APCTP SEMINAR

Two Dimensional Layered Materials for Intrinsically stretchable Applications : The beginning

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Abstract

Solid-state electronics has been advancing to flexible electronics and rapidly evolving towards stretchable electronics. The introduction of smartphones made an electronic revolution worldwide; since then, the consumer for electronic products is growing in leaps and bounds. Simultaneously, the customers expectation and technological requirements for the development of next-generation electronic devices also escalates exponentially. Wearable, implantable, and human-machine interfacing have become optimistic goals of the next-generation devices. To realize these devices in day today life, the next-generation electronic devices should accomplish the key merits of soft, stretchable, bendable, and foldable. Polymeric and organic are the first choice materials for stretchable electronics due to their physicochemical properties. However, lack of electronic performance compared to their inorganic counterparts in charge carrier mobility and long-term stability is accomplished through structural designs (buckling and serpentine). To increase the device resolution and achieve practical throughput of fabrication, intrinsically stretchable inorganic semiconductors and dielectric materials should be explored. To address these issues, we are developing intrinsically stretchable materials based on the two-dimensional (2D) nanosheet through a solution process. By integrating stretchable semiconducting 2D transition metal dichalcogenides materials (TMDs) as active layer, with stretchable electrodes (Au) and dielectric (h-BN), we have fabricated and demonstrated a nanosheet based intrinsically stretchable unit device. This avant-grade methodological approach will open up a new roadmap for future electronic devices with high stretchability and mobility.

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