

TROUBLESHOOTING POLYMERIZATIONS

**Tools for Polymerization Troubleshooting:
A case study and problem-solving approach**

**29th North American
Intensive Short Course**

**Monday, June 11
to
Wednesday, June 13
2007**

Directed by

Dr. A. Penlidis, FCAE, FCIC
Canada Research Chair in Polymer Engineering
Professor and Director
Institute for Polymer Research
Department of Chemical Engineering
University of Waterloo

To be held at

**Best Western
St. Jacobs Country Inn
Waterloo, Ontario
CANADA**

TROUBLESHOOTING POLYMERIZATIONS

PROGRAMME

Session 1 Monday, June 11 **9:00 am - 12:30 pm**

Introduction to chain growth polymerization mechanisms and kinetics (radical/ionic); linear, branched, crosslinked chains; rate expressions; molecular weight and long-chain branching expressions; instantaneous property methods; examples of trouble-shooting with typical polymerization data

Session 2 Monday, June 11 **2:00 – 5:00 pm**

Analysis of data using linear regression; pitfalls of linearized models; examples from copolymerization; reactivity ratio estimation techniques; parameter estimation using linear and non-linear regression techniques with single and multiple responses; parameter identifiability; examples from terpolymerization

Session 3 Tuesday, June 12 **9:00 am – 12:30 pm**

Emulsion/suspension processes; copolymer composition control policies; energy balances; effect of impurities in emulsion polymerization; troubleshooting with particle size and molecular weight distributions; diffusional limitations (from low to high conversions); high temperature polymerizations; gelation criteria and crosslinking systems

Session 4 Tuesday, June 12 **2:00 – 5:00 pm**

Discriminating between different models; examples from copolymerization; optimal sensor location and selection; hierarchical designs for estimating variance components in measurement errors; factorial design of experiments; sequential experimental designs; Bayesian approaches; troubleshooting with multiple site catalysts; multivariate analysis with many experimental factors; filtering techniques

Session 5 Wednesday, June 13 **9:00 am – 12:00 noon**

Polymer property characterization techniques; off-line and on-line/in-line sensors; GC, GPC, particle size, density, spectroscopic techniques, DSC, DMA; branching level detection; rheological measurements; case studies and examples with application properties; recent advances (NMR, IR, Raman)

Session 6 Wednesday, June 13 **1:00 – 3:00 pm**

Chemical modification of polymers through reactive extrusion; extruder reactors; polymer reactive extrusion (engineering considerations, types of polymer modification reactions); rubber technology and properties; case studies/industrial applications; recent advances.

All sessions will include **case studies** from a variety of polymerization systems (free radical and catalytic), reactors and monomers. Participants can discuss their own examples and interact with the lecturers. The lecturers have organized courses for more than 20 years involving more than 1000 industrial participants representing more than 60 companies worldwide. The examples used represent state-of-the-art.

REGISTRATION INFORMATION

You may register in the following ways:

via email to Professor A. Penlidis at
penlidis@uwaterloo.ca

via fax to Professor A. Penlidis at:
519/746-4979

*For further information, see also our website (check under "Events" section) at:
www.ipruw.com*

WHO SHOULD ATTEND?

Engineers and chemists involved with polymerization, polymer production technology, polymerization kinetics, process engineering, product development and characterization, modeling, polymer reactor design and optimization, product/process improvement, design of polymerization experiments, data analysis and handling.

Everyone will benefit from learning **problem-solving techniques** and tips for **troubleshooting polymerization behaviour**. The lecturers have more than 75 years of accumulated experience in polymer process/product development and polymerization technology.

All **topics** are highly **practical** and have been tested and re-evaluated repeatedly over the last 28 years and during numerous **industrial in-house** courses.

GENERAL INFORMATION

COURSE FEES

The cost per person is US\$1,000. The course fee includes registration, beverage breaks, course notes and reception/dinner on Tuesday, June 12, 2007 at the University Club. Special discounts exist for two or more participants from the same company.

Upon receipt of intent to register, **further information** will be sent regarding payment options.

COURSE NOTES

The course notes have recently been updated and expanded and are included in the cost of registration. Copies are available for purchase by non-participants for US\$500. Notes will be given to participants just before lectures start.

COURSE/GUEST LECTURERS

Professor Tom Duever, Waterloo
Professor Neil McManus, Waterloo
Professor Costas Tzoganakis, Waterloo

LOCATION

The course will be held at:

The Best Western St. Jacobs Country Inn

50 Benjamin Road East

Waterloo, ON N2V 2J9

Tel: 519-884-9295

Fax: 519-884-2532

Toll-free: 1-800-972-5371

Email: sales@stjacobscountryinn.com

Web: stjacobscountryinn.com

YOU MUST MAKE YOUR OWN HOTEL RESERVATIONS

A block of rooms at special rates has been set aside (until June 1, 2007) for course participants. When contacting the St. Jacobs Country Inn, in order to obtain the special rate, please indicate that you are reserving one of a block of rooms reserved for the University of Waterloo course.

TRANSPORTATION/OTHER DETAILS

For ground transportation or any other details regarding your visit to Waterloo, please contact

Rosemary Anderson
Conference Coordinator
Tel: 519/888-4789
Fax: 519/746-4979
Eml: ipr@uwaterloo.ca

IN-HOUSE COURSES

The Institute for Polymer Research at University of Waterloo has more than 25 years experience in conducting in-house courses specifically tailored to your needs and requirements. Secrecy agreements could be signed permitting the consideration of highly relevant material.

Further information on this course or other courses may be obtained from

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