Rough surface could keep small electronic parts from sticking together

March 5 2014

When a piece of gift-wrapping tape sticks to itself, it's frustrating, but when small parts in a microgear or micromotor stick together, an electronic device may not work well, if at all. Scientists now report in the journal *ACS Applied Materials & Interfaces* that rough zinc oxide coatings can prevent tiny silicon parts from adhering to each other. The study could accelerate the development of even more advanced, high-performance electronics and small sensors.

Xinchun Lu and colleagues explain that adhesion is a big concern when designing very small silicon-based machines called microelectromechanical systems (MEMS). Today, MEMS are in many consumer products, such as cell phones, tablets, car airbags and inkjet printers. On this large scale, manufacturers can make sure that small parts have enough space and don't touch. However, when moving to smaller devices and parts for high-performance electronics, space is at a premium, and it's more likely that parts will touch. Silicon is widely used in MEMS devices, but it is sticky. The typical solution is to coat silicon with a water-repellent coating. Roughening up a surface can also help minimize contact between surfaces. Lu's group set out to see whether combining the two—using a water-repellent zinc oxide film with a rough surface—could work.

They investigated the stickiness of various zinc oxide films in the laboratory. They found that thicker films were rougher and had a lower adhesion force (were less sticky) than thin ones. Low humidity also helped, say the researchers.

Provided by American Chemical Society