

EE 298-12
Solid State Technology and Devices Seminar

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1-2pm
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Bionic E-skins with ultraflexible organic devices

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ABSTRACT:

In this talk, we will report recent progress of ultraflexible organic devices [1-6] such as organic thin-film transistors (OTFTs), organic photovoltaic cells (OPV), and organic light-emitting diodes (OLEDs) that are manufactured on ultrathin plastic film with the thickness of 1 μm [1-3]. First, we have manufactured the ultraflexible organic transistor integrated circuits (ICs) on 1 μm thick PEN or PET. The organic transistor ICs exhibit extraordinary robustness in spite of being super-thin. The electrical properties and mechanical performance of the transistor ICs were practically unchanged even when squeezed to a bending radius of 5 μm , dipped in physiological saline, or stretched to up to double their original size. These organic transistor ICs have been utilized to develop a flexible touch sensor system. Then, we have demonstrated polymer based photovoltaic devices on 1 μm thick PEN, with equal power conversion efficiency to their glass-based counterparts. They can reversibly withstand extreme mechanical deformation and have unprecedented solar cell specific weight. Instead of a single bend, we were able to form a random network of folds within the device area. Moreover, the issues and the future prospect of flexible organic devices will be addressed. We will also describe our recent research activities to apply ultraflexible and stretchable electronic systems for biomedical applications. For example, organic transistor-based amplifier was manufactured on 1.2 μm thick films and utilized to fabricate sheet-type 64-channel surface electromyogram measurement sheet.