

POLYMER REACTION ENGINEERING

Tuesday, May 4
to
Thursday, May 6
1999

PROGRAMME

Tuesday, May 4

Morning Session
9:00-12:00

CHAIN-GROWTH
POLYMERIZATION
MECHANISMS AND KINETICS

An introduction to free radical and ionic (heterogeneous and homogeneous Ziegler-Natta and metallocene catalysis) polymerization kinetics.

Topics include:

- ◆ Linear, branched and crosslinked chains via free-radical mechanisms
- ◆ Linear and branched chains via ionic mechanisms (heterogeneous and homogeneous Ziegler-Natta and metallocene catalysis)
- ◆ Stockmayer's bivariate distribution-instantaneous property methods.

Afternoon Session
2:00-5:00

ADVANCED POLYMERIZATION
KINETICS

Topics include:

- ◆ Identification of multiple active site types (GPC, TREF/NMR, TREF/GPC/NMR)
- ◆ Identification of active site performance
- ◆ Long chain branching
- ◆ Ziegler-Natta and metallocene catalysis

6:00 Cocktail Party

Sponsored by Zeton Inc., a leading supplier of pilot plant and catalyst evaluation equipment. The cocktail party part will be held at the Venture Inn. All course attendees are welcome to attend.

Wednesday, May 5

Morning Session
9:00-12:00

EMULSION/DISPERSION/
SUSPENSION PROCESSES

Topics include:

- ◆ Styrenics, PVC
- ◆ Batch, semi-batch and continuous operation
- ◆ Relevant thermodynamics and surface chemistry
- ◆ Particle nucleation/growth
- ◆ Ionic/steric stabilization
- ◆ Particle size distribution and molecular weight distribution

Afternoon Session
2:00-5:30

POLYOLEFINIC PROCESSES

Topics include:

- ◆ Molecular, rheological and solid state properties which are relevant to production, processing and end use applications of polyolefins (LDPE, HDPE, LLDPE, polypropylene, and copolymers)
- ◆ Effects of short and long chain branching and molecular weight distributions
- ◆ Effects of main process variables on productivity and polymer properties
- ◆ Models of polyolefin production processes and plant data comparisons. Examples will include free radical high pressure processes (tubular and autoclave reactors) & heterogeneous catalytic processes (slurry and gas phase)

Thursday, May 6

Morning Session
9:00-12:00

PRINCIPLES OF POLYMER
REACTOR MODELLING AND
KINETIC DATA COLLECTION

In this section, ideas from all previous lectures (i.e. physico-chemical phenomena operative in polymerization systems) will be incorporated into a mathematical model. Steps for the development of a polymerization model will be outlined, and applications/uses of models will be discussed. Important modern aspects on *parameter estimation and the optimal design of experiments* in aid of meaningful kinetic data collection will also be highlighted.

Topics include:

- ◆ Batch, semi-batch and continuous operation
- ◆ Dynamic modelling of reactor systems
- ◆ Population balance equations for particle size and molecular weight
- ◆ Screening and factorial designs for data collection
- ◆ Sequential and non-linear design of experiments
- ◆ Evolutionary operation
- ◆ Model discrimination issues

Thursday, May 6

GENERAL INFORMATION

Afternoon Session
2:00-5:00

MONITORING, DYNAMICS
AND CONTROL OF
POLYMERIZATION
PROCESSES

A good understanding of the reaction mechanisms and of the dynamic behaviour of the reactor system is essential to ensure safe and stable operation and achieve tight product quality control.

Topics include:

- ◆ Overview of current control practices
- ◆ Sensors for monitoring reactor behaviour
- ◆ Energy balance and rate control
- ◆ Control of product properties
- ◆ Model uses to combine on-line and off-line data
- ◆ Kalman filtering and inferential control
- ◆ Software sensors and multivariable statistics
- ◆ Optimal reactor grade changes
- ◆ Advanced linear and non-linear control

5:00

ADJOURNMENT

COURSE FEES

The cost per person is \$1000 US. Two people from the same organization will be charged \$1800. The Course fee includes registration, course notes, coffee breaks and dinner on Wednesday, May 5.

The number of participants is limited to 30 and it is therefore recommended that you register for the course as soon as possible.

Cancellations will not be accepted after April 16, 1999. There is a service charge of \$200.00 US for cancellations.

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 \$400 US. Notes will be given to participants at 8:50 am just before lectures start.

LOCATION

The course is being held at:

VENTURE INN
2020 Lakeshore Road
Burlington, Ontario L7S 1Y2
Tel: (905) 681-0762
Fax: (905) 634-4398

"YOU MUST MAKE YOUR OWN HOTEL RESERVATIONS"

A block of rooms at special rates have been set aside for course attendees. When contacting the Venture Inn please indicate that you are attending the short Course on Polymer Reaction Engineering to obtain the special rate.

LECTURERS

The lectures will be given by the course directors:

Dr. A.E. Hamielec, Professor Emeritus and Director of McMaster Institute for Polymer Production Technology, Department of Chemical Engineering, McMaster University, Hamilton, Ontario, Canada.

Dr. A. Penlidis, Professor and Director of the Institute of Polymer Research, Department of Chemical Engineering, University of Waterloo, Waterloo, Ontario, Canada.

and

Dr. J. B. P. Soares, Assistant Professor, Department of Chemical Engineering, University of Waterloo, Waterloo, Ontario, Canada

IN-HOUSE COURSES

Drs. Hamielec and Penlidis are available to conduct 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 Dr. A.E. Hamielec at:

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