Louisiana EPSCoR
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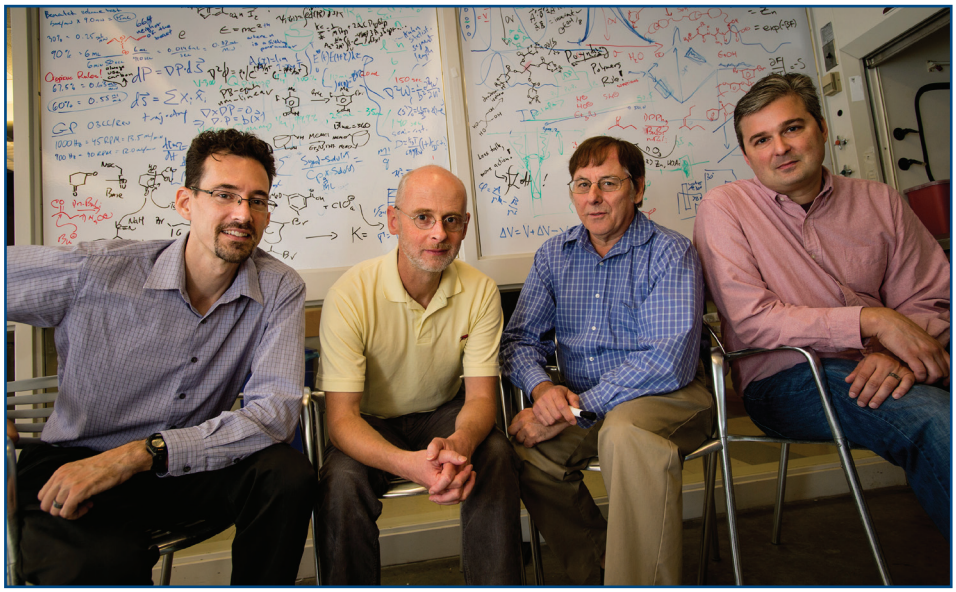
Everyday Materials Being Revolutionized by Smart Polymers

Polymers shape our daily lives in so many ways. Imagine the benefits of taking medication customized for your specific treatment that will travel through your body and wait until it reaches the targeted location to release the medication.

This is exactly what Louisiana researchers are working on: developing "smart" polymers that can help us on a molecular level inside and outside of our bodies. Smart polymers respond when a change in their environment occurs, such as pH, temperature, magnetic field, or light.



SMATDAP researchers from Tulane University: Dr. Scott Grayson, Dr. Bruce Gibb, Dr. Wayne Reed and Dr. Hank Ashbaugh. Photo: Paula Burch-Celentano.

But this is just one application for smart polymers. Traditionally, oil spills in water bodies have been treated with dispersants. Imagine the benefits of using a smart polymer instead to encapsulate the oil droplets inside of the polymer which contains hungry bacteria that would then digest the oil.

It is no surprise that industry budgets billions of dollars every year to protect steel structures from rust. Imagine how much would be saved by using a smart polymer paint that automatically self-heals its surface by releasing a sealant if it is scratched or chipped.

Advanced materials like these are currently being researched and developed as part of a new consortium of Louisiana and Mississippi materials researchers, called the Smart MATerial Design, Analysis, and Processing (SMATDAP) consortium. The SMATDAP consortium has been awarded a $6 million dollar EPSCoR Research Infrastructure Improvement Track 2 grant from the National Science Foundation (NSF) to build this next generation of smart polymers and the tools needed to accelerate cost-effective commercial production.

The SMATDAP interdisciplinary research team brings together considerable intellectual talent in computational and materials sciences from eight universities, including: Louisiana State University, Tulane University, University of New Orleans, Xavier University, Jackson State University, Mississippi State University, University of Mississippi and the University of Southern Mississippi.

"We are pleased to be selected by NSF, and to partner with Mississippi for this exciting work," said Dr. Tom Layzell, Senior Advisor to the Louisiana Board of Regents. "With the influx of business and industry in Louisiana, research and outreach programs which focus on science, technology, engineering, and mathematics (STEM) areas are critical. We eagerly anticipate the outcome."

By coordinating research with education and outreach, the consortium will also work towards strengthening regional economic competitiveness through building a diverse STEM pipeline. Advances in the science of polymer characterization and materials synthesis will serve as a central theme for education and outreach activities that engage local schools, teachers, undergraduate and graduate students, and industry.

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The interdisciplinary research team will utilize the cyberinfrastructure resources from both states, like the Louisiana Optical Network Initiative (LONI) and Mississippi Center for Supercomputer Research (MCSR). Researchers will design and apply world-class experimental and computational tools for molecular modeling and cyber control strategies across the life-cycle of polymer development from laboratory to the factory floor.

"The activities of this multi-jurisdictional consortium will create a pipeline of high-tech workers that translates state-of-the-art research and development into an engine that contributes to sustainable economic development in the region," said Dr. Michael Khonsari, Louisiana EPSCoR Project Director and Associate Commissioner for Sponsored Programs.

Smart Polymer Manufacturing

At Tulane University's Center for Polymer Reaction Monitoring and Characterization (PolyRMC), researchers are developing the second generation of the Smart Materials Automatic Continuous Online Monitoring of Polymerization (SM-ACOMP) instrument and software to provide unprecedented monitoring of smart polymer responses during synthesis. The consortium is working in partnership with Dr. Wayne Reed's start-up company, Advanced Polymer Monitoring Technologies (APMT).

The future third generation of the SM-ACOMP will become an industrial tool that will modernize the global polymer industry by using optimized, feedback-controlled processes that automatically control the polymerization reactions during manufacturing.

SM-ACOMP technology by APMT.

SMATDAP consortium members from Louisiana and Mississippi gathered at the kick-off meeting in New Orleans.

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