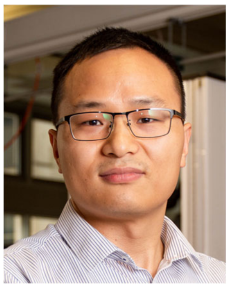
Research Group for Advanced Energy Conversion, RIST, Special Lectures



Engineering Microcracks for Wearable Sensors

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Date：November, 9, 2023, 14:00-15:00

Location: Hall No. 10, 1st floor

Abstract: Due to their ability to detect subtle and large mechanical deformations, as well as their mechanical compliance, stretchable and wearable sensor devices are gaining increasing attention for their potential use in applications such as human health monitoring, robots, and human-machine interactions. Piezoresistive sensors have proven to be an effective solution for achieving both high stretchability and high sensitivity, as they can utilize the deformation-induced change in electric conductance between neighboring conductive nanofillers within an elastomeric matrix. Various strategies have been developed to improve the sensing range and sensitivity of piezoresistive sensors, including segregated conductive networks of porous microstructure, microcracks, and hybrid conductive fillers. In this study, we introduce a novel method for significantly improving the mechanical robustness of conductive thin films made from commonly used metals and conductive polymers, which will be critical for developing next-generation stretchable sensors. By addressing the major limitation of existing methods that use wavy curves with unavoidable stress concentrations at the arc regions, this new technique overcomes the bottleneck issue of low stretchability and ductility of existing conductive material thin films. This breakthrough significantly expands the design space of flexible and stretchable electronic devices beyond wavy curves constructed from low-ductility conductive materials. Moreover, the new stretchable conductive thin films will enable the low-cost manufacturing of micro- and nano-meter sized devices using conventional processes such as sputtering, ink-jet printing, and evaporation. This will facilitate the integration of miniaturized microelectronics and further enhance the development of stretchable sensors for a wide range of applications.

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