11th Open Polyolefin Reaction Engineering Course

An Industrial Short Course on Olefin Polymerization Processes

Lyon, France

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Course Outline

www.polyolefins.org

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Catalysis, Polymerisation, Processes and Materials

Villeurbanne, France

Course Description

We designed this course for engineers, chemists, and scientists working in olefin polymerization with coordination catalysts, polyolefin physical properties and microstructural characterization.

All sessions include case studies that apply the concepts covered in the lectures to real situations in laboratory and industrial scales. We designed the lectures in a way that both beginners and specialists can benefit from the course.

We will provide an electronic copy of the course notes and of the PRE educational software we developed to illustrate the subjects covered in the course to each participant. We encourage the participants to bring their laptop computers, so they can follow the notes and use the PRE educational software during the lectures.

Instructors

Professor João B.P. Soares is a specialist in the areas of olefin polymerization kinetics and catalysis, mathematical modeling of olefin polymerization processes and polyolefin microstructural characterization.

Dr Timothy McKenna is a specialist in the areas of polyolefin particle morphology and experimental methods for the evaluation of particle morphology, single particle modeling, and the production of impact copolymers.

Dr Christophe Boisson is an expert in the field of catalyst design for olefin polymerization, particularly in the field of single site catalysts for commodity and specialist applications.

Registration

Registration forms and relevant information are available at *www.polyolefins.org* or by contacting us at *info.polyolefins@gmail.com*

The course fee is 4000 CAD$ (equivalent to 2800 € or 3250 USD$) for industrial participants, 1500 CAD$ for students. Special discounts exist for two or more participants from the same institution. Please contact us at *info.polyolefins@gmail.com*for more information.

The course fee includes course registration, an electronic copy of the course notes (pdf), the educational software and coffee breaks. Please note that attendees are responsible for their own lodging and meals.

Location

The course will be held at the *Résidence Villemanzy* in the centre of Lyon.

Registered participants will be provided with a link to reserve their rooms at Villemanzy, should they wish to stay there (it is convenient, and in the centre of town with easy access to restaurants and public transportation).

The PRE Course Series

We designed the PRE course to fill the need in the industry and academia for graduate-level training on polyolefin reaction engineering, characterization and physical properties. This is the 14th public course of the series. Previous public courses have been run in Lyon (FR), Porto Alegre (BR), Dubai (UAE), and Houston (USA).

In addition, we run 3-day and 5-day in-house courses. For more information on the PRE Course Series, please visit www.polyolefins.org

Course Contents

Introduction and Multiscale Concept
- Course contents – Catalytic Polymerization
- Fundamentals of the Multiscale Approach

Catalysts for Olefin Polymerization
- Review of catalyst and cocatalysts types
- Summary of insertion mechanism
- Catalyst supports
- Catalyst characterization

Polymerization with Single-Site Catalysts
- Molecular weight distribution
- Chemical composition distribution
- Long chain branch distribution

Polymerization with Multiple-Site Catalysts
- Characteristics of Ziegler-Natta and Phillips polymers
- MWD/CCD deconvolution for Ziegler-Natta polymers
- Mathematical models for CEF, TREF, CRYSTAF, and HT-TGIC

Principles of Mathematical Modeling
- Population balances
- Method of moments
- Method of instantaneous distributions
- Monte Carlo simulation

Industrial Processes and Reactors -
- Slurry processes
- Gas-phase processes
- Solution processes

Thermodynamics – Sorption and Diffusion
- Non-idealities - multicomponent mixtures
- Review of Modelling Approaches

Polymer Particles: Particle Growth, Morphology and Transport
- Mass and heat transfer in growing polymer particles
- Polymeric flow and multigrain models
- Particle fragmentation – theory and reality
- Morphology models and particle growth

Simulation of Industrial Reactors
- Fluid dynamics
- Heat and mass transfer
- Residence time distribution

Parameter Estimation for Polymerization Kinetic Models
- Homopolymerization models
- Copolymerization models
- Effect of impurities on productivity and molecular weight

Polyolefin Microstructural Characterization
- Gel permeation chromatography
- Fractionation techniques based on chemical composition

Differential Commodity Polyolefins
- Chain walking and late transition metal catalysts
- Production of thermoplastic elastomers via heterogeneous long chain branching
- Production of linear-block olefin copolymers

Software

We will provide a copy of the PRE educational software we developed to all course participants at no additional cost. The PRE education software is composed of a series of Excel spreadsheets covering the following applications:

1. Polyolefin microstructural simulation using Flory's and Stockmayer's distributions
2. Molecular weight and chemical composition distribution deconvolution for multiple-site catalysts
3. Long chain branching modeling
4. Semi-batch and continuous polymerization reactor simulation
5. Polymerization kinetics with coordination catalysts