

EDUCATIONAL EVENTS 2020



**DON'T MISS OUT ON THE
EARLY REGISTRATION FEES**
see website for details





INTERNATIONAL CENTRE FOR DIFFRACTION DATA

For over 75 years, the International Centre for Diffraction Data has been providing the utmost quality powder diffraction data to scientists. As a not-for-profit corporation, we are dedicated to collecting, editing and publishing the world famous Powder Diffraction File™ (PDF)[®]. Through worldwide symposia, workshops, training courses, and the industry's leading conference, the Denver X-ray Conference, we hold true to our mission to promote the application of materials characterization methods and to provide a forum for the exchange of new ideas and cutting-edge knowledge in this field.

Why Choose the ICDD Training Courses?

The purpose of the ICDD training courses is to teach both theoretical knowledge and practical applications of X-ray fluorescence spectrometry (XRF) and X-ray powder diffractometry (XRD). Instructors have extensive experience in the field and are specially selected from academia, government, and industry to deliver the best of theory and practice. The focus on practical applications, hands-on experience, and intense personal instruction differentiates ICDD courses from other training courses. Each course utilizes a team of instructors representing a range of expertise to meet your training needs.

Who Should Attend?

- Lab personnel who wish to improve their analysis skills
- The academic sector currently developing a program or curriculum in XRD or XRF
- Graduate students who wish to gain knowledge in either XRD or XRF theoretical and practical applications
- XRD and XRF field professionals seeking to sharpen analysis skills
- Those who wish to share experiences, knowledge and ideas with peers working in the XRD or XRF field
- Those with questions they wish to discuss with our team of experts

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Employees from some of the nation's most prominent businesses, corporations, government agencies, laboratories and academic institutions participate in the ICDD's clinics:

- ATF
- Boeing
- Boliden Mineral AB (Sweden)
- Bristol-Myers Squibb
- Bruker Nano
- Duke Energy
- Eastman Kodak Company
- ExxonMobil
- Georgia Institute of Technology
- IBM Microelectronics
- IODP at Texas A&M University
- Oregon State University
- Oxford Instruments
- Malvern Panalytical
- Pennsylvania State University
- Rigaku Americas Corp.
- Sandia National Lab.
- SPEX SamplePrep LLC
- U.S. Customs & Border Protection
- USGS
- ZS Pharma

Here's what some of our previous attendees had to say about our education programs:

Excellent clinic. An opportunity to interact with XRF expert practitioners. Another advantage and resource is the participants who come from many different industries with differing expertise.

~ XRF 2019

What great opportunities to interact and learn from the world renowned scientists in powder diffraction filed! A must for anyone who is working on any materials characterization using XRD!

~ XRD I 2019

It was a great course with expert instructors who provided great one-on-one help!

~ XRD II 2019

It was a very interesting clinic with a very experienced and knowledgeable faculty!

~ Rietveld 2018

Incredibly beneficial. As a new user to Rietveld, who lacked experience with programs other than HighScore, this clinic has proved very useful!

~ Rietveld 2018

Practical X-ray Fluorescence Clinic

27 April – 1 May 2020

LECTURES

- Fundamentals of X-ray physics
- WDX and EDX
- X-ray spectrometry instrumentation
- Qualitative, semi-quantitative and standardless analysis
- Introduction to quantitative analysis
- Types and sources of error
- Precision and accuracy
- Calibration strategy
- Drift, line and interelement correction application
- Fundamental parameters
- Maintaining instrument integrity
- Specimen preparation

WORKSHOPS

- XRF instrumentation, components, scope, and comparison using live and disabled WDX and EDX instrumentation
- Selection of parameters for operation
- Hands-on computer exercises in qualitative, semi-quantitative and standardless WDX and EDX analysis
- Hands-on computer exercises employing polynomial regression, line overlap, empirical and fundamental parameter corrections during calibration
- Specimen preparation lecture and demonstration of the use of mixers, grinders, presses, fusion apparatus, etc.
- Discussion of problems encountered by participants

X-ray Fluorescence Faculty



John Anzelmo

Anzelmo & Associates, Inc.,
Madison, WI

Larry Arias

Bruker Nano,
Madison, WI

Eric Smith

SPEX SamplePrep LLC,
Metuchen, NJ

Mary Ann Zaitz

IBM Microelectronics,
Hopewell Junction, NY

Note: Faculty may change without prior notice to attendees.

Fundamentals of X-ray Powder Diffraction Clinic - XRD I

1 – 5 June 2020

- **Production and properties of X-radiation:** continuous and characteristic radiation, absorption, scatter and diffraction
- **Production of monochromatic X-radiation:** choice of source conditions, use of β -filters, proportional detectors and pulse height selection, monochromators, use of solid-state and area detectors
- **Components of the diffraction pattern:** reflection, positions and intensities, Miller indices, effects of scatter and fluorescence
- **Acquisition of good diffraction data:** specimen preparation techniques and measurement of powder patterns using diffractometer methods
- **The powder diffractometer:** optical arrangement, factors affecting instrumental profile width, choice and function of divergence slit, calibration and alignment, detectors, and X-ray optics
- **Qualitative phase identification:** the Powder Diffraction File™ (PDF®), quality of reference patterns, various search/match methods, data analysis strategies for superior results
- Hands-on use of computers for demonstration of the latest software
- Data mining with the Powder Diffraction File™ (PDF®)



8 – 12 June 2020

- Brief review of fundamentals
- **Factors affecting d-spacing of crystals:** unit cell, crystal structure, and solid solutions
- **Factors affecting accuracy of measured 2θ values:** intensity aberrations, specimen displacement, specimen transparency, diffractometer misalignment, and the use of external and internal standards
- **Factors affecting diffraction-line intensities:** structure-based (scattering factors, structure factors, multiplicity); instrument-based (source intensity, optics, slits, detector characteristics); specimen-based (crystallinity, crystal size, microstress, preferred orientation); data analysis method (background subtraction, $K\alpha_2$ removal, smoothing, peak area determination)
- Data mining with the Powder Diffraction File™ (PDF®)
- Use of the Powder Diffraction File™ (PDF®) for qualitative phase analysis—complementary methods, Boolean search methods, use of data other than d/I values
- **Hands-on use of computer methods for qualitative phase identification:** peak-hunting methods, data reduction/treatment methods, search/match techniques, use of elemental data, error windows and probability searching, and scoring algorithms
- **Quantitative analysis:** use of Reference Intensity Ratios, binary mixtures, absorption correction methods, and matrix-flushing methods
- Exploration of powder indexing methods
- Lecture and workshop using the Rietveld method for quantitative analysis

X-ray Powder Diffraction Faculty:



James Kaduk

Poly Crystallography & Illinois Institute of Technology,
Naperville, IL

Susan L. Quick

The Pennsylvania State University,
University Park, PA

Mark Rodriguez

Sandia National Laboratories,
Albuquerque, NM

Earle R. Ryba

The Pennsylvania State University,
University Park, PA

Thomas Blanton, Cyrus Crowder (Emeritus), Timothy Fawcett (Emeritus), Stacy Gates-Rector, Amy Gindhart, Suri Kabekkodu, Justin Blanton and Charles Weth
International Centre for Diffraction Data, Newtown Square, PA

Note: Faculty may change without prior notice to attendees.

Rietveld Refinement & Indexing Clinic

28 September - 2 October 2020

Learn the principles and techniques of Rietveld analysis at ICDD's specialized clinic. Reinforce your learning experiences with our hands-on data analysis training!

Discover the Rietveld method as a powerful tool for:

- Extracting accurate and precise structural information from powder patterns of inorganic, organic, and coordination compounds
- Performing accurate quantitative phase analysis
- Obtaining microstructural information such as size, strain, and texture

Through collaborations with other database organizations and ICDD's editorial efforts, 426,000+ entries in the ICDD's PDF-4+ database have atomic coordinates and related parameters. This clinic will focus on the expanded quantitative and structural analysis capabilities of PDF-4+.

Rietveld Refinement & Indexing Faculty:



James Kaduk

Poly Crystallography & Illinois Institute of Technology, Naperville, IL

Joel Reid

Canadian Light Source, Saskatoon, Canada

Thomas Blanton, Justin Blanton, Stacy Gates-Rector, Amy Gindhart and Suri Kabekkodu

International Centre for Diffraction Data, Newtown Square, PA

Note: Faculty may change without prior notice to attendees.

Registration:

Registration fees for training courses include lecture, workshop and lab materials as well as catered lunches and multiple coffee breaks on all full days. Registrations will be accepted up until two weeks before the start of the course. After that, please call for availability. Payment must be received prior to the course to attend.

Have a group of 3 or more attendees? Contact Eileen Jennings for pricing. To obtain group discount, all registrations (pdf version) must be submitted at the same time. Registrations made before or after are not eligible for the discount.

COURSE REGISTRATION FEES:

Practical X-ray Fluorescence Clinic

By: 16 March 2020 \$1,700* After: 16 March 2020 \$1,950

Fundamentals of X-ray Powder Diffraction Clinic – XRD I

By: 20 April 2020 \$1,700* After: 20 April 2020 \$1,950

Advanced Methods of X-ray Powder Diffraction Clinic – XRD II

By: 20 April 2020 \$1,700* After: 20 April 2020 \$1,950

X-ray Powder Diffraction Clinic – XRD I & II

By: 20 April 2020 \$3,400* After: 20 April 2020 \$3,600

Rietveld Refinement & Indexing Clinic

By: 17 August 2020 \$1,700* After: 17 August 2020 \$1,950

* To receive the early registration fee, payment must be included with your registration form.

Transfer, Cancellation and Refund Policy:

ICDD must guarantee payment for meals and materials in advance. You will receive a 50% refund of the paid registration fee if your written cancellation is received at ICDD 20 business days prior to the start of the class. With less notice, a colleague may take your place, or the course materials will be mailed to you, but no refund will be given.

Please note: A minimum of ten registrants per course is required, otherwise the course may be cancelled and your registration fee refunded. You will be notified of a course cancellation no later than two weeks prior to the start of the course.

Tuition Waivers*:

ICDD offers a limited number of tuition waivers for the XRF, XRD I, XRD II, and Rietveld Clinics. The tuition waivers were established to promote the education of the scientific community, particularly the academic sector, in X-ray materials analysis. Faculty members and graduate students are encouraged to apply. If you are currently developing a program in X-ray fluorescence spectrometry (XRF), X-ray powder diffraction (XRD) or Rietveld analysis, or are interested in incorporating these topics into an established course, a tuition waiver can provide you with the opportunity to learn the principles and practices of these disciplines from experts in the field. Please note that a tuition waiver covers the tuition only; travel and lodging are the responsibility of the attendee.

To apply for a tuition waiver, please submit a one-page written request stating your objectives in attending the course, and/or how you will incorporate these disciplines into your curriculum. Tuition waiver applications must be accompanied by a clinic registration form (pdf version) and received at the ICDD by the application deadline listed below. All applications will be reviewed on a competitive basis, and recipients will be notified no later than four weeks prior to the start of the clinic session.

* Tuition waivers are named in honor of Dr. Eugene P. Bertin, Dr. Ron Jenkins, Dr. Deane K. Smith, and William Frank McClune, pioneers in the field of X-ray powder diffraction and X-ray fluorescence, for their dedication and service to the ICDD's X-ray clinics.

TUITION WAIVER APPLICATION DEADLINES:

XRF – Practical	16 March 2020
XRD I - Fundamentals	20 April 2020
XRD II – Advanced	20 April 2020
Rietveld Refinement	17 August 2020



Location

International Centre for Diffraction Data

12 Campus Boulevard
Newtown Square, Pennsylvania,
19073-3273 USA
Phone: 610.325.9814

ICDD reserves the right to use any and all photographs taken throughout the course to promote the clinics and/or workshops without additional approval from you, the participant.

Lodging & Transportation

Information on host hotel, airport shuttles, driving directions and maps can be found here: <http://www.icdd.com/hotel-and-directions/>