Cement Chemistry and Sustainable Cementitious Materials

About this course

Every day, we see concrete used all around us – to build our houses, offices, schools, bridges, and infrastructure. But few people actually understand what gives concrete its strength, resistance, and utility.

The aim of this course is to offer basic cement chemistry to practitioners, as well as new students in the fields of chemistry and engineering.

You will learn how cement is made and hydrated, as well as the environmental and economical benefits it offers. You’ll learn to test your samples in isocalorimetry in order to track the hydration and to prepare and observe samples by scanning electron microscopy. In the last two weeks of the course, you will also learn how X-ray diffraction works and how to apply it to cements.

Because the course is designed for beginning students, it’s not necessary to have a cement background, however basic concepts in chemistry and crystallography will help. This course lasts 6 weeks, during which you can take theoretical courses and tutorials to test the cement in the laboratory.

What you'll learn

- Understanding of the hydration of cement
- The science and utility behind Supplementary Cementitious Materials in concrete technology
- Best practices (via tutorials) for testing samples through X-Rays diffractometry, Scanning Electronic Microscopy and Isocalorimetry

Course Syllabus

**Week 1: Research context on sustainable cementitious materials**
Set up the context of sustainability in the research about cementitious materials

**Week 2: Hydration of cement**
Introduction to cement chemistry and hydration mechanism
Week 3: SEM-EDX
How to use SEM-EDX to characterize cement. Learn the best practices and LMC tips.

Week 4: Cement and kinetics
Go deeper in cement hydration and kinetics of the reaction. Learn how to use isocalorimetry to follow the reaction: best practices and LMC tips.

Week 5: XRD 1
Learn the basics on XRD and how to prepare samples for XRD

Week 6: XRD 2
Apply XRD to cementitious materials and go deeper on analyzing the XRD results.

Meet the instructors

• Karen Scrivener
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• Dr Ruben Snellings
Researcher at the Sustainable Materials Management
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Course details

- Length: 6 weeks
- Effort: 3 – 4 hours per week
- Price: Free
- Institution: EPFLx
- Subject: Science
- Level: Intermediate
- Languages: English
- Video Transcripts: English