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Tabletop system performs angle-resolved photoemission spectroscopy

Researchers in the laboratory of David Dresselhaus in the department of physics and JLA at the University of Colorado (Boulder) have developed a tabletop system to perform angle-resolved photoemission spectroscopy (ARPES). This technique is one of the key tools used in the quest to understand the complex electronic interactions responsible for high-temperature superconductivity. Typically, ARPES experiments are performed at large research synchrotron light sources, and the cost of a $100 million. Instead, the Dresselhaus system uses (e000 000) photons from the fourth harmonic of a titanium-sapphire laser produced through two stages of nonlinear second-harmonic generation in BBO (beta barium borate) crystals.

The resulting flux of 2 x 10^11 photon/s is a bandwidth of less than 5 meV, which represents about two orders of magnitude improvement over even the best synchrotron beam lines. The relatively low photon energy also greatly increases the momentum resolution and decreases the background signal of ARPES relative to higher-energy synchrotron systems. In addition, the pulsed nature of the titanium laser opens up the possibility to directly observe electron dynamics using ARPES. Contact Jacobs Kortel at jkortel@colorado.edu.

Polymer solar cells achieve 5.2% efficiency

Researchers from the University of Colorado (Boulder) have achieved a record efficiency of 5.2% for polymer solar cells. The team used a new polymer material that absorbs light and generates an electron and a hole, which can then be separated and used to generate electricity. The team used a new polymer material that absorbs light and generates an electron and a hole, which can then be separated and used to generate electricity. This is a significant improvement over previous polymer solar cells, which have typically achieved efficiencies of less than 4%.

Angle-scanning an etalon precisely measures its thickness variation

Used in imaging solar spectroscopy, Fabry-Perot interferometers made from lithium niobate substrates must have thickness variations of nearly 1 nm (micron)

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