Smart Soft Materials with Multiscale Architecture and Dynamic Surface Topographies

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Abstract
Smart soft materials have one or more characteristics that can be significantly altered in convertible fashions by external stimuli, such as light, moisture, mechanical force, temperature, electric/magnetic fields, pH, and so on. Inspired by the fascinating visual display strategies and adaptive mechanisms in animals and plants, we have fabricated a series of smart soft material-based devices that can respond to external stimuli with instantaneous and reversible fashions in optical, electrical, mechanical, and/or shape deformation signals. These devices can be fabricated for widespread applications, including smart windows, encryption devices, thermal camouflage, wearable strain sensors, anticounterfeit tabs, 3D stretchable electronics, dynamic displays, rewritable media, human−machine interfaces, and so on. The key to successfully achieving those intriguing characteristics in these smart material systems lies in the function-orientated structural design, which integrates bioinspired design and surface engineering with multiscale architecture as the crucial elements. This talk will present a summary of our recent work on bioinspired smart soft materials. These materials are characterized by convertible topographies like dynamic cracks, folds, stimuli-responsive wrinkles, and other analogous structures. These systems demonstrate high design flexibility, excellent reversibility, and wide applicability, which can pave new routes for designing next-generation smart soft materials equipped with versatile, tunable, adaptable, and interactive stimuli-responsive properties.

Short bio: Dr. Luyi Sun is a professor in the Department of Chemical and Biomolecular Engineering and a member of the Polymer Program at the University of Connecticut. His research focuses on the design and synthesis of nanostructured materials for various applications. Dr. Sun has published >290 peer-reviewed journal articles. He is the inventor/co-inventor of >70 U.S./foreign patents. The scientific results by Dr. Sun's group have been reported by major media including *Chemical & Engineering News* of the American Chemical Society, *Plastics Engineering* magazine of the Society of Plastics Engineers, *New Scientist*, *Smithsonian Magazine*, Yahoo, MSN, etc. He is a Fellow of the Society of Plastics Engineers and the National Academy of Inventors, and a member of the Connecticut Academy of Science and Engineering.