PolyRMC Celebrates its Second Anniversary
August 2009

Message From the Director

Dear Friends:

PolyRMC reaches its second anniversary with new perspectives and plans, while hosting another succession of remarkable colleagues, visitors, and students enlivening the activities. The past year has been full of discoveries, inventions, new results, and initiatives.

Research highlights of the year include the first uses of ACOMP to predictively control polymerization reactions, including those in emulsion phase; the conception and initial prototyping of 2nd generation ACOMP, which will allow the evolution of polymer stimuli responsiveness to be monitored during synthesis; findings that relate the physics of polyelectrolytes to their synthesis; new fundamental kinetic phenomena discovered in living and free radical polymerization; continued dissemination of the capabilities and achievements of ACOMP through invited presentations and literature contributions.

Collaboration with ongoing and new industrial collaborators has grown apace, and PolyRMC continues to receive a steady stream of industry visitors interested in seeing how online monitoring and advanced polymer characterization can benefit their companies. An important event was the cancellation of the Varian Inc. license from Tulane University to PolyRMC's ACOMP and associated technology. Varian underwent serious restructuring in the face of the current recession and is in the process of being acquired by Agilent technologies. PolyRMC is very excited to have the commercialization dimensions of ACOMP 'come home', and a strong initiative is underway to work with a small number of private companies for ACOMP tech transfer to the industrial milieu.

In this sense we have greeted the current recession as an opportunity rather than a pitfall, as we believe that the opportunities afforded by ACOMP and related technologies for improved industrial efficiency, better economic performance and reduced environmental impact per kilo of product are needed now more than ever, and we are working with alert industrial people who share this vision.

PolyRMC staff, students, Board Members, colleagues, and supporters look forward to a very intense upcoming year with great focus, but unfettered hopes.

Best Regards,

Wayne Reed, Director
In Memoriam

PolyRMC regrets to announce that Advisory Board Member Dr. Walther Tscharnuter recently passed away unexpectedly. Dr. Tscharnuter was the co-founder and President of Brookhaven Instruments Corporation (Holtsville, NY). He was a professor of Physics at the Technische Universität in Vienna, Austria, and worked as a Postdoctoral Associate for Prof. Benjamin Chu (SUNY Stony Brook) before founding BIC. He was a brilliant and unceasingly creative individual who pioneered much of modern dynamic light scattering technology, and who had a perpetual stream of humor flowing beneath his thick Austrian accent. He was a friend and colleague of PolyRMC Director Reed for nearly 30 years.

PolyRMC dedicates this 2nd Anniversary Edition to the memory of Dr. Tscharnuter.

Mission Statement:
To be the world’s premier center for polymerization reaction monitoring R&D

Highlights:
Strong flow of advances, publications, and presentations.
Second plenary meeting of the PolyRMC Advisory Board.
Louisiana Initiatives with local industries continued.
New national initiatives in SMSLS and ACOMP.

Motto:
Value and impact based on scientific and technical excellence, integrity, and relevance.
Personnel

Alina M. Alb, Associate Director for Research  
Michael F. Drenski, Associate Director for Instrumentation  
Alex Reed, Operations Manager and Marketing Coordinator  
Wayne F. Reed, Founding Director

Postdoctoral Associates/Sabbatical Visitors

Dr. Daniel Elizarrarás (U. Coahuila, Mexico)  
Prof. Rilton Alves de Freitas (Univali, Itajai, Brazil)  
Prof. Fabio Florenzano (UNIVAS Pouso Alegre, Brazil)  
Dr. Frank Bentrem (Naval Research Labs)  
Dr. Nodirali Normakhamatov (Uzbek Academy of Sciences)

Graduate Students

Tomasz Kreft, (Ph.D. 2008)  
Colin McFaul, (Joined Spring 2007)  
Zheng Li, (Joined Fall 2007)  
Zifu Zhu, (Joined Fall 2008)

Undergraduate Students

Namdi Brandon, (Summer 2009)  
Demian Reed, (Summer 2009)  
Curtis McGinnity, (Fall 2008)  
Gerard Lakin, (Fall 2008)

Recent Personnel and Visitors


Academic Collaborators


Summer Spotlight...

Undergraduate wields programming prowess.

Namdi Brandon, BS Physics Tulane graduate in May 2009, was employed this summer under PolyRMC NSF funds to significantly broaden the LabView programming basis for data acquisition and manipulation for SMSLS and prototype 2nd generation ACOMP instrumentation. Mr. Brandon will pursue his Ph.D. in Computational Science at U. N. Carolina, Chapel Hill starting Fall 2009.
First time application of ACOMP to control of polymerization reactions using semi-batch operation (i.e. reactor feed):


First time application of ACOMP to semi-batch polymerization reactions in heterogeneous phase and control of latex particle size and polymer mass:

A. M. Alb, W. F. Reed, "Online monitoring of molecular weight and other characteristics during semi-batch emulsion polymerization under monomer starved and flooded conditions, submitted, Macromolecules

First time monitoring of polymerization reactions by simultaneous automatic continuous non-chromatographic and discrete chromatographic methods: ACOMP-SEC


Novel approaches in the online monitoring of the synthesis of 'living' copolymeric polyelectrolytes by ACOMP

Investigate reaction kinetics during RAFT copolymerization, deviations from control, and the feasibility of a novel method to follow the charged monomer, based on conductivity.


New link established between two separate fields; the chemical synthesis of copolymers and the description of the physical chemistry properties of polyelectrolyte solutions.
ACOMP was used for studying basic initiation mechanisms in free radical polymerization:


**Invited review articles bring broader dissemination of ACOMP capabilities and results:**


**Other recent publications:**


Alina M. Alb (PQ), Wayne F. Reed (PQ)‡, Fábio H. Florenzano (PQ). Copolimerização embloco via RAFT monitorada por ACOMP, *Sociedade Brasileira de Química* (SBQ). Tulane University


**Patents**

Natural Products Efforts Continue with Brazilian and Uzbek Colleagues

PolyRMC has begun to develop online methods for quantifying processes involving natural products, such as extractions, enzymatic and chemical modifications, encapsulation of other agents, and the formation of nanostructures. These have wide applications in the pharmaceutical, food, agricultural, oil recovery, personal care, and materials industries.

The National Science Foundation (CBET 0623531) has provided funds to help spur this collaboration, aiding in travel and activities of PolyRMC in Brazil, while the Brazilian government and other organizations provide for Brazilian students and scientists to spend time at PolyRMC.

Prof. Rilton Alves de Freitas, sponsored by the Brazilian Science Foundation, CNPq, spent a six month sabbatical at PolyRMC, investigating the derivitization of chitosan using online reaction monitoring and other PolyRMC characterization methods.


This led to the first adaptation of ACOMP to monitoring modification reactions of natural products. A new device for simultaneously measuring conductivity and pH within a recirculating ACOMP configuration was designed and implemented by Mr. Drenski.

N. Normakhomatov, A.M. Alb, M.F. Drenski, A. Boymirzaev, W.F. Reed "Online Monitoring of the Chemical Modification of a Natural Product", in preparation.

News and Events

- The PolyRMC Advisory Board had its 2nd Annual meeting on March 6th 2009. The Board is comprised of distinguished members with diverse scientific and business profiles.
- Tomasz Kreft earned his Ph.D. in March 2009, with his dissertation entitled "Predictive control of free radical polymerization reactions including copolymeric polyelectrolytes." He is currently a Postdoctoral Associate in the group of Prof. David Haddleton at Warwick Universtiy, England.
- Manufacturing Extenison partnership of Louisiana (MEPOL) project director, Rebecca Scherff visited PolyRMC to discuss possible collaborations between MEPOL's Polymer Testing Lab and PolyRMC. PolyRMC also registered with MEPOL as a 3rd part consultant.
- PolyRMC added a new staff member in Spring 2009; Alex Reed, Marketing Coordinator and Operations Manager, who has been organizing and carrying out initiatives and strategies as well as overseeing lab operations.
- PolyRMC has become a member of the Louisiana Chemical Industry Alliance (LCIA), and attended the annual LCIA tradeshow in Lake Charles, LA on June 11th of 2009.
- PolyRMC is delighted to bring back home the commercialization dimension of ACOMP after Varian cancelled its license to ACOMP in the wake of Varian’s economic problems, and has begun to collaborate in earnest with several potential industrial candidates for early stage ACOMP tech transfer to industry.
- PolyRMC staff presented at and attended the annual TIMES meeting. PolyRMC and Reed research group members have been involved with TIMES for many years.
PolyRMC Director Reed was a visiting professor at the University of Bordeaux for a short period in Summer 2009.

The Tulane Engineering Forum, with corporate sponsorship and participation from around the world, was held on April 3rd, 2009 at the Ernest N. Morial Convention Center in New Orleans, LA. PolyRMC was present at this event with a booth and presentations by Director Reed and Dr. Roger of Arkema Inc.

**Upcoming SEC Course at PolyRMC**

PolyRMC will offer a two day course on Size Exclusion Chromatography: Theory and Applications, at its facilities at Tulane University. Tentatively scheduled for Nov. 2009. Contact Alex Reed if interested at (504) 865-5087 or areed2@tulane.edu.

**Update on new PolyRMC Initiatives**

- A campaign to promote SMSLS (Simultaneous Multiple Sample Light Scattering) as the most accurate and efficient means to monitor the stability of therapeutic protein formulations was launched, targeting the pharmaceutical sector.

- An initiative to make industries aware of the product improvement, energy and cost savings as well as the reduced environmental impact potentially afforded by online reaction monitoring began. It was also coupled with responses to solicitations from the Dept. of Energy.

- PolyRMC devised its initial strategy for the Natural Products initiative, in which companies involved in this area should realize substantial upside gains by monitoring and understanding the many reactions and processes involved in natural product production.

- A new initiative to push the limits of ACOMP detection to the ppm level to confront the problem of Bisphenol in consumer products is currently being pursued with Manufacturers.

PolyRMC is currently working on projects with several clients locally, nationally, and internationally. PolyRMC is using its unique problem-solving and characterization techniques in diverse fields, including rubber and other synthetic polymers and biopolymers. The Center is also attempting to diminish the carbon footprint and total energy consumption of the polymer manufacturing industry as a whole while, at the same time, reducing costs and increasing competitiveness of polymer manufacturers. The Center envisions accomplishing this through implementation of ACOMP at the industrial level to monitor large-scale polymerizations.

PolyRMC is currently seeking industrial collaborators who would like to increase their manufacturing efficiency and product quality, and reduce their manufacturing costs.

**Update on Louisiana Initiatives**

**Links with Louisiana industry strengthen...**

Advisory Board Member Dan Borné has continued to disseminate word of PolyRMC activities to the Louisiana Chemical Association members.

First steps were taken at PolyRMC this summer to plan a series of video presentations to be used as outreach to Louisiana’s elementary, middle, and high school students. They aim to show Louisiana’s children the vast sweep, science and technology, and many opportunities that exist within the State’s vast chemical industry.
Funding

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Dr. Maria Burka, Program Director

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Prof. Daniel DeKee, TIMES Director
Dr. Michael Meador, NASA PI

Arkema, Inc.
Dr. Chris Roger, Arkema Project Director

Total S.A.
Dr. Shaffiq Jaffer
Dr. Jean-François Minster
Dr. Philippe Tanguy

Polymer Laboratories (now a part of Varian, Inc.)
Dr. John McConville
Dr. Steven O’Donahue

PolyRMC also acknowledges other collaborations on instrumentation with:

Mr. Dan Borné, President, Louisiana Chemical Association, (Baton Rouge, LA)
Dr. Bill Bottoms (Chairman), Chairman of SBA Materials Inc. (Palo Alto, CA)
Mr. Ronald J. Evans, Owner, International Packaging Co., (New Orleans, LA)
Mr. Paul H. Flower, President and CEO, Woodward Design + Build (New Orleans, LA)
Dr. Raymond S. Farinato, Research Fellow, Kemira Water Solutions, Inc. (Stamford, CT).
Dr. John McConville, Brookhaven Instruments Corp. (Holtsville, NY)
Dr. Chris Roger, Arkema, Inc., Director, Corporate & External Research (Philadelphia, PA)
Dr. Hyuk Yu, W. H. Stockmayer Prof, Emeritus & Eastman Kodak Prof. UW-Madison (Madison, WI)

Honorary, Dr. José Carlos Pinto, Federal University of Rio de Janeiro, Brazil.