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LSU Associate Professor Theda Daniels-Race Researches Non-Traditional Energy

After the BP oil spill and with the economic and political demands to lessen dependence on fossil fuels, Louisiana is actively supporting research toward the development of alternative energy.

Theda Daniels-Race, associate professor of the LSU Department of Electrical and Computer Engineering and the Center for Computation & Technology, has received \$147,194 from the Louisiana Board of Regents to discover how combinations of new hybrid materials can be used in non-traditional means of energy production, transmission, and storage. Daniels-Race's proposal titled, "Nanoscale Electronic Characterization of Hybrid Electronic Materials," was funded for a three-year period.

"As the words alternative energy can be applied to a broad range of engineering technologies, in this work we will investigate the basic science behind these potential applications from a very fundamental electronic materials perspective—that is, at the molecular/nanoparticle level. In this way, we not only have the opportunity to observe new science, but we will be able to learn about, and therefore exploit, the fundamental physicochemical properties needed to engineer hybrid materials and their functions in alternative energy processes," said Daniels-Race.

A new form of hybrid electronic materials (HEMs), known as GUMBOS, or a Group of Uniform Materials Based on Organic Salts, will be investigated. GUMBOS were recently discovered by LSU Vice Chancellor Isiah M. Warner of the Office of Strategic Initiatives, Boyd Professor and Philip W. West Professor of Analytical & Environmental Chemistry. They represent a first in that they are a new nanomaterial composed of ionic liquid species in the frozen state.

"What is different about GUMBOS," said Daniels-Race "is that, unlike traditional ionic liquids which have melting points less than 100 degrees Celsius, GUMBOS can be synthesized to exist in the solid-state as nanoparticles in the 25 to 250 degrees Celsius range. As designer nanoparticles, their properties can be tailored to meet a host of applications in areas ranging from energy to biomedical functions to environmental uses. GUMBOS provide the prospect of utilizing new science with the objective of addressing fundamental alternative energy needs of efficiency, lower production costs, and materials-to-device engineering and development."

Daniels-Race will work with Warner and his group, who will provide the GUMBOS needed for the research.

"We believe that in this study of HEMs for alternative energy applications we combine the discovery of new materials with exciting engineering developments in an area of urgent national interest," said Daniels-Race. "As conventional and highly developed electronic materials, such as silicon, reach their predictable limits, and the nation's focus upon alternative means of energy production increases, this investigation stands well-poised to meet the academic and practical demands for new discoveries."

For more information on this and other research at the LSU Center for Computation & Technology, visit: <http://www.cct.lsu.edu/home>

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