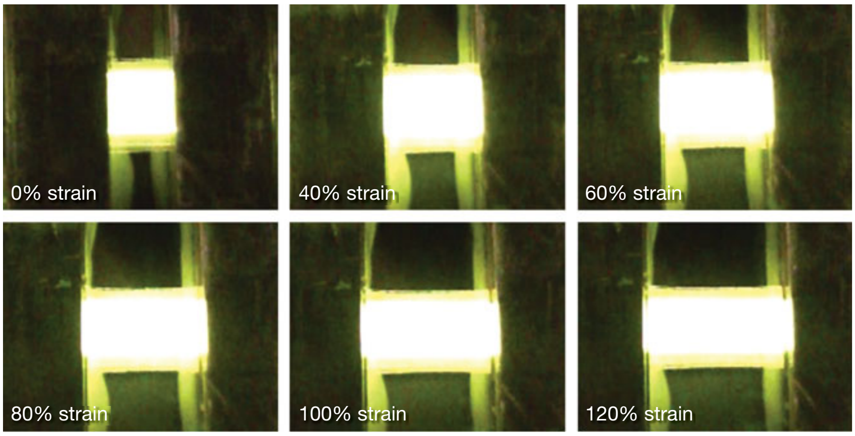
Demkowicz looks forward to further exploring the newly discovered mechanism. These efforts will include *in situ* experiments, developing design tools to create microstructures best suited to self-healing and, eventually, figuring out how to undertake cheap and efficient large-scale processing. "Here we have a truly new mechanism, something previously not known, that goes against conventional wisdom of fracture mechanics," he said. "To me it's extremely exciting because it opens up opportunities that previously did not exist."

Rachel Nuwer

New OLED overcomes elasticity obstacles

Stretchable electronics and displays represent a rapidly expanding technology. While difficult to fabricate due to the challenge of combining elastic components with rigid and brittle inorganic light-emitting diodes and organic light-emitting diodes (OLEDs), these devices offer remarkable advances in the development of expandable and foldable screens, wearable electronics, and biocompatible light sources for *in vivo* or epidermal medical devices.

In the October issue of *Nature Photonics* (DOI: 10.1038/nphoton.2013.242; p. 817), J. Liang and co-workers from the University of California–Los Angeles report the fabrication of an elastomeric polymer light-emitting device (EPLED) comprised of an electroluminescent polymer layer sandwiched between a pair of transparent composite electrodes. The group of scientists, led by Qibing Pei, prepared the rubbery composite electrodes by casting a thin silver nanowire (AgNW) network on the surface of a poly(urethane acrylate) (PUA) matrix. The electroluminescent polymer layer is a blend of commercially available products such as SuperYellow, a yellow light-emitting polymer, ethoxylated trimethylolpropanetriacrylate (ETPTA), poly(ethylene oxide) (PEO), and lithium trifluromethane sulfonate (LiTf). The resulting EPLEDs exhibit high transparency, emit from both surfaces with uniform high efficiency, and are collapsible at room temperature. Light emission continues even when the device is exposed to strains as large as 120%, and they can be stretched repeatedly up to 1000 times at 30% strain.



Device characterization of a stretchable polymer light-emitting electrochemical cell. Reproduced with permission from *Nat. Photonics*. **7** (2013), DOI: 10.1038/nphoton.2013.242; p. 817. © 2013 Macmillan Publishers Ltd.

In another experiment, the researchers showed that the device can be bent and folded without mechanical or electrical damage and without compromising its light-emitting properties. With these promising results, the researchers anticipate that fully stretchable OLED displays for high-resolution display of information will be achieved in the near future.

Dominica H.C. Wong

Addendum

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