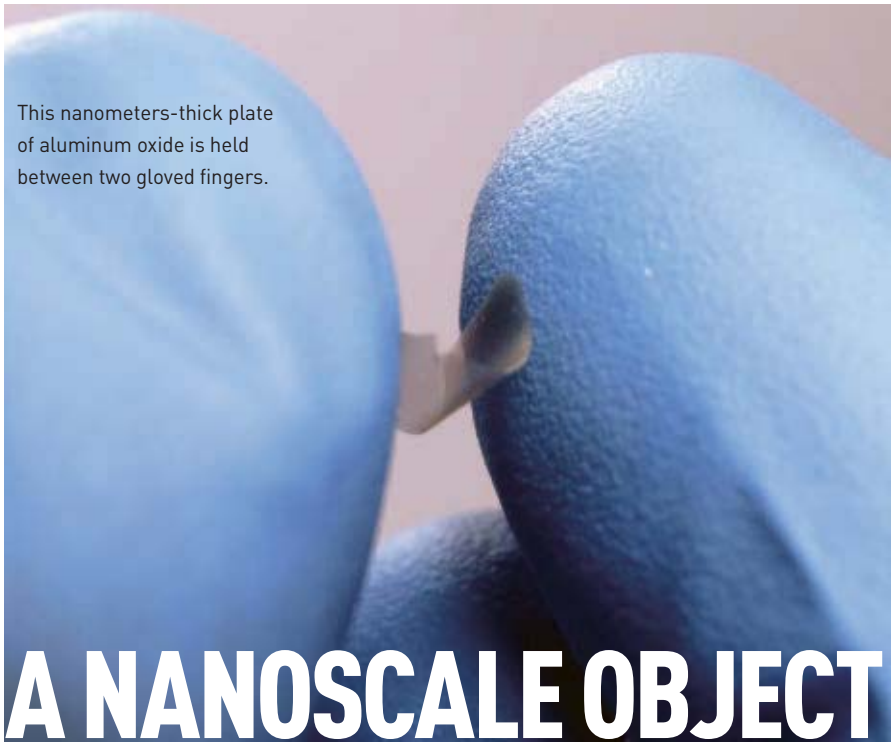

This nanometers-thick plate of aluminum oxide is held between two gloved fingers.

A NANOSCALE OBJECT YOU CAN PICK UP

Graphene sheets are today's "it" material, prized for mechanical strength as well as interesting electrical properties. But on their own, these single atom-thick sheets will curl up or clump. And don't even think about picking one up unless it's mounted on a much thicker backing or in a frame.

Now, researchers at the University of Pennsylvania in Philadelphia have produced a plate of super-thin material that can be picked up and held between two fingers. These plates aren't quite as thin as graphene, but at 25 to 100 nm thick, they are much thinner than a wavelength of light.

The plates are made of aluminum oxide, which is deposited one atomic layer at a time to achieve precise control of thickness and a distinctive honeycomb shape.

"Aluminum oxide is actually a ceramic, so something that is ordinarily pretty brittle," said lead researcher Igor Bargatin, an assistant professor at Penn's School of Engineering and Applied Science. "You would expect it, from daily experience, to crack very easily. But the plates bend, twist, deform, and recover their shape in such a way that you would think they are made out of plastic. The first time we saw it, I could hardly believe it."

Indeed, instead of curling or clumping, the corrugated plates spring back to their original shape after being bent and twisted. Also, when held firm on one end, the plates remain rigid rather than sagging like a thin sheet of plastic.

The plates are also less prone to sticking to the side of a surface due to Van der Waals forces. The honeycomb structure doesn't provide for as many surface-to-surface contact points as a simple plane.

The material has intriguing potential for aerospace and micro-mechanical applications, where strength and light weight are critical properties.

"The wings of insects are a few microns thick, and can't be thinner because they're made of cells," Bargatin said. "The thinnest man-made wing material I know of is made by depositing a Mylar film on a frame, and it's about half a micron thick. Our plates can be ten or more times thinner than that, and don't need a frame at all. As a result, they weigh as little as a tenth of a gram per square meter."

The team published its findings in the journal *Nature Communications*. ME