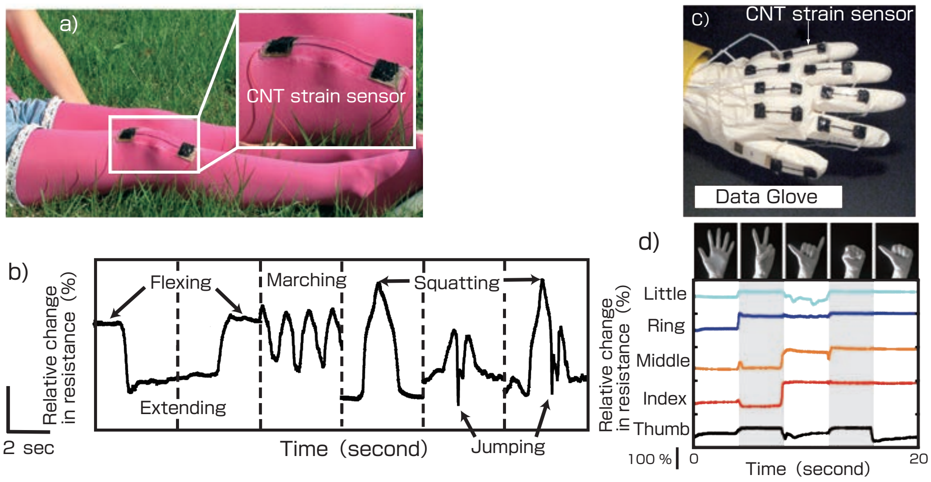
A carbon nanotube strain sensor

Detects 50 times as much strain as conventional strain sensors

We have developed a strain sensor using highly densely-packed, oriented single-walled carbon nanotube (CNT) films bonded to a stretchable polymer substrate. The sensor measures strain by detecting changes in the electrical resistance of the films. This CNT strain sensor can detect strains of up to 280 %, about 50-times greater than conventional metal strain sensors. In addition, durability was demonstrated by repeated application of 150 % strain over 10,000 cycles, and strain response time was found to be 14 ms. The sensor is less prone to creep than strain sensors made of conducting polymeric composites and is more than 20-times faster in creep recovery. The CNT strain sensor can be easily attached to clothing or directly to the body to monitor motion from knees to fingers. It is likely to be used in future wearable devices such as in recreational and medical applications.



Examples of human motion monitoring devices using the CNT strain sensor

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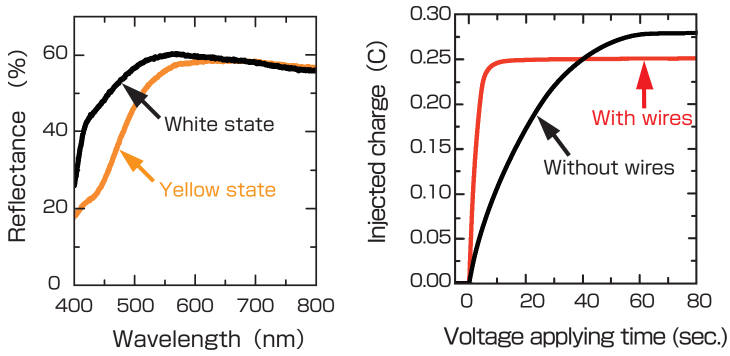
Improvement in performance of electrochromic devices through printing of fine metal wires

A step toward larger-area light-control glass and electronic paper

Using the ink with the nanoparticles of Prussian blue-type complex, we have developed electrochromic devices by using a transparent electrode onto which fine metal wires have been printed. The devices realize high transmittance and reflectance without lowering response speed. The electrochromic device also reduces the amount of the rare metal, indium.

The fine metal wires were formed by printing with gold nanoparticle ink using the super inkjet method, an original technology of AIST. The developed electrochromic devices display a color change from white to yellow when a voltage of 1.5 V or less is applied. When white, the reflectance exceeds 55 % in most of the visible light region. The realized response speed is approximately eight times higher than when fine metal wires are not applied. No significant drop in speed was observed even after 1,000 cycles. This technology is expected to be effective in the production of larger area light-control glass, electronic paper, and other devices using electrochromic devices.



Properties of the device with fine metal wires
Changes in reflectance (left) and charge injection behavior (right)

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