PolyRMC: Annual Newsletter

Message from the Director

PolyRMC has completed its strongest year yet in its six year history. External funding, overwhelmingly from the private sector, is at its highest point so far. The diversity of projects includes dynamics of therapeutic protein aggregation, characterizing the encapsulation and release of oil and other agents in micelles and hybrid polymer/nanoparticle structures, finding new self-organizing nanostructures in colloid solutions, monitoring the stimuli responsiveness of polymers during synthesis, analyzing processing steps in natural product manufacturing, seeking the origin of particulates generated in emulsion reactions, developing new light scattering technologies and a new particle characterization platform we term ‘filtrodynamics’, and more.

PolyRMC is proud to have hosted the 26th International Symposium on Polymer Analysis and Characterization June 9-12, 2013 in New Orleans. ISPAC brought together 150 world experts and practitioners from academia, industry, and government from 21 countries in an intense four day interchange of new ideas, discoveries, and methods in the historic Monteleone Hotel in the French Quarter.

The number of visiting postdoctoral and graduate students increased this year, as well as the number and variety of internships for science, engineering, and business students. The PolyRMC spinoff company Advanced Polymer Monitoring Technologies, Inc. (New Orleans) is growing by leaps and bounds, commercializing patented technology from PolyRMC under exclusive license from Tulane. APMT is generating high-tech jobs and opening new opportunities in the region and has now outgrown its rented quarters at Tulane and is slated to move to a new site in the following months.

Along with the growth of APMT comes change for PolyRMC. Associate Director for Instrumentation Michael Drenski, and Assistant Director for Marketing and Operations Alex Reed are transitioning into their full time roles at APMT as CTO and CEO, respectively. PolyRMC is delighted to welcome Dr. Curtis Jarand as the full time Sr. Instrumentation Specialist, and several new graduate students.

We are all looking forward to another exciting year of discovery, innovation, learning, valuable results, and fruitful collaborations.

Sincerely,
Wayne F. Reed
PolyRMC Overview

PolyRMC is a non-profit center within the Tulane University School of Science and Engineering that has developed unique instrumentation and methods for comprehensive monitoring of polymerization reactions, allowing process optimization, accelerating R&D of new polymeric materials, and potentially allowing fullscale reactor control. This work is complemented by our advances in the area of macromolecular characterization.

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

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

PolyRMC Team

Founding Director— Prof. Wayne F. Reed
Associate Director for Research— Prof. Alina M. Alb
Associate Director for Instrumentation— Mr. Michael F. Drenski
Assistant Director for Operations and Marketing— Mr. Alex W. Reed
Sr. Instrumentation Specialist— Dr. Curt Jarand

Current graduate students: Colin McFaul, Zifu Zhu, John Robertson and Brooke Peaden

PolyRMC Welcomes Dr. Curtis Jarand, Carl Pasquarelli, Prof. Scott Grayson and New Graduate Students

Dr. Jarand, PolyRMC’s new Sr. Instrumentation Specialist, holds a B.S. in chemistry from Southern Illinois University at Carbondale, an M.S. in chemistry with a graduate minor in toxicology from New Mexico State University and a Ph.D. in analytical chemistry from the University of New Orleans. He has been previously employed by Veritox/GT Engineering in Redmond, WA where he served as a consultant and senior chemist in a wide variety of failure analysis, industrial hygiene, and toxicology related projects in support of industry and litigation. Prior to employment at PolyRMC, Dr. Jarand served as a developmental scientist and scientific review officer at Eurofins Central Analytical Laboratories, an industry leading food safety laboratory in Metairie, LA.

Prof. Scott Grayson is PolyRMC’s first faculty affiliate. He is an associate professor in Tulane’s Department of Chemistry. His expertise includes the synthesis of polymers using living polymerization techniques, and construction of higher order polymer topologies using click chemistry. He also has extensive experience characterizing macromolecules using Matrix-Assisted Laser Desorption/Ionization-Time-of-Flight Mass Spectrometry (MALDI-TOF MS).

Carl Pasquarelli is PolyRMC’s newest Advisory Board Member. Carl Pasquarelli is the plant manager of Nalco An Ecolab Company’s Garyville, LA facility where employees make waste water treatment products and chemicals used in paper making, mining, petroleum, steel, power generation, food and beverage, plus aluminum refining. Carl joined Nalco in 1980 as an engineer in Corporate R&D. During his 33 year tenure, he held positions in supply chain management in North America and Europe. He holds degrees in chemistry and chemical engineering from the University of Pittsburgh and the Illinois Institute of Technology and serves as a board member with the Louisiana Chemical Association.

John Robertson joins the group as a graduate student. He received his B.S. in physics from the Florida Institute of Technology and is a new PhD student at Tulane University. Research Interests include polymer reactions, organic synthesis, solid-state phenomena, and medical physics.

Brooke Peaden joins the group as a graduate student. She received a B.S. in physics and chemistry from the University of Puget Sound, completing research on vibration modes of cymbals. This past year she worked at Element 1 Engineering as an environmental engineer where she worked on measurement of mercury emissions at coal fired power plants, helping to lower emissions using both new and proven technologies.
Recent and Upcoming Events

**August 16, 2013:** A. Reed will present about university technology transfer on a workshop panel at a Louisiana State Bar Association seminar.

**August 19-23, 2013:** W. Reed will present an invited talk on protein aggregation and SMSLS at the Bioprocessing Summit in Boston.

**September 8-11, 2013:** A. Reed will present about smart manufacturing test beds at the GIL conference in Silicon Valley.

**September 20, 2013:** PolyRMC Advisory Board meeting, beginning at noon.


**November 11-13, 2013:** Fall session of PolyRMC’s GPC Academy.

**November 22, 2013:** Prof. W. Reed will be invested as the new Murchison-Mallory Chair in Physics. 3 p.m. LaVerne-Bernick University Center. Reception to follow.

**May 12-14, 2014:** Spring session of PolyRMC’s GPC Academy.

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PolyRMC Organizes the 26th International Symposium on Polymer Analysis and Characterization (ISPAC)

ISPAC 2013, June 9-12, 2013 in New Orleans, received a record amount of sponsorship and support from companies and non-profit organizations. The event was held in the historic Hotel Monteleone in the French Quarter. 13 world experts gave invited, plenary talks, while another 80 participants provided contributed talks and posters. Exhibitors had a chance to detail their technologies for interested potential clients. PolyRMC’s W. Reed is a member of the ISPAC Governing Board. See the conference website for more information on the scientific program, sponsors, etc.

PolyRMC’s Mike Drenski presenting at ISPAC 2013


Next year’s 27th ISPAC will be at Les Diablerets, Switzerland, and the 28th ISPAC will be in Houston, TX.

PolyRMC in Local News

⇒ Prof. Grayson (PI) and Reed (co-PI) of Tulane University and Prof. Savin (co-PI, USM) are working on a project to improve oil dispersants. The project was one of 19 awards from over 336 proposals. The project is focused on developing hybrid nanoparticle/polymer particles whose oil-dispersing capability would be independent of concentration.

⇒ Prof. Reed will be invested in the Murchison-Mallory Chair in Physics

⇒ PolyRMC spin-off APMT was awarded a Phase I SBIR grant by the National Science Foundation, working with Prof. Anne Robinson’s group in Tulane’s Dept. of Chemical and Bimolecular Engineering.

⇒ Alex Reed was awarded the Millenial award for Innovation by Social Renaissance in New Orleans.

http://tulane.edu/sse/polyRMC/
Update on APMT

PolyRMC spin-off, Advanced Polymer Monitoring Technologies, Inc. (APMT), continues its technology commercialization endeavors and has been operating out of leased laboratory space at Tulane University since early 2013. The Company has been growing quickly and will be moving to a new facility in September. APMT continues to work closely with PolyRMC on various proprietary technologies and platforms. Some recent APMT highlights include:

- Products delivered to customers in 2013
- Joint Development Agreement in place with customer for development of industrial ACOMP
- Closing seed round of financing August 30th
- Partnerships developed with leading automation and instrumentation companies
- Awarded Phase I SBIR grant by National Science Foundation working on SMSLS technology
- 3 full-time engineers hired since July
- 3 paid full-time summer interns (2 engineers and 1 business)
- 7 senior part-time consultants
- Moving into a large warehouse facility in September

Features in Scientific and Technology Progress


Further work continues in summer 2013 with visiting researcher Dr. Marie DuFrechou, in collaboration with Dr. Emmanuel Mignard (Laboratory of the Future, Bordeaux, France)

- Prof. Alina Alb presented two talks at the 245th ACS National Meeting in New Orleans, LA in the Division of Polymer Chemistry. The first presentation was: Evelyn F. de Melo and Alina M. Alb, “pH dependent self-assembly behavior of amphiphilic diblock copolymers by RAFT studied by light scattering-based methods.” The second presentation was: Zifu Zhu and Alina M. Alb, “Synthesis and characterization of guar gum-g-poly(acrylic acid) copolymers.”
- Light scattering and the thermodynamics of therapeutic protein aggregation. In collaboration with Dr. Mark Brader and other scientists at Biogen Idec (Cambridge, MA) PolyRMC’s proprietary SMSLS was used to map out the kinetics of protein aggregation under thermal stress, discovering multiple Arrhenius regimes and a stochastic regime in the process. “Monitoring Protein Aggregation Kinetics with Simultaneous Multiple Sample Light Scattering”, Michael Drenski, Mark Brader, Roy Alston, Wayne F. Reed, J. Analytical Biochemistry, 2013, 437, 185-197.
- Monitoring Polymerization Reactions; from Fundamentals to Applications, Eds. Wayne F. Reed and Alina M. Alb, was commissioned by Wiley Interscience, and affirms PolyRMC leadership in the field of polymerization monitoring. The book is slated to appear in October 2013.

PolyRMC Joins Smart Manufacturing Leadership Coalition (SMLC)

Reflecting PolyRMC’s extensive involvement with the polymer manufacturing sector, the move to join SMLC is timely. SMLC is developing a conceptual informatics structure that will generalize horizontal and vertical integration of all dimensions in any given manufacturing platform. In principle, it will be translatable to any sector; polymers, aerospace, automotive, pharmaceuticals, food, energy, etc. Originally started by professors at UT Austin and UCLA, SMLC now includes many leading industries and other universities. Alex Reed, a Member of the SMLC Board, is the test bed subgroup co-leader. PolyRMC and APMT technologies are potential early test beds for the SM platform.

http://tulane.edu/sse/polyRMC/
PolyRMC and APMT Summer Interns Working Side by Side

APMT has been leasing Tulane lab space during its early stages of operation. As such, summer 2013 fostered a very interesting atmosphere of sharing and interaction between the APMT engineering team and PolyRMC’s research team. The interns and visiting researchers from both organizations ate lunch together nearly every day and often collaborated on day to day projects. The overall teams of PolyRMC and APMT are also quite diverse and interdisciplinary with a blend of physics, analytical chemistry, synthetic chemistry, chemical engineering, and business. All undergraduate and graduate internships were full-time, paid positions.

Ryan Swinney is an APMT engineering intern who is a rising senior in the engineering physics program at Tulane University. He will continue his work with APMT in the fall and spring for his senior design project.

Ankush Patil is an APMT engineering intern who is a rising senior in chemical engineering at Worcester Polytechnic Institute.

Nick Chvany is a PolyRMC engineering physics intern and is a rising senior in the engineering physics program at Tulane University. He will continue his work with PolyRMC in the fall.

Varun Arul is a PolyRMC intern who will complete his M.S. in chemical engineering at the University of Florida in Gainesville.

APMT and PolyRMC are always looking for bright, motivated interns both during the school year and for summer 2014. If you are interested in an internship, please send a resume and cover letter to jobs@apmtinc.com.

Cadie and Noelle Higginson are rising sophomores at Benjamin Franklin High School and worked at PolyRMC to gain STEM experience in a laboratory environment. They volunteered in the lab part-time in the first half of the summer.

Sponsor Corner

Some of PolyRMC’s 2013 sponsors include:

- biogen idec
- An Ecological Company

- PanTEX
- NALCO
- SOLVAY
- GULF OF MEXICO RESEARCH INSTITUTE

Typical types of industrial projects include:

* Methodology development for polymer characterization (GPC or other).
* Fundamental and quantitative understanding of polymer science and engineering systems; thermodynamics, reaction kinetics, complex interactions.

* Long-term (6-24 months) R&D projects for online reaction monitoring (ACOMP), process optimization (ACOMP, ACM), formulation/product stability testing (SMSLS, GPC, DLS), quality control support, etc.
* Medium to long-term new polymer product development R&D using ACOMP and ACM.
* ACOMP feasibility and method development in preparation for implementation at the manufacturing reactor or in the R&D laboratory.
* Polymer characterization and analysis services.
* Expert polymer characterization and analysis services for intellectual property cases.

http://tulane.edu/sse/polyRMC/
Research Partnerships and Collaborations, Past and Present

PolyRMC Advisory Board

Dan Borné—President, Louisiana Chemical Association.

Dr. Bill Bottoms (Chairman)—Chairman, SBA Materials Inc.

Ronald Evans—Owner, International Packaging Co.

Paul Flower—President and CEO, Woodward Design+Build.

Dr. John McConville—President, Polymer Standards Service-USA Inc.

Mr. Carl Pasquarelli—Plant Manager, Nalco (an Ecolab company) Garyville, LA facility.

Dr. Chris Roger—VP for R&D, Pall Corp.

Dr. Hyuk Yu—Walter H. Stockmayer Professor Emeritus & Eastman Kodak Professor Emeritus of Chemistry at the University of Wisconsin-Madison

Tulane Collaborators
Prof. Scott Grayson
Prof. Janarthanan Jaya-wickramarajah
Prof. Vijay John
Prof. Kyriakos Papadopoulos
Prof. Mark Fink
Prof. Brian Mitchell
Prof. Gary McPherson

Visiting Researchers
Prof. Fabio Florenzano
Prof. Nodirali Normakhmatov
Prof. Bruno Grassl
Dr. Florence Chauvin
Dr. Frank Bentrem
Prof. Rilton Alves de Freitas
Dr. Daniel Elizarraras
Dr. Gemma Garcia Gonzales
Dr. Aurelie Boyer
Dr. Emmanuel Mignard
Dr. Stephan Moyses
Dr. Mark Reeder
Dr. Atul Bhatnagar
Dr. Marie Dufrechou
Claiom Brussamarello
Evelyn De Melo

Visiting Instructors
Carlo Dessy
Dr. John McConville
Dr. Lily Zhu

Collaborators
Dr. Mark Brader
Dr. Roy Alston
Daryl Cable
Riccardo Williams
Dr. Wesley Whipple
Carl Pasquarelli
Dr. Hua Zheng
Zack Desselle
Grant Heard
Stephanie Steelman
Dr. David Moutz
Prof. Charles McCormick
Prof. Judith Puskas
Prof. John Anderson
John Caldwell (In Memoriam)
Khue Nguyen
Dr. George VonBon-dungen
Dr. Bob Ardoin
Dr. Al Bacas
Dr. Gary Doucette
Prof. Christopher
Barner-Kowollik
Dr. Algirdas Serelis
Prof. Nadya Siliveira
Prof. Dimitrios Samios
Prof. Claudia Sayer
Prof. Ricardo Michel
Prof. Joana Ganter
Dr. Patrick Maestro
Dr. Bruno Amram
Dr. James Wilson
Dr. Marie-Pierre Labeau
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Dr. Serge Henrot
Dr. Francine Palmer
Dr. Jean-Christophe Galland
Dr. Larry Hough
Prof. William Dichtel
Dr. Brian J. Smith
Tracy Cornish-Blauvelt
Paul Ford
Dr. Ling Qi
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