UW-Madison: Making two dimensional quantum materials using curved surfaces

Posted on Thursday, Oct 22, 2020

MADISON – Scientists at the University of Wisconsin-Madison have discovered a way to control the growth of twisting, microscopic spirals of materials just one atom thick.

The continuously twisting stacks of two-dimensional materials built by a team led by UW-Madison chemistry Professor Song Jin create new properties that scientists can exploit to study quantum physics on the nanoscale. The researchers published their work today in the journal Science.

“This is the current frontier of 2D material research. In the last few years, scientists have realized that when you make a small twist between atomic layers – usually a few degrees – you create very interesting physical properties, such as unconventional superconductivity. For example, the twisted material loses its electrical resistance completely at the low temperature,” says Jin. “Researchers consider these 2D-quantum materials, and call such work ‘twistronics.’”

Yuzhou Zhao, a graduate student and first author of the study, says the standard practice for making twisting two-dimensional structures has been mechanically stacking two sheets of the thin materials on top of each other and carefully controlling the twist angle between them by hand. But when researchers grow these 2D materials directly, they cannot control the twist angle because the interactions between the layers are very weak.

“Imagine making a stack of continuously twisting playing cards. If you have nimble fingers, you could twist the cards, but our challenge is how to make the atomic

layers twist in a controllable way by themselves at the nanoscale," Jin says.

Jin's team found out how to control these twisting nanoscale structures' growth by thinking outside the flat space of Euclidean geometry.

STORY CONTINUES AT https://news.wisc.edu/do-the-t-wist-making-two-dimensional-quantum-materials-using-curved-surfaces/