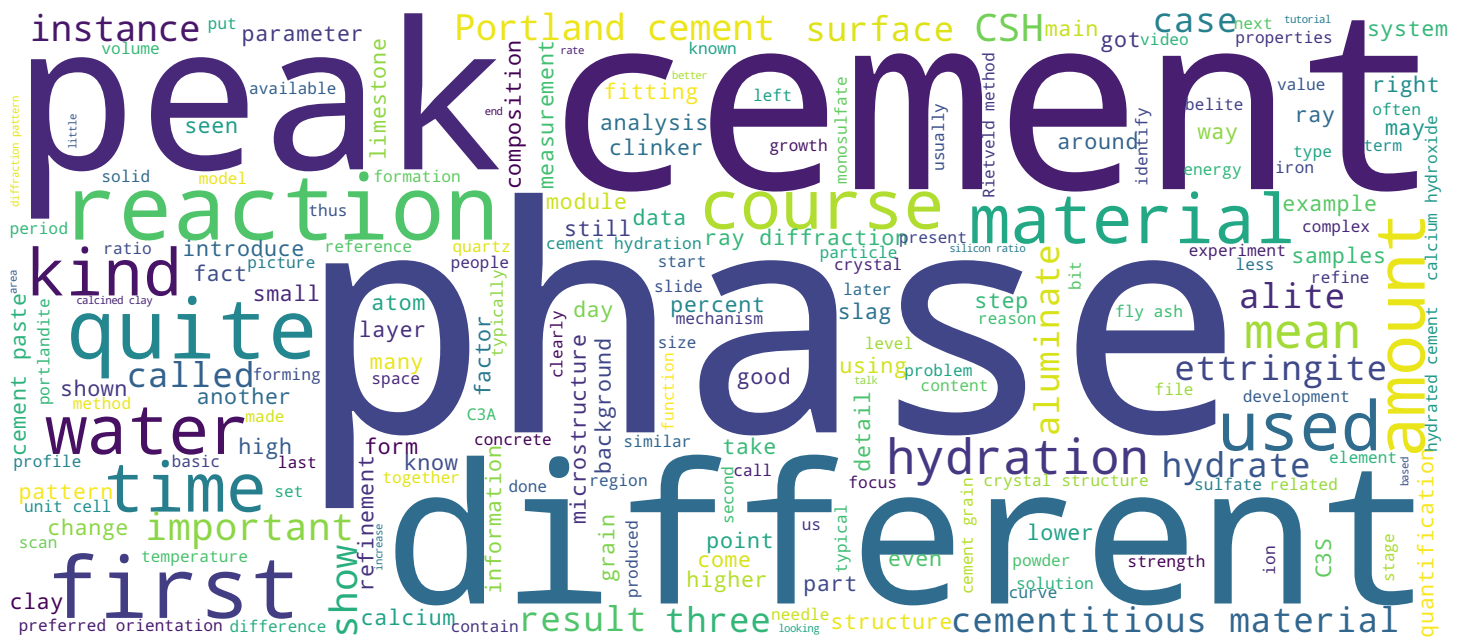


Cement Chemistry and Sustainable Cementitious Materials

Aurélie Favier



Search MOOC



Video



Welcome



- 2 main parts
- Cement chemistry
 - Sustainability
 - Cement hydration
 - Cement kinetics
- X ray diffraction
 - Qualitative analysis
 - Quantitative analysis by Rietveld method

Hello I'm Aurelie Favier, project manager of this course and I would like to welcome you to cement chemistry and sustainable cementitious materials. This course will introduce you to the basic of cement hydration and how to develop and characterize low carbon cement. It is divided in two main parts. The first part will introduce the sustainability and the chemistry of cementitious materials during four weeks. The last two weeks will focus on the use of x-ray diffraction for the analysis of low carbon cements.

Notes

Summary

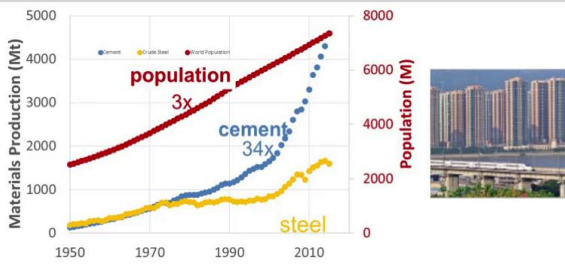


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Week 1: Introduction



Growth in cement use in last 70 years



• Sustainability of cement

- CO₂ emissions
- Growing demand
- Use of supplementary cementitious materials
- LC3 technology : use of calcined clays and limestone

Limestone
Calcined
Clay
Cement

LC³

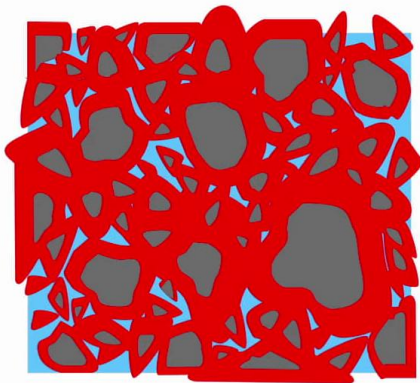
During the first week, Professor Scrivener will introduce you to the challenge facing research and development of cements. It will detail a viable solution to meet the ecological challenges and growing demand for building materials.

Notes

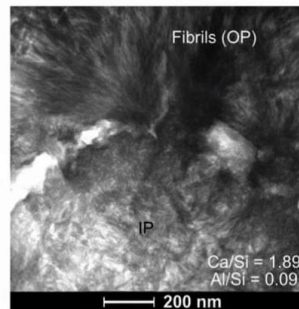
Summary



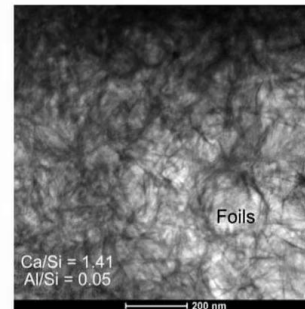
Week 2: Cement hydration



- Cement hydration
 - Basic in cement chemistry
 - Changes in microstructures



(a) Plain cement (PC), 90 days, 20°C



(b) PC 10SF, 90 days, 20°C

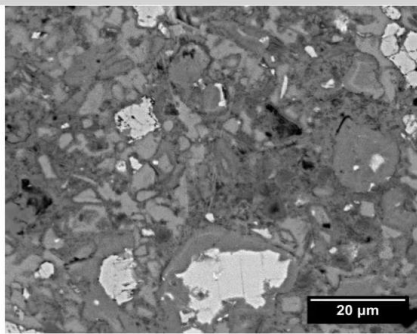
In week two, we will begin the course on the hydration of cement. You will learn how those microstructures evolve and the consequences on the properties at short, medium and long term.

Notes

Summary



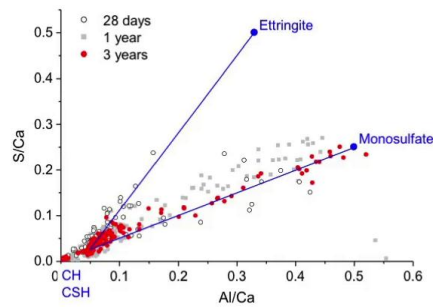
Week 3: Scanning Electron microscopy



• SEM

- Tutorial videos
 - Stopping hydration
 - Polished sections preparation

• Use of SEM -EDX



To complete the course on hydration, week three will be a tutorial on the use of scanning electron microscopy on polished surfaces to characterize a cement during hydration. A first video will explain how to stop hydration, prepare and polish samples for microscopy. Then the second tutorial will show you how to use a SEM to identify the phases and quantify them.

Notes

Summary



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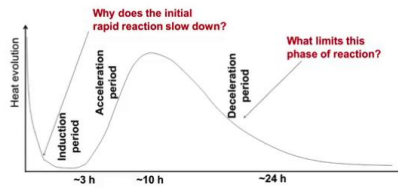
Week 4: Cement kinetics



Kinetics are key



underlying mechanisms not well understood



- Cement kinetics

- Step by Step
- Effect of SCMs
- Tutorial video on isocalorimetry

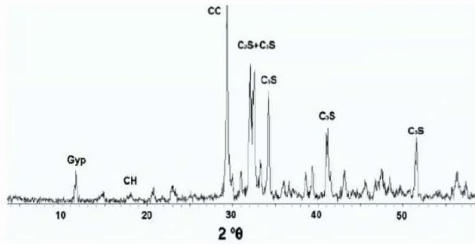
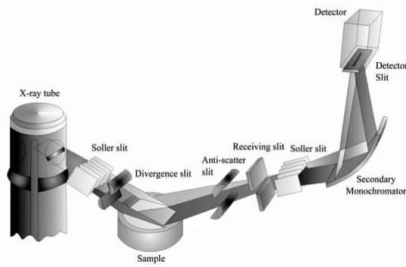
The last week of the first part will detail a different kinetics of cement hydration and will be illustrated with a tutorial on isothermal calorimetry to monitor the progress of reaction.

Notes

Summary



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• X ray diffraction

- Introduction
- Phases identification
- Qualitative analysis
- Quantitative analysis using Rietveld method

• And also....

Tutorials videos

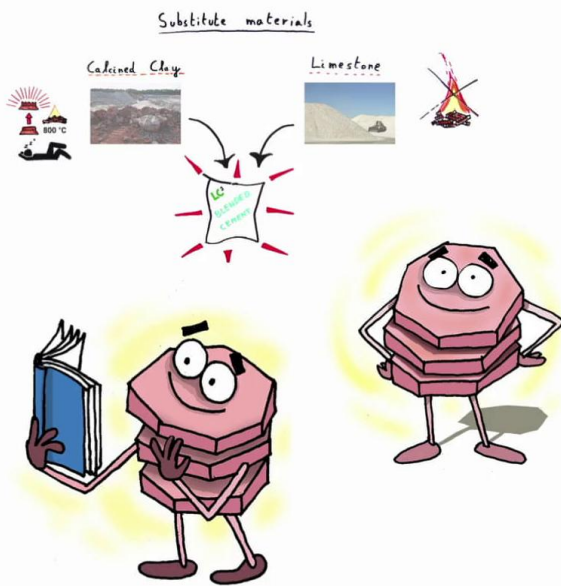
Finally the two last weeks will focus on the use of x-ray diffraction to characterize anhydrous cements, hydrated phases and supplementary cementitious materials. You will find different demonstration videos to illustrate the data acquisition, phases identifications and quantification by Rietveld method.

Notes

Summary



In general...



- Extra videos on LC3 project
 - With the participation of Prof Fernando Martirena
- References
- Links
- Quizzes and exercises



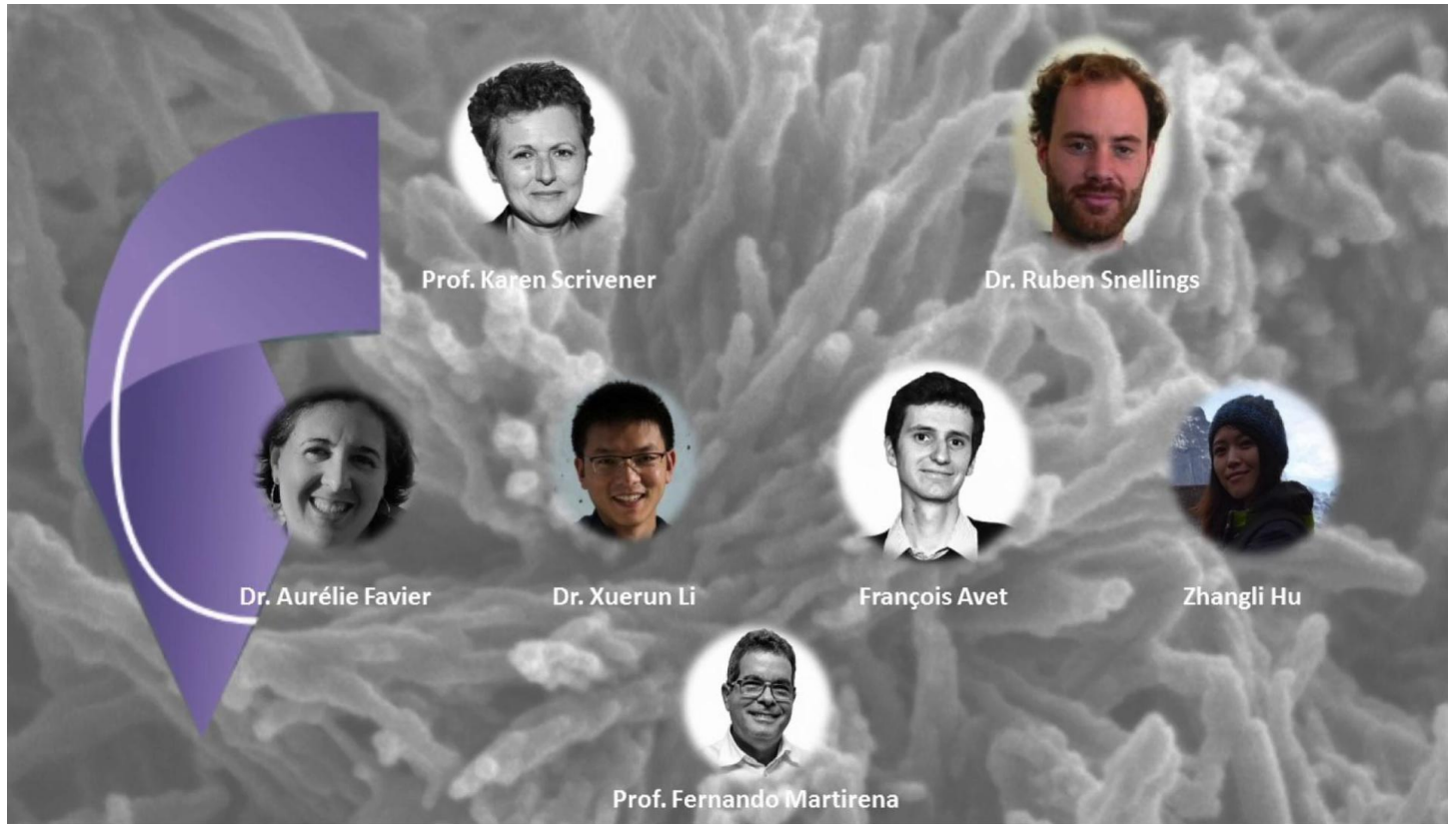
Throughout this course, you will find quizzes, exercises, documents and complementary links, as well as videos on the development of limestone calcium clay cements called LC3.

Notes

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The whole team thanks you for your participation and wishes you a good time with us.

- Notes

Summary

