

# 3rd NIST Workshop on Cement Materials Characterization

October 30 – November 1, 2018  
Lecture Room B, Administration Building  
NIST, Gaithersburg, Maryland

## Instructors

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## General Description

This workshop will provide practical information, guidance, and practice for performing chemical and structural analysis of portland cement and portland cement clinker materials. Lectures and practicums will cover quantitative X-ray powder diffraction, quantitative scanning electron microscopy and microanalysis. Additional sessions will give information on measuring aqueous solution composition in cement binders and the reaction rates with water at solid surfaces.

This workshop requires the prior downloading and installation of several open-source software applications onto the participant's Windows or Mac OS X laptop computer. Instructions for preparing the laptop are provided in a separate document.

## Workshop Schedule

### Tuesday, October 30, 2018

8:30	<b>Welcome and Orientation</b>	J. Averill, J. Bullard
8:40	<b>Lecture 1</b> <i>Overview of Cement Characterization</i>	P. Stutzman
9:00	<b>Lecture 2</b> <i>X-rays, powder diffraction, and Rietveld analysis with applications to cementitious materials</i>	S. Feldman
10:30	<b>Break</b>	
10:45	<b>Lecture 3</b> <i>Specimen preparation and phase identification by X-ray powder diffraction</i>	P. Stutzman
11:15	<b>Practicum 1</b> <i>Single phase and simple mixture identification</i>	All
12:00	<b>Lunch at NIST Cafeteria</b>	
12:45	<b>Lecture 4</b> <i>Introduction to Profex-BGMN software</i>	P. Stutzman
1:45	<b>Practicum 2</b> <i>Analysis of single phases and simple mixtures</i>	All
2:30	<b>Break</b>	
2:45	<b>Lecture 5</b> <i>Analysis of clinker and cements using selective extractions</i>	P. Stutzman
3:15	<b>Practicum 3</b> <i>XRD analysis of SRM 2686a clinker</i>	All

### Wednesday, October 31, 2018

8:30	<b>Lecture 6</b> <i>Recap of clinker analysis practicum</i>	P. Stutzman
9:00	<b>Practicum 4</b> <i>Cement analysis exercises</i>	All
10:30	<b>Break</b>	

**Wednesday, October 31, 2018 (Continued)**

10:45	<b>Lecture 7</b> <i>X-ray fluorescence spectrometry I: sample preparation</i>	D. Broton
11:45	<b>Lunch at NIST Cafeteria</b>	
12:30	<b>Lecture 8</b> <i>X-ray fluorescence spectrometry II: calibration, analysis, and examples</i>	D. Broton
1:30	<b>Break</b>	
1:45	<b>Lecture 9</b> <i>Quantitative methods in scanning electron microscopy</i>	P. Stutzman, A. Brand
3:15	<b>Break</b>	
3:30	<b>Practicum 5</b> <i>SEM analysis of SRM 2688 clinker</i>	All

**Thursday, November 1, 2018**

8:30	<b>Lecture 10</b> <i>Analyzing cement microstructure with MicroChar</i>	J. Bullard
9:00	<b>Practicum 6</b> <i>SEM analysis of cement</i>	All
10:30	<b>Break</b>	
11:00	<b>Lecture 11</b> <i>Measuring reactions at solid surfaces</i>	A. Brand
11:30	<b>Lunch at NIST Cafeteria</b>	
1:00	<b>Practicum 7</b> <i>Elective sample analysis, XRD or SEM, and optional lab tour</i>	All