Fabrication of Highly Flexible Organic Nanofiber Phototransistors on a Textile Composite and Their Applications in Wearable Photosensors

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Flexible electronic devices are considered key components of wearable smart electronics. Flexible organic electronic devices with high mechanical stability have been prepared on various types of substrates. Textiles have been considered particularly strong candidates as novel substrates for wearable electronics with high flexibility and stretchability for various applications. However, textile is hard to be utilized as the substrate of the electronic devices because of its high surface roughness. Herein, we report highly flexible OFET-based phototransistors based on a textile-elastomer composite substrate and electrospun polymer semiconducting nanofibers. The phototransistors with textile composite substrate showed highly stable device performance under extreme bending conditions, with a bending radius down to 0.75 mm and repeated tests over 1,000 cycles. Furthermore, we fabricated highly flexible 10 × 10 photosensor arrays that were able to detect incident photonic signals with high resolution. The results clearly showed possibility of application for our devices toward the wearable photosensors.