

PROCESS ANALYTICAL SPECTROSCOPY: An Essential Part of the PAT Toolbox

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Course Summary

Process analytical chemistry provides the tools for improving the timeliness, frequency or precision of analytical data through the use of rapid at-line, on-line or in-line analyzers. It is a key tool in efforts to improve asset productivity, lower manufacturing costs and improve product quality. This one-day course will provide an overview of process analytical technology with emphasis on spectroscopic tools, especially near-infrared (NIR), mid-infrared (IR) and Raman. It will provide useful information on how to get started with a project, including the advantages and disadvantages of the available technologies as well as practical issues that arise during real-world implementation. Examples of the use of NIR, IR and Raman analyzers to improve chemical and pharmaceutical manufacturing processes will be discussed.

Among the topics to be covered is an introduction to spectroscopy; an overview of process applications of NIR, MIR and Raman spectroscopy; sampling for process spectroscopy; chemometrics; and guidelines for practical implementation of spectroscopic PAT tools.

Course Outline:

- I. Introduction to PAT
- II. Introduction to Spectroscopy
- III. Other PAT Techniques
- IV. Sampling
- V. Applications of Process Analytical Spectroscopy in Industry
- VI. Calibration: Chemometrics
- VII. Calibration: Chemometrics continued
- VIII. Guidelines for Successful Process Analytical Technology Implementation

Who Should Attend?

This course is geared toward the analytical chemist or engineer who may be involved in process improvement with the intention of using process analytical tools. It will provide a general overview of process analytical chemistry with useful information on how to get started with a project, considering different aspects of the technology and implementation. Further information will be covered on spectroscopic tools, especially NIR, MidIR and Raman, with examples of applications of each of these to chemical and pharmaceutical manufacturing.

About the Instructor

Katherine A. Bakeev works in the Process Analytical Technology and Chemometrics group of GlaxoSmithKline in King of Prussia, PA. She has many years of industrial experience in the electronics, chemical and pharmaceutical industry. She is the recipient of the 2007 Craver Award in Applied Vibrational Spectroscopy for her efforts in, and promotion of, near infrared (NIR) spectroscopy and chemometrics to create greater sophistication in process analytical methods and to obtain improved process understanding. Her work has included work in process analytical chemistry to enhance process understanding with ISP, and as a product specialist for Foss

NIRSystems. She holds a PhD in Polymer Science and Engineering from the University of Massachusetts in Amherst, and a Masters in Technology Management from Stevens Institute of Technology. She has written articles and given numerous presentations on the use of near-infrared spectroscopy (NIR), and is the editor of the book *Process Analytical Technology: Spectroscopic Tools and Implementation Strategies for the Chemical and Pharmaceutical Industries*. She is the president of the Council for Near Infrared Spectroscopy, and a member of the ASTM committees E13 (Molecular Spectroscopy and Separation Science) and E55 (Pharmaceutical applications of PAT).