Researchers at McGill University, Montreal, Quebec, Canada, discovered how to control the piezoelectric effect in nanoscale semiconductors called quantum dots, enabling the development of tiny new products. A quantum dot has a diameter of only 10 to 50 atoms, or less than 10 nm. The discovery offers a way to control the speed and switching time of nanoelectronic devices, and possibly even to develop nanoscale power supplies, whereby a small compression would produce a large voltage.

A Tel Aviv University, Israel, solution to electronic environmental waste applies a discovery in nanotechnology, based on self-assembled peptide nanotubes, to “green” the optics and electronics industry. Scientists developed a new nanomaterial by applying the scientific disciplines of both biology and physics. They are growing their own light sources using organic chemistry—organic nanosticks are made of carbon, making them inexpensive and environmentally friendly.

A research team at Rutgers University, N.J., found a material in which an electric field can control the overall magnetic properties of the material. The effect was found by studying magnetic properties of a manganite mineral consisting of magnesium, oxygen, europium and yttrium. At low temperatures (7 to 20 degrees above absolute zero) and in high magnetic fields, a slight change in applied electric fields causes a large change in the mineral’s magnetic properties. The magnetoelastic effect could lead to advances comparable to hard drives made possible with the discovery of giant magnetoresistance.

Nanocomp Technologies awarded Air Force contract

Nanocomp Technologies, Concord, N.H., was awarded a multimillion dollar Phase II contract by the U.S. Air Force Research Laboratory (AFRL) under the Department of Defense’s Small Business Innovation Research (SBIR) program. Nanocomp will continue its work to advance carbon nanotube (CNT)-based materials as replacement for metal-based electromagnetic interference (EMI) shielding and electrostatic discharge (ESD) components on manned and unmanned aircraft. The Phase II award builds on Nanocomp’s successful demonstration that large-format CNT sheets can meet the requirements of EMI shielding, as well as withstand industrial stresses involved in prepregging.


Photovoltaic technology modeled after nature

Scientists at Massachusetts Institute of Technology (MIT), Cambridge, succeeded in mimicking a key aspect of photosynthesis by creating a novel set of self-assembling molecules that can turn sunlight into electricity. The molecules can be repeatedly broken down and then reassembled quickly by adding or removing an additional solution. The system is made up of seven different compounds, including carbon nanotubes, phospholipids, and proteins that make up the reaction centers, which, under the right conditions, spontaneously assemble themselves into a light-harvesting structure that produces an electric current. When a surfactant is added to the mix, the seven components all come apart and form a soupy solution. When the surfactant is removed by pushing the solution through a membrane, the compounds spontaneously assemble once again into a perfectly formed, rejuvenated photocell.


SiGen’s PolyMax production system

Silicon Genesis, San Jose, Calif., is producing solar wafers using its new high volume manufacturing PolyMax system. SiGen produced 85-μm thick, 156-mm square kerf-free monocrystalline silicon wafers. This achievement is said to deliver the first true mono c-Si kerf-free wafering for the photovoltaic (PV) industry. The introduction of the PolyMax high volume-manufacturing system brings the industry one step closer to replacing wire saw processes with a lower cost, waste-free wafering solution. www.sigen.com.

Forcing mismatched elements together could yield better solar cells

An international team, including University of Michigan (Ann Arbor) professors, invalidated the most commonly used model to explain the behavior of a unique class of materials called highly mismatched alloys. The best solar cells today are still missing a material that can make use of a portion of the sun’s infrared light.

The team made samples of gallium arsenide nitride, a highly mismatched alloy that is spiked with nitrogen, which can tap into that underutilized infrared radiation. They used molecular beam epitaxy to cox the nitrogen to mix with their other elements.

Next, the researchers measured the alloy’s ability to convert heat into electricity to determine whether its 10 ppm of nitrogen were distributed as individual atoms or as clusters. In some cases, nitrogen atoms grouped together, contrary to what the prevailing “band anti-crossing” model predicts, thus showing experimentally that the band anticrossing model is too simple to explain the electronic properties of highly mismatched alloys. It does not quantitatively explain several of their extraordinary optical and electronic properties. Atomic clusters have a significant impact on the electronic properties of alloy films.

www.engin.umich.edu.