Spintronics Steps Forward

Researchers show how to "set" the spin for spintronics applications important to faster electronic devices.

USF News

TAMPA, Fla. (May 9, 2012) - A team of physicists from the University of South Florida and the University of Kentucky have taken a big step toward the development of practical spintronics devices, a technology that could help create faster, smaller and more versatile electronic devices.

The research funded by the U.S. Department of Energy was led by USF Physicist Sergey Lisenkov and Professor Madhu Menon at Kentucky's Center for Computational Sciences. Their findings were published this week in *Physical Review Letters*.

Lisenkov said an important step toward fabrication of the "holy grail" of spintronics is finding a semiconductor that has a net 'spin' at room temperature. The biggest challenge, however, is how to set the spin and in what material.

The USF-Kentucky team showed that a simple combination of metal atoms and a flat sheet of one atom- thick layer of pure carbon called graphene can be suitably engineered and used for this purpose.

Graphene is a relatively tangible material that can be made by peeling ordinary graphite (the same material in lead pencils) with common transparent tape. Graphene boasts properties such as a breaking strength 200 times greater than steel. It is of great interest to the semiconductor and data storage industries, electric currents that can blaze through it 100 times faster than in silicon.

Spintronic devices are hotly pursued because they promise to be smaller, more versatile, and much faster than today's electronics and use less energy.

Spin is a quantum mechanical property with directional values "up" or "down". This is analogous to the "on"' or "off"' values used with binary digital coding in modern computers. The advantage of spintronic devices is once the direction of the spin is set, no energy is required to keep it going. The spin-based data storage doesn't disappear when the electric current stops.

Using state-of-the-art theoretical computations, the research team demonstrated that by placing cobalt atoms in graphene holes - created by removing one or two nearby carbon atoms - it is possible to set the spins in a controlled manner. That, the researchers said, is the key to practical spintronics application for graphene.

*To read their complete paper, click **here.***