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Nanotube Magnetic Transistor Prototype Promises Better Memories

Single electron spin directly controlled through electric current

Typical computers today have two main components interacting with each other dynamically in order to process data: the central processing unit and the memory core. The memory core of the computer relies mostly on magnetic components, while the central processing unit uses electrical signals to operate. Nonetheless, University of Copenhagen researchers believe that the future of faster computers lies in creating new means of storing data by combining electricity and magnetism into a new type of transistor. "We are the first to obtain direct electrical control of the smallest magnets in nature, one single electron spin. This has vast perspectives in the long run. In our experiments, we use carbon nanotubes as transistors. We have placed the nanotubes between magnetic electrodes and we have shown that the direction of a single electron spin caught on the nanotube can be controlled directly by an electric potential. One can picture this single electron spin caught on the nanotube as an artificial atom," says researcher from University of Copenhagen and participant in the study, Jonas Hauptmann. Although physicists around the world know for some time that it would be theoretically possible for them to control the spin of a single electron by exerting electrical control, until now no one succeeded in practically demonstrating the mechanism. No wonder that the scientific community became suddenly interested in the finding of the Danish researchers. "Transistors are important components in every electronic device. We work with a completely new transistor concept, in which a carbon nanotube or a single organic molecule takes the place of the traditional semi-conductor transistor. Our discovery shows that the new transistor can function as a magnetic memory," concluded professor Jens Paaske from the Nano-Science Center and the Niels Bohr Institute, in charge for the data analysis collected during the experiment.