THIN-FILM ELECTRONICS

Peel-and-stick circuits

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Credit: Chi Hwan Lee, Purdue University

The ability to fabricate thin-film electronics on wafers and then transfer them to other surfaces could be used to turn everyday objects into smart devices. However, existing methods of separating thin films from their fabrication wafers, including chemical etching and physical lift-off, are problematic. For example, chemical etching destroys the wafer and can introduce defects into the film, whereas physical lift-off has limitations on the materials that can be used. Baoxing Xu, Chi Hwan Lee and colleagues now report a versatile transfer printing process that allows wafers to be used numerous times and dissimilar semiconductor materials to be combined in one circuit.

The researchers — who are based at Purdue University, the University of Virginia and Stanford University — first

deposited layers of nickel on silicon wafers before using standard complementary metal–oxide–semiconductor (CMOS) processes to create thin-film electronic circuits. Thanks to the nickel layer, the films can be smoothly peeled off the wafer in water. They can then be trimmed to a desired shape with scissors and stuck to a new surface (a wooden block, for example; see image) using a commercial adhesive. To illustrate the capabilities of the approach, Lee and colleagues created a variety of nanoelectronic stickers including logic gates, hybrid photodetectors and sensors.

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