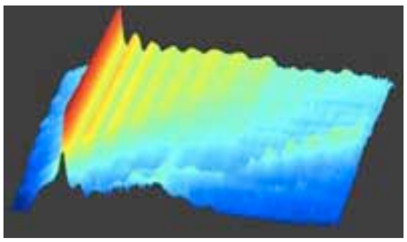
LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Aug. 13-17, 2012

e! Science News

PUT TO THE TEST



The peaks on this chart represent key energy signatures produced in dense ultrahot plasma. ***Image courtesy of Sam Vinko, University of Oxford.***

The first controlled studies of extremely hot, dense matter should benefit a wide range of fields, from research aimed at tapping nuclear fusion as an energy source to understanding the inner workings of stars.

The new study has overthrown the widely accepted 50-year-old model used to explain how ions influence each other's behavior in a dense plasma.

The research, by an international collaboration including the Lab's Yuan Ping, also demonstrates the unique capabilities of the Linac Coherent Light Source (LCLS) X-ray laser at SLAC National Accelerator Laboratory at Stanford University. While researchers have created extremely hot and dense plasmas before, LCLS allows them to measure the detailed properties of these states and test a fundamental class of plasma physics for the first time ever.

Plasma is sometimes referred to as the fourth state of matter -- alongside solid, liquid and gas -- and in this case it was hundreds of times hotter than the surface of the sun (3.6 million degrees Fahrenheit). These measurements contradict the prevailing model that scientists have used for a half-century to understand the conditions inside plasmas.

To read more, go to *e! Science News*.

I'VE GOT ONE WORD FOR YOU...

Lab materials scientist Natalia Zaitseva leads a team of Livermore researchers that has developed the first plastic material capable of efficiently distinguishing neutrons from gamma rays. ***Photo by Jacqueline McBride.***

Plastics. There's a reason why actor Dustin Hoffman, in the 1967 classic movie "The Graduate," was advised to pursue a career in plastics: There's no telling just how far this field will go.

A team of LLNL researchers has developed the first plastic material capable of efficiently distinguishing neutrons from gamma rays, something not thought possible for the past five decades or so.

As a result, the new technology could assist in detecting nuclear substances such as plutonium and uranium elements that could be used in improvised nuclear devices by terrorists and could help in detecting neutrons in major scientific projects.

With the material's low cost, huge plastic sheets could easily be formed into dramatically larger surface areas than other neutron detectors currently used and could aid in the protection of ports, stadiums and other large facilities.

To read more, go to *R&D Magazine*.

GOING THE DISTANCE

Crystal Green handles a mock non-radioactive fuel assembly, as part of the hands-on training in nuclear criticality safety. ***Photo by Jamie Douglas/LLNL.***

As a freshman, Crystal Green didn't mind going across the country to work with a mentor in the Minority Serving Institutions program.

Now Green, a sophomore and a summer intern in the Nuclear Criticality Safety Division (NCSD), has been awarded a $1,500 scholarship by the American Nuclear Society's (ANS) Columbia, S.C. Chapter.

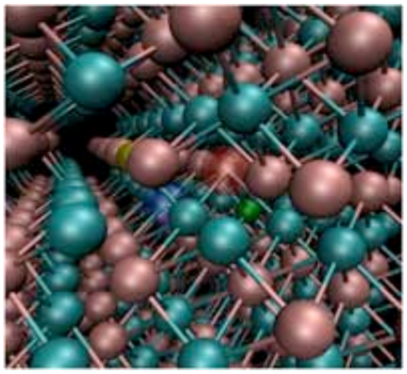
Green is working on her bachelor's degree in nuclear engineering with a minor in physics at South Carolina State University, and will graduate in 2014. This is her second summer working as an intern at LLNL.

Green, who is originally from Augusta, Ga., traveled cross-country to work with her mentor Dave Heinrichs in the Minority Serving Institutions program when she was a freshman. Last summer, her work focused on using COG, an LLNL-developed Monte-Carlo multi-transport code to model a French reactor, SILENE. This work helped her become one of the first place winners at the Student Poster Symposium.

To read more, go to the Web.

R&D

CONDUCTING RESEARCH



Atomic structure of co-dopant complex in thallium bromide that binds charged vacancies and reduces their mobility.

Lab researchers have discovered a new method to control the conductivity of materials that could eventually apply to fuel cells, batteries and gas sensors.

Postdoc Cedric Rocha-Leão, working with Condensed Matter and Materials Division's Vince Lordi, has found a new method to independently control ionic and electronic conductivities in certain solids.

The new approach allowed quantitative screening of dopants to find those most effective for a particular application. The recent work focused on optimizing conduction in thallium bromide for high-resolution room-temperature gamma radiation detectors, for which high electronic conductivity and low ionic conductivity are required.

Achieving simultaneous control of ionic and electronic conductivity in materials is one of the great challenges in solid state ionics. Since these properties are intertwined, optimizing one often results in degrading the other.

To read more, go to *R&D Magazine*.

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