August 25 - 30, 2024
Toulouse, France

78th RILEM Annual Week &
RILEM Conference on Sustainable Materials & Structures:
Meeting the major challenges of the 21st century - SMS 2024

PhD course on Rheology and processing of fresh cement-based materials

Date and location: 22 August 2024 and 23 August (1.5 days), INSA Toulouse, France

Competence targets

The objectives of the courses are the following:

- Provide an overview of the physical and chemical origin of the rheological behavior of fresh cement-based materials and of the changes induced by the use of organic polymers (admixtures)
- Provide an overview of the measurement techniques from standard industrial testing to advanced rheometry
- Provide an overview of the relation between rheology requirements and processing of fresh concrete.

Topics

The following topics will be addressed during the course:

- Components physical properties; particle morphology; packing properties.
- Colloidal interactions; Brownian motion; hydrodynamic dissipation; particle inertia – direct frictional contacts.
- Polymer conformation; polymer adsorption; plasticizers; viscosity agents; competitive adsorption
- Non-Newtonian fluids; thixotropy; hydration and loss of workability.
- Rheometry – oscillations - quality control.
- Mixing and granulation; pumping; casting and pouring; spraying and coating; formwork pressure; segregation and bleeding; 3D printing
- Computational fluid dynamics – distinct element methods – process engineering

Preparatory reading

The following paper should be read before the lecture:

- Computational modeling of concrete flow: General overview, Roussel, N. ; Geiker, M.R. ; Dufour, F. ; Thrane, L.N. ; Szabo, P., Cement and Concrete Research, Volume: 37 Issue: 9 Pages: 1298-1307, 2007
- Steady state flow of cement suspensions: A micromechanical state of the art, Roussel, N. ; Lemaitre, A. ; Flatt, R. J. ; Coussot, P., Cement and Concrete Research, Volume: 40 Issue: 1 Pages: 77-84 , 2010
- Rheology of fresh concrete: from measurements to predictions of casting processes, Roussel, N., Materials and Structures, Volume: 40 Issue: 10 Pages: 1001-1012, 2007 Adapt earthen material rheology to process requirements including 3D printing

Speaker

Nicolas Roussel is the head of the physico-chemistry of construction materials laboratory at Gustave Eiffel university, France. He is moreover the current president of RILEM. His research focuses on mix design, rheology and processing of construction materials. With 135 journal papers and more than 10.000 citations, his H-index is currently 54. He received in 2007 the Robert L'Hermite medal for his work on fresh concrete rheology and processing.

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/