

**Receive hands-on training in diagnosing and solving your polymer R&D problems!**

**The American Chemical Society Presents...**

# Polymer Chemistry: Principles and Practice

## **Seven Compelling Reasons to Register for This Course:**

1. Understand Practical Uses of Various Polymer Characterizations Methods and the Structure-Property Relationships.
2. Learn How Polymers Are Synthesized.
3. Work and Consult with Renowned Authorities in the Polymer Field.
4. Gain Hands-on Experience by Performing or Discussing a Variety of Experiments in the Laboratory Working in Small Groups.
5. Learn to Diagnose and Solve Practical Problems in Polymer Synthesis, Characterization, Mechanical Properties and Processing.
6. Gain a Remarkable Breadth of Knowledge of Polymer Science, Covering a Variety of Topics from Polymer Synthesis to Polymer Processing.
7. Solve Your Practical, Work-Related Problems by Discussing Your Work with Polymer Experts.

## **3 Sessions offered yearly:**

- Sunday – Friday
- mid-March
- mid-August
- mid-December

**The course is held at Virginia Tech, Blacksburg, Virginia**

**Register Today at**  
**[www.ProEd.acs.org](http://www.ProEd.acs.org)**

**Enrollment in this exceptionally popular course is strictly limited to 30 participants. Sessions sell out quickly. Don't delay!**

## Who Should Attend?

Anyone currently working or beginning to work with polymers and their applications, including bachelor degree through Ph.D. level research chemists, engineers, physicists, or technicians should take this course. Managers in the polymer industry will greatly benefit from this in-depth, lecture-laboratory course. No prior knowledge of polymer science is assumed.

**Note:** Because of the amount of lab work, enrollment is strictly limited to 30 people. Each participant should bring comfortable clothing, arriving early enough on Sunday to have a meal and be well rested for the first evening session.

## What You'll Learn

- Polymer synthesis, molecular weight determination and characterization of rheological and viscoelastic behavior
- Polymer structure and morphology
- Mechanical testing of elastomers, plastics, and fibers
- Examples from the fields of adhesion, composites, films, coatings, biomaterials, etc.
- Measurement of various properties of polymers, which are later discussed as functions of chemical composition, molecular weight, topology, morphology, etc.

## Comprehensive Program Agenda

SUNDAY	
4:30 – 5:00 PM	Registration
5:00 – 5:50 PM	Welcoming and Outline of Course (Long)
5:50 – 6:00 PM	Break
6:00 – 7:15 PM	Polymer Terminology and Design Parameters (Long)
7:15 – 7:30 PM	Break
7:30 – 9:00 PM	Step-Growth Polymerization: Polyesters, Polycarbonates & Engineering Thermoplastics (Long)
MONDAY	
8:00 – 9:00 AM	Thermosets (Riffle)
9:00 – 9:10 AM	Break
9:10 – 10:20 AM	Chain Growth Polymerization: Mechanism and Homopolymerization (Long)
10:20 – 10:30 AM	Break
10:30 – 11:30 AM	Free Radical Copolymerization (Riffle)
11:30 – 11:40 AM	Break
11:40 – 12:30 PM	Living Polymerization (Riffle)
12:30 – 1:15 PM	Lunch Together (vans leave at 1:15 for Kelly Hall)
1:25 – 3:00 PM	Polymerization Labs, 240 Kelly Hall (Riffle)
3:00 – 3:20 PM	Return to Lectures - Break
3:20 – 4:15 PM	The Amorphous State of Polymeric Materials (Bortner)
4:15 – 4:25 PM	Break
4:25 – 5:15 PM	Ring-Opening Polymerization (Riffle)
5:15 – 7:00 PM	Dinner, your choice
7:00 – 8:15 PM	Morphology (Moore)
8:15 – 8:30 PM	Break
8:30 – 10:00 PM	Characterization of Morphology (Moore)

**TUESDAY**

8:00 – 9:15 AM	Block and Graft Copolymers (Riffle)
9:15 – 9:30 AM	Break (vans leave at 9:30 for ICTAS II)
9:45 – 11:45 AM	Polymerization Labs, ICTAS II (Long)
12:00 – 1:00 PM	Lunch Together
1:00 – 2:15 PM	Thermal Analysis (Moore)
2:15 – 2:25 PM	Break
2:25 – 3:15 PM	Synthesis of Polyolefins (Matson) (vans leave at 3:20 for Hahn Hall)
3:20 – 5:00 PM	Polymerization Labs, Hahn Hall South 3001 and 3009 (Long/Moore)
5:00 – 6:30 PM	Influence and Determination of Molecular Weight and Molecular Weight Distribution(Long)
	<b>Tuesday Evening Free</b>

**WEDNESDAY**

8:00 – 9:20 AM	Polymer Rheology and Processing (Bortner)
9:20 – 9:30 AM	Break (vans leave at 9:30 for ICTAS II)
9:30 – Noon	Thermal Analysis Lab, ICTAS II (Moore/Long)
12:00 – 1:00 PM	Lunch Together (vans leave at 1:00 for ICTAS II)
1:00 – 1:45 PM	SEC/APC Lab, 285 ICTAS II (Long)
2:00 – 2:15 PM	Break
2:15 – 3:15 PM	Design of Segmented Copolymers: Polyurethanes (Long) (vans leave at 3:20 for HHS)
3:30 – 6:00 PM	Melt Rheology and Processing Lab, HHS and CRC (Bortner)
	<b>Wednesday Evening Free</b>

**THURSDAY**

8:00 – 9:00 AM	Polymer Rheology and Measurement Techniques (Bortner)
9:00 – 9:10 AM	Break
9:10 – 10:00 AM	Viscoelasticity and Free Volume (Moore)
10:00 – 10:15 AM	Break
10:15 – 11:15 PM	Accelerated Testing (Moore)
11:15 – 12:15 PM	Mechanical Testing I (calculators/laptops needed) (Moore)
12:15 – 1:00 PM	Lunch Together
1:00 – 2:00 PM	Mechanical Testing II (Moore)
2:00 – 2:15 PM	Break
2:15 – 4:30 PM	Effects of Internal and External Variables on Polymer Rheology and Elastic Effects in the Viscous State (Bortner)
5:00 – 7:00 PM	ACS Networking Event, Bull and Bones, casual dress.

**FRIDAY**

8:00 – 9:15 AM	Strain-Induced Crystallization (Bortner)
9:15 – 9:30 AM	Break
9:30 – 10:30 AM	Introduction to Biomaterials (Riffle)
10:30 – 11:30 AM	Degradation and Stabilization of Polymers (Riffle)

## About the Faculty

**Timothy E. Long**, Professor of Chemistry, Virginia Tech, is involved with various aspects of chain and step-growth polymerization research including the synthesis and characterization of block, star, branched and segmented copolymers; liquid crystalline polymers; sol-gel chemistry; living polymerization; methodologies; polymer blend compatibilization; and polymeric packaging materials. Previous research experience includes industrial research and development at both Eastman Kodak and Eastman Chemical Company.

**Robert B. Moore**, Professor of Chemistry, Virginia Tech, is involved with fundamental research to characterize and understand morphology-physical property relationships in nanostructured polymers. Current efforts include: control of morphology-transport property relationships in PEM fuel cell systems, characterization and control of actuation behavior in ionomer-based artificial muscles, and the correlation of small-angle x-ray and neutron scattering methods with spectroscopy to characterize morphology and dynamics in heterogeneous polymeric systems.

**Judy S. Riffle**, Professor of Chemistry, Virginia Tech, studies the synthesis of functionalized homopolymers and block copolymers and their activity in metal complexation and particle formation and in understanding structure-property relationships in thermoset copolymer networks.

**Michael J. Bortner**, Assistant Professor of Chemical Engineering, Virginia Tech, has a decade of industry experience working in polymer and composite materials and process development. He was a Senior Process Engineer at Nuvotronics and a VP of Manufacturing Process Development at NanoSonic before returning to Virginia Tech as a Professor in the Department of Chemical Engineering.

**John B. Matson**, Assistant Professor of Chemistry, Virginia Tech, has been a faculty member in the Department of Chemistry since 2012. His research focuses on the synthesis of polymers with applications in biology, self-assembly, and sustainability.

## Here's What Previous Participants Have to Say About This Course

"This group of instructors does an incredible job. Synthesis blends into characterization and then into practical engineering seamlessly. The lectures were both lighthearted and intense."

—Mitch Refvik, Research Team Leader, Chevron Phillips Chemical Co.

"Since my formal training was not in polymer chemistry, this course was valuable to me. It helped me gain a more comprehensive understanding of polymer science. The information I learned will be quite helpful to me in my research program."

—Walt Kosar, Ph.D., Sr. Research Scientist, Technical Polymers Group, Arkema, Inc.

## Course Fee

Check the ACS website to see current member and non-member pricing  
[www.ProEd.acs.org](http://www.ProEd.acs.org)

## Course Location

All lectures are typically held at the **Inn at Virginia Tech**, second floor, or the **Hilton Garden Inn**, located near campus. Laboratory sessions are held in Hahn Hall North, Hahn Hall South, Kelly Hall, and ICTAS II on VT campus. A guide will escort participants to labs. In case of inclement weather, a van will be provided at the front door of The Inn immediately following lecture.

## Lodging Information

The guestroom blocks will be held until one month before each session. To ensure that you are able to book a room at this special rate, we urge you to make your hotel reservation as soon as possible, mentioning that you are an American Chemical Society short course participant. Please check the ACS website for the course location, or contact the MII administration at [mii@vt.edu](mailto:mii@vt.edu).

The closest airport is in Roanoke, VA, about 45 minutes drive from Blacksburg. For those wishing to rent a car, all major rental car agencies have facilities at the Roanoke Airport. Alternatively, bus service is available through Smart Way Bus ([www.smartwaybus.com](http://www.smartwaybus.com)) which will bring you directly to the Virginia Tech campus.

## Payments/Cancellations

All registrations must be prepaid. You may register online or via mail. Please go to the ACS website for full registration instructions.

If you need to cancel your enrollment, you may do so up to ten (10) business days before the session and still receive a refund of your registration fee, minus a \$50 administration fee. The specific cancellation date will be provided in your confirmation letter. After that time, no refund or credit will be issued but you may have a co-worker attend in your place.

# See you in Blacksburg!



**ACS**  
Chemistry for Life<sup>®</sup>



**Macromolecules  
Innovation Institute**  
*At the intersection of science, engineering, and society*