

Graduate Chemistry Research Opportunities
Institute of Paper Science and Technology
Georgia Institute of Technology
500 10th St., NW Atlanta, Georgia 30332-0620

By Dr. Art Ragauskas
School of Chemistry and Biochemistry
arthur.ragauskas@ipst.gatech.edu, ragauskas@hotmail.com

The July 2003 merger of the Institute of Paper Science and Technology (IPST) and the Georgia Institute of Technology (GA Tech) is having a dramatic impact on graduate education. The merger of the two institutions is providing even greater training/research opportunities for graduate students.



“The core of our education process has been strengthened,” according to Dr. Ragauskas, pointing out that new facilities and a larger base of educational and research opportunities are now available to students who wish to pursue a rigorous graduate education in chemistry. “Regardless of

whether students want to specialize in pulp and paper science or focus on innovative biomass/biopolymer chemistry, they will get an excellent educational experience here,” he says.

Student Research Activities

Ragauskas, with almost 20 years of experience in oxidative chemistry, carbohydrate, fiber/lignin/cellulose chemistry and biotechnology, is currently pursuing research in the several areas of biopolymers and pulp and paper science. The objective, he explains, is to harness the possibilities inherent in the chemistry of cellulose, the most abundant organic chemical on earth.

A major area of concentration at IPST at Georgia Tech these days involves research aimed at improving the performance paper through modification of lignocellulosic fibers. Through the use of a combination of chemistry, biotechnology, and plasma technologies Dr. Ragauskas’ research groups is looking at ways to improve current paper making processes, as well as to improve the strength, absorbency, and other properties of paper. An exciting aspect of this research is the



development new nano-cellulose and hemicellulose based materials. Such innovative research approaches allow researchers to impart a variety of new functionalities to paper, he explains, including controlled release, enhanced barrier properties for packaging and security, new water absorption properties, and other technologies that will convert paper into an active, value-added material derived from nature’s preeminent renewable

resource. Our research program is also well known nationally and internationally for our studies in bleaching and pulping for kraft and mechanical pulps and these studies are continuing to develop.

Another area of research that presents vast opportunities is the use of cellulose to develop new biocomposite materials from which new products can be designed and produced. An example is so-called biocomposites of pulp, a unique product that is produced by imparting the natural qualities of the wood fiber onto synthetic and/or bioplastics. These composite products often have far greater value than either product alone. A need exists for solid fundamental research in this area in order to transfer the potential of biotechnology from the laboratory to commercial applications.

Another area of carbohydrate research lies in the creation of biofuels, which are being developed through the degradation of biomass. “The substitution for imported hydrocarbons with bio-based fuels and chemicals offers a tremendous opportunity to enhance national security, balance of trade, rural employment opportunities, and environmental performance including net reductions in CO₂ emissions,” explains Ragauskas. The conversion of lignocellulosic waste would provide a practical solution to the country’s growing demand for fuel by converting waste, which is costly to dispose of, into a valuable future resource. This area of research provides distinct energy generation and carbon dioxide fixing benefits; these research challenges and societal benefits are being addressed at IPST at Georgia Tech.



State-of-the-Art research Facilities

IPST at Georgia Tech offers modern state-of-the-art research facilities that provide an excellent environment for students to perform all phases of chemical research. The laboratories are equipped with state of the art analytical chemistry facilities and specialized equipment for pulp and paper production and testing. Furthermore, in the near Ragauskas and his colleagues look forward to the completion of a major nanocenter located on the ground floor of IPST that will include: 3 SEMs including a High



Resolution Digital STM/AFM Facility; 200 KeV STEM/TEM and Dual Beam Focused Ion Beam units.



A “Phenomenal” Opportunity for Students

The merger of IPST and a major research institution like Georgia Tech provides students with an interest in chemistry and biomaterials unparalleled opportunities, says Ragauskas.

“The whole infrastructure at Georgia Tech has been opened up to us,” he explains. The new organizational arrangement provides multiple benefits for students, including more chances to interact with a variety of faculty, greater access to modern research facilities, and ultimately, greater employment opportunities in the future.

“We have an excellent track record with graduate students,” notes Ragauskas. “Our people typically do very well after graduation.” To date, Ragauskas has supervised the graduate work of 16 Master’s students and 18 doctoral students; of these six have received awards, such as graduate student award of the American Chemical Society and best IPST student. Furthermore, numerous undergraduates have worked in the laboratory of Dr. Ragauskas.

Currently, a large group of students and postdoctoral research fellows are being trained under the supervision of Ragauskas. “Right now we have four post-doctoral fellows, one Master’s student and nine doctoral students, so there is a lot of interaction in my group,” he says. And there is always room for gifted, enthusiastic graduate students wanting to join this productive group.

New Multidisciplinary Program Available

A new program is now being formed at Georgia Tech to address the growing need for innovation in science and engineering involved in paper production. The M.S. and Ph.D. degrees in Paper Science and Engineering (PSE) may also appeal to students with an interest in chemistry. Offered by the College of Engineering and the College of Science, in conjunction with IPST at Georgia Tech, this multidisciplinary program is designed to prepare students for careers in the pulp and paper industry.



“These new programs will equip students with a unique set of skills to lead in this effort,” says Ragauskas, noting the importance of the paper industry to the economy of Georgia.

“Regardless of which path they choose, graduate students are going to receive a great educational experience here.”

For More Information

Please Contact: Art. Ragauskas
Institute of Paper Science and Technology
Georgia Institute of Technology
500 10th St., NW Atlanta GA
30332-0620

1-800-558-6611

404-894-4778 (Fax)

arthur.ragauskas@ipst.gatech.edu, ragauskas@hotmail.com