

Registration Form

Course Offering # **0912-203**

Crystallization Technology

December 7–9, 2009 • New Brunswick, NJ

Priority Code: **520**

(Please use this code when registering)

Dr. Mr. Ms. _____
First Name Last Name

Job Title _____

Company/Institution _____

Company Address _____

City _____ State _____ Zip _____

Tel _____ Fax _____

E-mail Address _____

(Required in order to send confirmation material. CfPA does not rent or sell e-mail addresses)

Note: Please complete separate form for each registrant.

Tuition and Payment Methods

Early Registration (Save \$200)
(Must register and pay by October 12, 2009)

U.S. \$ Single Rate / Group Rate*
1940 / \$ 1860

Regular Registration

U.S. \$ Single Rate / Group Rate*
2140 / \$ 2060

Tuition payable in US funds net of all charges includes continental breakfast, luncheon, breaks, text and course notes.

*Group Rate is per person, for two or more enrollments registering at the same time, from the same company, for the same course.

Note: Payment is due before course start date.

Send Invoice

Purchase Order # _____
(if Required)

Check (payable in U.S. funds to The Center for Professional Advancement)

Credit Card

Visa MasterCard American Express Discover

Card # _____ Exp. Date _____

Cardholder Name _____

Signature _____

3 Ways To Register

- Internet: www.cfpa.com
- Fax registration form to: **732.238.9113**
- Mail registration form to:

The Center for Professional Advancement (CfPA)
P.O. Box 7077
East Brunswick, NJ 08816-7077

General Information

Payment: Tuition payable in US funds net of all charges. Payment is due BEFORE course start date. If payment has not been received two weeks before the course, a credit card will be required to guarantee registration.

Discounts/Rates: To receive the Early Registration Discount, payment is required at time of registration and/or BEFORE early registration discount expires or the regular tuition rate will apply. If choosing invoice/check/wire transfer, payment must be received prior to expiration of early registration discount or the regular tuition rate will apply. All tuition prices are a per person rate. To qualify for the Group Rate tuition, registration must be for two or more enrollments registering at the same time, from the same company, for the same course. Multiple discounts not applicable.

Cancellations/Substitutions/FEES: All cancellations are subject to a \$150.00 processing fee. Applicants may cancel up to two weeks prior to the course start date for a refund. If less than two weeks, a credit will be issued that can be used towards a future course up to one year from the date of issuance. No refunds or credit will be issued for those who do not attend the scheduled course and/or cancel less than two working days before the start date. Substitutions are permitted at any time. If for any reason, CfPA decides to cancel this course, we are not responsible for airfare, hotel or other costs incurred by the registrant. Program content, schedule and instructors are subject to change without notice.

Confirmation Letters: Before each course begins, all registrants will receive written confirmation including detailed information regarding course location – VIA EMAIL. If confirmation is not received two weeks prior to the course please contact Customer Service.

For questions/more information contact Customer Service at 732-613-4500 or info@cfpa.com

Our full terms and conditions can be found on our website at www.cfpa.com

Courses of Interest

- **Active Pharmaceutical Ingredients**
course id# 840
- **Atomization, Sprays and Atomizers**
course id# 1883
- **Granulation, Tableting and Capsule Technology**
course id# 541
- **Microencapsulation and Particle Coating**
course id# 774
- **Mixing of Liquids and Complex Materials**
course id# 1115

Who We Are

The **Center for Professional Advancement (CfPA)** is the largest accredited technical training organization in the world with a curriculum of approximately 350 short courses in 18 industries including Pharmaceutical, Biotechnology, Medical Device, Chemical, Cosmetics, Food and more.

Since our founding in 1967, we have successfully trained nearly a half million people worldwide in topics ranging from basic and introductory concepts to new advances and cutting-edge technology, and current U.S. and European regulations. CfPA courses are offered in a variety of formats – Public offering, Client Site and Online – to fit you or your company's training needs.

Accreditations



The **Center for Professional Advancement** has been approved as an Authorized Provider by the **International Association for Continuing Education and Training (IACET)**, 8405 Greensboro Drive, Suite 800,

McLean, VA 22102. In obtaining this approval, **The Center for Professional Advancement** has demonstrated that it complies with the ANSI/IACET Standards which are widely recognized as standards of good practice internationally. As a result of their Authorized Provider membership status, **The Center for Professional Advancement** is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standards.

The Center for Professional Advancement offers many courses which have a chemical component. Such courses may earn up to 20 Certification Units toward certification by **The National Certification Commission in Chemistry and Chemical Engineering**, sponsored by **The American Institute of Chemists**.

SAVE \$200-Register & Pay by Oct 12

December 7–9, 2009

New Brunswick, NJ

Crystallization Technology

Course Topics Include:

- Recent Advances in Crystallization Processes
- Practical Problems of Crystallizer Operation
- Organic and Inorganic Systems
- Crystal Purity/Effects of Additives
- Non-Ideal Conditions
- Scale-Up and Operating Characteristics

Directed by:

Dr. Wayne J. Genck
President
Genck International



CfPA

The Center for Professional Advancement
Accredited Technical Training Worldwide

www.cfpa.com

The Center for Professional Advancement

P.O. Box 7077, East Brunswick, NJ 08816-7077

Phone: 732.238.1600 • Fax: 732.238.9113

E-mail: info@cfpa.com

www.cfpa.com

Who Should Attend

The course is intended for engineers, chemists and technicians involved with the design, analysis or operation of organic or inorganic crystallization processes at the bench-scale, pilot plant or commercial-scale level including:

- Design Technologists
- Process Development Technologists
- Pilot Plant Technologists
- Plant Operation Technologists
- Vendor Testing

Their supervisors and others working with them can profit from a detailed practical knowledge of crystallization technology.

Learning Objectives

Upon completion of this course, you will be able to:

- Identify the fundamentals of crystallization technology and its application to plant-scale equipment
- Prepare flowsheets and control strategy
- Plan and carry out basic experiments
- Define polymorphism
- Analyze laboratory, pilot plant and plant data
- Perform basic troubleshooting
- Define scale-up techniques

Course Description

This course provides a practical treatment of crystallization technology, presented in light of the many recent advances in the understanding of crystallization processes. Emphasis will be given to the practical problems of crystallizer operation, and a logical way of understanding the potential and limitations of crystallizer performance will be presented. Both organic and inorganic systems will be treated in batch and continuous mode. Elementary topics in the analytical description of particle-size distributions will be presented. The treatment will not emphasize the mathematics of particle distributions, but rather the basic principles involved and the results that can be applied.

Practical problems to be considered are Crystal Size Distribution (CSD) and its interaction with crystal habit, purity, and fouling; secondary nucleation; crystallizer configuration, e.g., seeding, classification, fines removal, scale-up considerations, the impact of mixing, polymorphism, crystallizer transients and stability, and online measurement of crystallization parameters. Efficient techniques for scanning crystal growth, nucleation and habit modifiers will be discussed. These problems will be considered from both analytical and operational points of view.

Participants are asked to bring a hand-held calculator to the course.

Crystallization Technology

COURSE OUTLINE

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First Day

8:00 a.m.: Registration/Continental Breakfast

8:30–10:15 a.m.: Introduction

- Production Specification
- Determining what Precipitates
- Solubility and Supersaturation
- Metastability
- Habit and Internal Symmetry of Crystals

10:30–12:00 noon: Crystallization Basics

- Crystal Growth
- Nucleation Fundamentals/Controlling Nucleation
- The Interplay of Growth and Nucleation in Batch Crystallizations

1:00–2:45 p.m.: Crystal Size Distribution (CSD)

- Properties
- Measurement
- Number Distributions

3:00–5:00 p.m.: The Mixed-Suspension Mixed-Product Removal (MSMPR) Crystallizer

- Population Balance
- Process System Feedback

Second Day

8:30–10:15 a.m.: Crystal Shape and Form

- Controlling Factors
- Complex Forms and Aggregates
- Crystal Aging and Ripening

10:30–12:00 noon: Crystal Purity/Effects of Additives

- How Impurities Incorporate Into the Crystal
- Liquid Inclusions
- Minimizing Impurities
- Habit Modifiers
- Nucleation Inhibitors

1:00–2:45 p.m.: Chiral Crystals and Polymorphs

- Definition
- Thermodynamics
- Monotropic and Enantiotropic Systems
- Polymorph Investigations
- Transformation
- Process Development
- Case Histories

3:00–5:00 p.m.: Non-Ideal Conditions

- Size Dependent Growth
- Growth Rate Dispersion
- Agglomeration and Breakage
- Classified Product Removal
- Fines Removal
- CSD Dynamics

Third Day

8:30–10:15 a.m.: Batch Crystallizers

- Population Balance
- Cooling Curves
- Analysis and Control

10:30–12:00 noon: Scale Up of Crystallizers

- From Beaker to Plant
- Impact of Mixing
- Vessel Configuration
- Secondary Nucleation

1:00–2:00 p.m.: Industrial Crystallizers

- Continuous and Batch
- FC
- DTB
- OSLO
- Surface Cooled and Mechanical

2:00–2:45 p.m.: Operating Characteristics

- Instrumentation
- Control
- Flowsheets
- Reaction Crystallization

3:00–3:30 p.m.: Summary of Calculations and Questions

Text

The text for this course, included in the fee, is *Crystallization 4th Edition*, by J.W. Mullin (Butterworth-Heinemann, 2001, ISBN 978-0-7506-4833-2, www.bhusa.com).

www.cfpa.com

Client Site

Training at your site and at your convenience. For further information, please contact **Client Site** Programs: Direct Dial (USA) +1/732.238.1600, ext. 4549; or fax +1/732.238.9113; or E-mail clientsite@cfpa.com.

Online Training Now Available

A NEW way to experience our accredited training, easily access the knowledge you need through the Internet. For a list of upcoming courses visit www.cfpa.com/online-training.

Course Director

Dr. Wayne J. Genck is President of Genck International, a consulting firm who specializes in crystallization and precipitation. He has consulted for over 180 companies producing inorganic and organic commodity, specialty chemical, fine chemical and pharmaceutical products. Areas of consultation include the effect of additives, caking, design, the impact of impurities, mixing, polymorphism, scale up and troubleshooting.

Dr. Genck authored the chapter on Crystallization for the new 8th Edition of Perry's Handbook and for the 3rd Edition of McGraw-Hill's Handbook of Separation Techniques for Chemical Engineers. He has authored over 25 papers in the field of crystallization and precipitation in Chemical Engineering Progress, Chemical Engineering and Chemical Processing Magazines. Dr. Genck is a member of the steering committee for the Association of Crystallization Technology and is a member of the AIChE Crystallization Program Committee, 2b. He has frequently presented lectures at AIChE meetings and Chemical Engineering Magazine seminars. In addition, he has made presentations at CPhI Conferences and the 1999 Symposium of Industrial Crystallization at Cambridge. He received his B.S. and his Ph.D. from Iowa State University where his thesis was on the kinetics of crystallization.

Additional Faculty

To Be Announced

For the most current information, view the online brochure on our website

Course Location

This course will be held in the **Hyatt Regency** located in **New Brunswick, New Jersey**. A limited block of rooms in the hotel will be held for our registrants until four weeks before the course. Participants must, however, make their own reservations; the cost of hotel accommodation is not included in the course fee. Hotel information will be included with your acceptance. To receive **CfPA's** rate and room block, be sure to mention that you will be attending one of our courses. For reservations call 800.233.1234; outside U.S. call 732.873.1234.