

Researchers Create Improved Magnetic-Semiconductor Sandwich

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Researchers at Ohio University have created an improved magnetic semiconductor that solves a problem spintronics scientists have been investigating for years.

Unlike classic or vintage electronics that operate on electronic charges, spin-based electronics focuses on the spin of electrons to carry and store information. Researchers predict spintronics will revolutionize the electronics industry by making devices faster, improving storage capacity and reducing the amount of power needed to run them.

Spintronics technology has not been widely applied yet, however, because scientists have had difficulty controlling, manipulating and measuring the electrons.

In a paper published online today in *Physical Review Letters*, a team of Ohio University and Ohio State University scientists led by postdoctoral fellow Erdong Lu have created an effective interface between a semiconductor and ferromagnetic metal. The two-layer “sandwich” of gallium nitride (GaN) and manganese gallium (MnGa) nearly eliminates any intermixing of the two layers and allows the spin to be “tuned.”

“We found a way to grow the metal on the semiconductor. The crystalline match between the two materials was nearly perfect. The advantage of this finding is in the growth process. By adjusting the conditions of the growth, we can tune the spin,” said Arthur Smith, associate professor of physics and astronomy and director of Ohio

University's Nanoscale & Quantum Phenomena Institute.

Magnetization was controlled by monitoring a property of the growth called reconstruction. Through the monitoring process, researchers could predict the properties of the spin.

“It has to do with the ratio of manganese and gallium,” Smith said.

The researchers also found that this new magnetic-semiconductor bilayer will operate at room temperature. Other materials have only worked at very low temperatures, which makes them impractical for commercial applications.

Source: Ohio University

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