From Smart Sensing to Multifunctional Materials: Are we ready for the challenges?

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Multifunctional materials that are capable of sensing their own state and knowing their residual capabilities in real time offer tremendous new abilities and opportunities for the design and usage of the materials. Such materials will revolutionize how we design, utilize, and maintain the materials and certainly lead to the development of new products and applications, ranging from aerospace, medical service, to civil infrastructures. This new class of materials must possess nerve-like intelligent sensor networks similar to biological material systems.

This presentation will highlight recent development of a stretchable sensor network technology for making such multifunctional materials possible in a large scale potentially for practical applications. Composite materials embedded with such a network could monitor their own health throughout their life cycle. Prosthetic skins embedded with the network could tremendously enhance the intelligence of a robot wearing such as a skin. However, design, fabrication and characterization of this new class of the materials involve multiple disciplines across the engineering fields and a paradigm change from traditional design and manufacturing principles. New challenges in research, education and implementation of the materials will be discussed.

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