Docket #: S17-032

Highly Stretchable and Tough Self-healing Elastomer for Electronic Skin

Stanford researchers at the Bao Lab have designed and fabricated a highly stretchable, tough, and self-healable material with high fatigue resistance applicable for electronic (e-) skin devices. This silicone polymer material supramolecularly cross-links through multi-strength hydrogen bonding interactions. Remarkably, the healing can even take place in water at room temperature. The self-healable supramolecular network realizes a high fracture energy (~12,000 J/m^2) and notch-insensitive stretching up to 1200%. It is readily moldable and stackable into stretchable 3D object shapes. This simple polymer design concept allows a broad range of mechanical property tuning desirable for targeted applications.

Figure

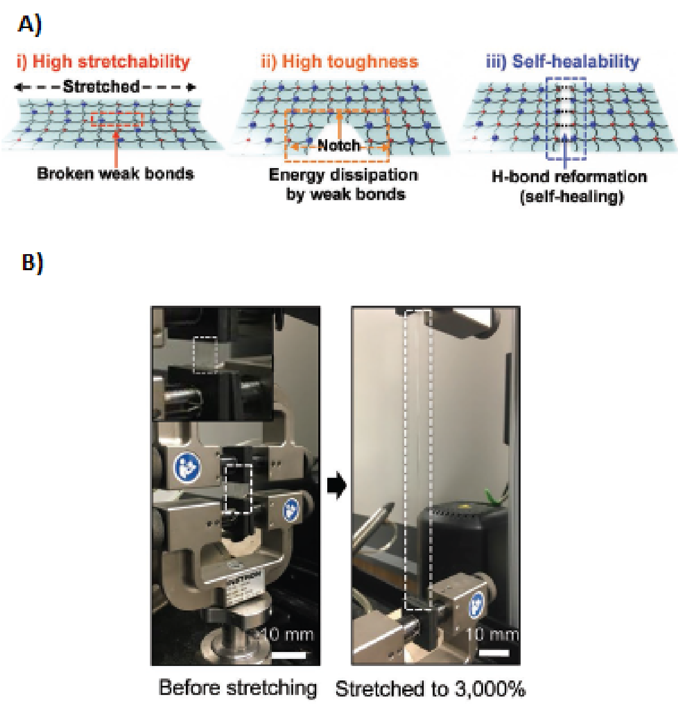

Figure description - Figure A. Schematics of a stretched polymer film (left), notched film (middle), and healed film (right). Figure B. The film before stretching (left) and showing high stretchability at 3000% stretching (right) in Instron machine.

Stage of Research

- Prototype completed
- Demonstrated a wafer-scale strain-sensor array that is able to sense both static and dynamic strain deformations induced by external stimuli

Applications

- Self-healing dielectric layer
- Self-healing substrate for electronic devices
- End user applications include: wearable devices, biomedical devices, and electronic displays

Advantages

- High stretchability
- High fracture toughness
- Autonomous self-healing, including underwater self-healing
- Transparent
- Tunable mechanical properties
- Easily processable
- Scalable

Publications

- Kang, Jiheong, et al. "Tough and Water-Insensitive Self-Healing Elastomer for Robust Electronic Skin." *Advanced Materials*, Feb. 2018, doi:10.1002/adma.201706846

Patents

- Published Application: 20190106544

- Issued: 11,053,390 (USA)

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