Researchers develop new method of controlling nanodevices

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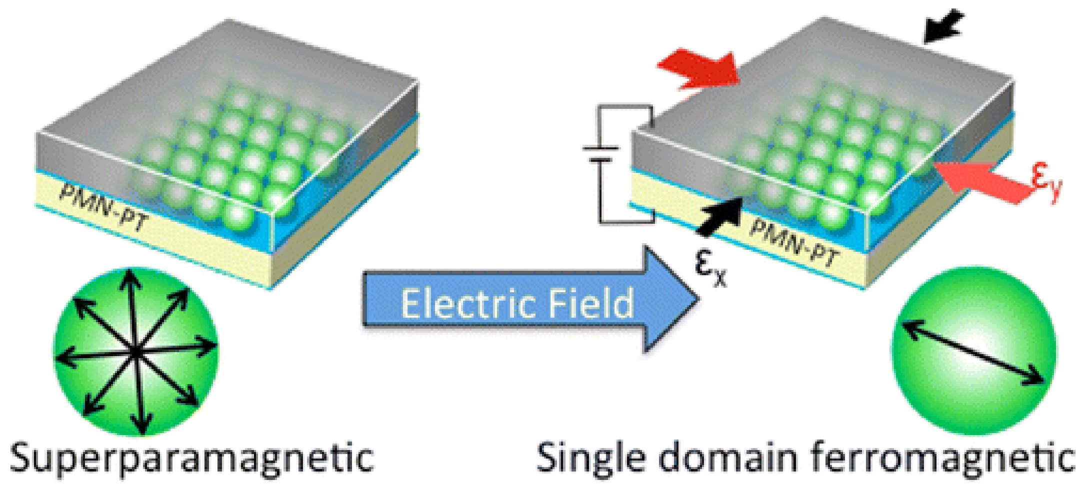

(Phys.org)—Electromagnetic devices, from power drills to smart-phones, require an electric current to create the magnetic fields that allow them to function. But with smaller devices, efficiently delivering a current to create magnetic fields becomes more difficult.

In a discovery that could lead to big changes in storing digital information and powering motors in small hand-held devices, researchers at UCLA have developed a method for switching tiny magnetic fields on and off with an electric field—a sharp departure from the traditional approach of running a current through a wire.

The researchers, affiliated with the university's National Science Foundation–funded TANMS (Translational Applications of Nanoscale Multiferroic Systems), developed a composite that can control magneto-electric activity at a scale of about 10 nanometers, some 1,000 times smaller than a red blood cell. Previously, the instability of magnetic particles at this scale made it impossible to control their movement, much less the energy reaching them.

The team used a composite of nickel nanocrystals coupled with a single crystal of piezoelectric material—which can generate power when a small amount of force is applied to it—to control the north–south orientation of the particles as well as their tendency to spin around, which are essential aspects of activating or deactivating a magnetic field.

The findings could potentially change the way electromagnetic devices are designed in the future. With further research, the team said, the discovery may allow significant miniaturization of equipment ranging from memory devices and antennas to instruments used to analyze blood. The researchers noted that while their findings represent a major scientific step, practical applications of the discovery are likely years away.

The research was published online Feb. 11 in the peer-reviewed journal Nano Letters (bit.ly/W8zhxd) and will appear in an upcoming print edition of the journal.

More information: Magnetoelectric Control of Superparamagnetism, *Nano Lett.*, Article ASAP. DOI: 10.1021/nl3034637

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