Inorganic-Based Heterogeneously Integrated Flexible Transistors and Sensors

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Mechanically flexible and stretchable devices have attracted much attention for a next class of electronics such as flexible photovoltaics, flexible displays, and wearable electronics. In this talk, integrated transistors and sensors on a flexible substrate are demonstrated using especially inorganic nanomaterials to form the active components.

For a flexible thin film transistor (TFT) application, carbon nanotube network film for p-type TFTs and amorphous InGaZnO film for n-type TFTs were integrated to fabricate a complementary metal-oxide-semiconductor (CMOS) inverter circuit on a flexible substrate. The performance in terms of voltage gain and low power consumption is better than or comparable to other previous reports[1, 2]. Furthermore, temperature sensor was also integrated with the CMOS circuits to show the possibility of flexible CMOS/Sensor integration for the future practical applications.

Furthermore, different types of mechanical sensors that can be used for a variety of device applications such as a human interactive device, a robotics, and a wearable devices as examples are introduced[3-6]. For these demonstrations, printing methods such as a screen printing was developed to form temperature and strain sensors for low-cost, macroscale, flexible devices.

This talk mainly focuses on the TFTs and sensors on a flexible substrate. However, the technique should be also applied to macroscale flexible photovoltaics and flexible display components since high performance and air-stable semiconductor materials are integrated.

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References

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