FLEXIBLE PHOTODETECTORS

Nanowire networks crack on

ACS Nano **12**, 4727–4735 (2018)

American Chemical Society

Photodetectors that are both flexible and transparent to light could be of use in commercial products including smart windows, foldable screens and wearable electronics. Two-dimensional materials have been used to fabricate such photodetectors, but sometimes suffer from a lack of uniformity or have to be built on rigid substrates. A promising alternative approach is to grow one-dimensional nanowires or nanowire networks. However, the photocurrent in these devices can be limited by the high contact resistance between single nanowires. K. D. M. Rao and colleagues have now used a low-cost silicon-on-insulator method to build transparent photodetectors made from uniform and low contact resistance nanowire networks.

The researchers — who are based at the Indian Association for the Cultivation of Science and at Trinity College Dublin — grew single-crystalline silicon nanowire networks with seamless junctions on a flexible substrate. The silicon-on-insulator substrate was first coated with resin in order

to form a pattern of highly interconnected cracks. Next, gold metal was deposited on top, and then the layer was lifted off to uncover metal nanowires formed in the cracks. Additional etching steps were then used to create a network of silicon nanowires that could be transferred to a flexible substrate.

Rao and colleagues tested the performance of the nanowire network in photodetector devices. The silicon nanowire network photodetectors showed broadband detection, good transparency and photoresponsivity up to 25 A W^{-1} . The researchers also showed that the presence of nanopores in the nanowire network and the low-resistance seamless junctions within the network improve the flow of charge and are responsible for the high-performance of the photodetectors.

Christiana Varnava

Published online: 13 June 2018

<https://doi.org/10.1038/s41928-018-0096-y>