

Doctoral course

Cement hydration, including supplementary cementitious materials

Date and location: 21 August 2024 and 22 August (1.5 days), [INSA Toulouse](https://www.insa-toulouse.fr), France

Overview of the course

Cement hydration is the central process by which cement and concrete works! It is behind the transition from a fluid suspension a strong solid. It leads to the final microstructure which governs the properties of the material, from mechanical to durability.

This course will go from the basics to the latest thinking on mechanisms.

Target audience

The courses are aimed at doctoral/post-doctoral students and industrial researchers in the field of construction materials and civil engineering.

Prerequisites

Basic knowledge of cement and concrete.

Detailed content

Day 1 morning

Lecture 1: Context

- Why is concrete the most used material on earth?
- Why do we have "Portland" cement are there alternatives?
- Where does its carbon footprint come from and what can we do about it?
- What is clinker?

Lecture 2: The basics of the analytical techniques for studying hydration and microstructure

- Continuous methods: Calorimetry and chemical shrinkage
- Bulk techniques: XRD, TGA
- Electron Microscopy
- Solid state NMR

Lecture 3: Cement hydrates

- C-S-H
- Aluminate hydrates

LUNCH

Day 1 Afternoon

Lecture 4: Alite/C3S Hydration

- Induction period
- Main Hydration peak.

- Later hydration.

Lecture 5: Hydration of the other clinker phases

- Aluminates and sulfate addition
- Belite ferrite
- Microstructural evolution

Lecture 6: Overviews of additions / SCMs

- Limestone
- Slag
- Pozzolans

Day 2 morning

Lecture 7: Impact of SCMs on hydration

- Filler Effect
- Later hydration measurement and limitation.

Lecture 8: Limestone calcined clay cement

- Clay selection
- Hydration
- properties

Lecture 9: Porosity

- Types of porosity
- Techniques for measurement.
- Implication for properties and modelling.

General organisation

The doctoral course will consist of 3 half-days of theoretical courses

A certificate of attendance will be issued at the end of the course.

Speaker



Karen Scrivener has been Professor and Director of the Laboratory of Construction Materials in the Department of Materials of EPFL (Ecole Polytechnique Federale de Lausanne for the last 20 years. She is a Fellow of the UK Royal Academy of Engineering and author of over 200 journal papers. Her research focuses on the understanding the chemistry and microstructure of cement-based materials and improving their sustainability. In 2008, she came up with the idea for LC3 cement, this material has the potential to cut CO₂ emissions related to cement by more than 400 million tonnes a year. She received her bachelor's degree in Materials Science from the University of Cambridge in 1979 and her PhD from Imperial College London in 1984.

Fees and registration to the course: <https://rilem-week2024.sciencesconf.org/resource/page/id/19>

More details about the conference: <https://rilem-week2024.sciencesconf.org/>