How Researchers Are Rewiring Electronics for the Future

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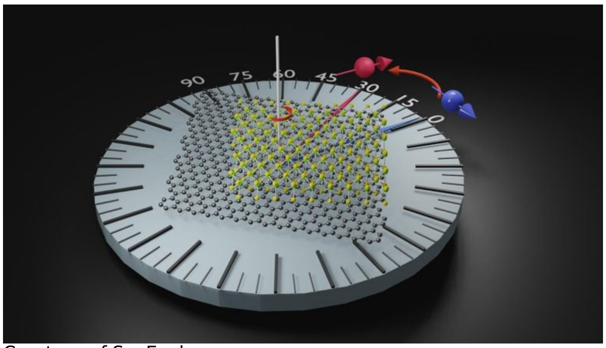

Courtesy of SynEvol
Credit: Haozhe Yang

The Nanodevices group at CIC nanoGUNE, in collaboration with researchers from the Charles University of Prague and the CFM (CSIC-UPV/EHU) center in San Sebastian, has created a novel complex material with novel features in the field of spintronics. This finding, which was reported in the journal Nature Materials, creates a number of new opportunities for the creation of innovative, more effective, and cutting-edge electronic devices, like ones that incorporate CPUs with magnetic memories.

Since two layers of these materials can produce novel effects when layered to form a heterostructure, the discovery of two-dimensional materials with distinctive properties has sparked a surge in study into these materials. It has recently been noted that the characteristics of this heterostructure can be considerably altered by small rotations of these layers.

"We investigated the stacking of two layers of graphene and tungsten selenide (WSe2) in this work," said Félix Casanova, an Ikerbasque Research Professor and co-leader of the Nanodevices group at nanoGUNE, who oversaw the project. "A spin current is generated in a desired specific direction if the two layers are placed one on top of the other and rotated at a precise angle," Félix Casanova continued.

One of the characteristics of electrons and other particles is spin, which is often transferred perpendicular to the direction of the electric current. One of the primary challenges of spintronics, or spin-based electronics that stores, manipulates, and transmits information, is managing these spin currents. But Félix emphasized that "this work shows that this limitation in fact disappears when suitable materials are used."

"By merely stacking two layers and applying a'magic' twist, new spin-related properties that do not exist in the initial materials can be obtained," the study found. "The design possibilities for next-generation devices are greater the more flexibility we have in choosing materials."