XL cycle PhD Course, Academic Year 2024/2025

"MODELS AND METHODS FOR MATERIAL AND ENVIRONMENTAL SCIENCES"

Innovative low-clinker limestone cements containing carbonated recycled concrete: hydration and durability issues.

Abstract:

The cement industry is a significant contributor to global greenhouse gas emissions, accounting for 5-8% of total emissions. With global cement production projected to increase by 12-23% by 2050, there is a pressing need to mitigate its environmental impact while maintaining the technical performance of cement. Efforts to reduce CO_2 emissions have explored alternatives such as Portland Limestone Cement (LC), which offers comparable technical properties with reduced clinker content. However, challenges such as susceptibility to sulfate attacks and the generation of large quantities of cement paste fines from the construction and demolition wastes, remain unresolved.

To address these issues, the Ph.D project is aimed at developing innovative low-clinker limestone cements incorporating carbonated recycled concrete fines and test their performance.

Hardened cement paste fine fractions, derived from both laboratory-prepared and real construction and demolition waste, will be carbonated; the carbonation conditions will be optimizedto to improve the reactivity when integrated as supplementary cementitious materials in innovative cement blends. The project involves laboratory studies on hydration kinetics, structural and microstructural development, and material performance in demanding environmental conditions.

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