Flexible 2D Semiconducting Electronics

Young Ki Hong, Wongeun Song, Minjeong Kim, and Sunkook Kim
Dept. of Electronics and Radio Eng., Kyung Hee University, Giheung-gu/Yongin-si, Gyunggi-do, 449-701, Korea
Tel.:82-31-201-3464, E-mail: kimskcnt@gmail.com

The development of mechanically flexible/stretchable electronics can open up next-generation commercial applications, which would be portable, bendable, unbreakable, and light-weight. Among their development, significant progress has been reported in bendable and conformal thin-film transistors (TFTs), a core device to drive/switch active matrix circuitry. However, the conventional TFTs, such as α-Si, LTPS, oxide, have a drawback in flexible circuitry because of the fragile nature and relatively low mobility. In this regards, the challenges to reach a next-generation flexible electronics requires to a novel semiconductor to achieve a mechanical stability and high-speed electronics.

Multilayer transition metal dichalcogenide (TMDC), in particular MoS_2, are emerging as highly attractive candidate for large-area thin-film transistors (TFTs) due to their relatively high mobility, large bandgap, and mechanical flexibility due to the 2D layered structure. In my paper, I will present the novel flexible process using solution-PI substrate, and high mobility 2D layered transistors based on large-grain and highly crystalline TMDC films grown onto insulator by thermal CVD. Such advances in high-performance flexible /stretchable 2D layered devices can exploit human-centric soft electronic to develop human-friendly, ultra-thin (thickness < 500 um) sensor system and wireless communication for a human signal recognition.