

NANOTRANSFER PRINTING

Sticky stamp switches on and off

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Credit: AAAS

The manipulation of components with small dimensions is necessary for the assembly of integrated electronic chips. Micromechanical grippers can pick up objects, but secondary adhesive surfaces are needed to deposit objects on a chip due to van der Waals forces and electrostatic attraction. One promising approach is to use a surface that can switch between strong and weak adhesion for pickup and placement, respectively. However, this method usually requires complex processes, such as heating or chemical reactions, which are impractical. A. John Hart and colleagues have now developed a soft nanocomposite with an electronically tunable adhesion that can be used to transfer microscopic structures.

The researchers — who are based at the Massachusetts Institute of Technology, the Korea Advanced Institute of Science and Technology and the University

of Pennsylvania — fabricated the nanocomposite by growing carbon nanotube fibres on a conductive electrode. When an electrical voltage (30 V) is applied, the nanocomposite can pick up objects that are in contact with the fibres due to strong electrostatic forces. A low voltage (below 15 V) can then be used to release the object at a new location. Hart and colleagues used the technique to print patterns of polystyrene microspheres (with diameters of 0.5 μm) and silver nanowires (with diameters of 20 nm) on silicon wafers. They also used it to print silicon dioxide microspheres onto flexible polymer films.

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