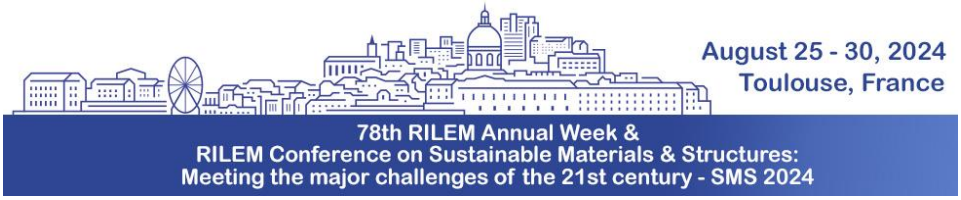

Doctoral course
Durability of concrete – exogenous and endogenous reactions

Date and location: 23 August (1 day), INSA Toulouse, France

Overview of the course

The durability of concrete is a key parameter in terms of the safety, economic cost and environmental impact of structures over their service life.

Durability is dependent on environmental conditions and the chemical and physical stresses to which structures are exposed in their environment, but also on internal reactions that may develop under the effect of the composition of the concrete and/or its thermal history, for example.

The course will aim to cover the spectrum of exogenous (external attacks) and endogenous (internal swelling reactions) chemical attacks on concrete, by considering the reaction mechanisms, the influencing parameters, in particular those relating to the composition and characteristics of concrete, the test methods, the normative aspects, etc.

This course will go from the basics to the latest findings on the aspects listed above.

Target audience

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

Prerequisites

Basic knowledge of cement and concrete, in particular cement hydration, and microstructure of cement paste/concrete. Ideally, participants will have taken the hydration course given in the same session on 21 and 22 August: https://rilem-week2024.sciencesconf.org/data/pages/pre_congress_cement_hydration_SCM_1.pdf

General organisation

The doctoral course will consist of 2 half-days of theoretical courses.

Detailed content

Introduction: Concrete structures in their environment: overview of potential attacks

- *Examples of strategic structures (bridges, soft water and waste water management structures, marine infrastructures, agricultural facilities, etc.)*

Standard environnement

- *Cement standardisation EN 197-1*
- *Classification of aggressive environments and recommendations in EN 206, FD P 18-011 – principle and lacks*

Reminders: cements, hydration, microstructure of cement paste and reactive transfer.

Exogenous and endogenous attacks: mechanisms, performance of concrete

Exogenous reactions

- *Leaching: pure water, acids*
- *Carbonation*

- *Soft water (magnesium, carbonate)*
- *Sulfates*
- *Sea water (sulfate, magnesium, carbonate)*
- *Biological attacks: sewage systems (biogenic acid), agricultural environments, WWTP*

Endogenous reactions

- *Delayed Ettringite Formation and Alkali-Aggregate reactions*

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

Speakers

Alexandra Bertron is a professor of Civil Engineering at INSA Toulouse, France. She is Deputy Director of the Laboratory for Materials and Durability of Construction (LMDC). Her research topics concern the durability of cementitious materials in chemically aggressive environments and in particular in biological environments (sewer systems, agricultural media, nuclear waste storage, etc.) and the related biogeochemical interactions, as well as the indoor air quality (gaseous and microbial pollution, photocatalysis). She was awarded several recognitions including: the Robert L'Hermite Medal (2014), IUF junior member (2016-2021), and RILEM Fellow (2021). She is the Editor-In-Chief of RILEM Technical Letters, the RILEM Open Access journal, and Associate Editor of Materials and Structures.

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/