



SUBLime

Sustainable Building Lime
Applications via Circular Economy
and Biomimetic Approaches



OPEN PhD POSITION in European Training Network

We are looking for a dedicated and highly motivated Early Stage Researcher (ESR), who will join our team to craft the future of lime mortars/plasters in new construction and conservation of the built heritage.

SUBLime description (4 years ETN project starting February 2021)

Lime is one of the earliest industrial commodities known to man and it continues to be one of the essential building blocks of modern Society. The global lime market is anticipated to approach the value of 44 Billion Euros by the end of 2026 and resulting in various growth opportunities for key players. The SUBLime network aims to develop the most advanced technology in lime-based materials modelling and characterization for industrial use that will go beyond the limitations of existing solutions in new construction and conservation in the built heritage. It is dedicated to recruit and train fifteen PhD students in multiple scientific and engineering fields towards a better understanding and development of sustainable innovations in both added functionalities and sustainability aspects in lime mortars and plasters, strongly based on novel biomimetic and closed loop recycling approaches. The cross-disciplinary approach throughout the SUBLime value chain, leveraging the knowledge of the academic (6) and industrial members (11), such as lime producers, mortar/plaster/block producers, and end-users for the prioritization of industrial needs, will dramatically increase the transfer of scientific knowledge to the lime-consuming industries in the EU.

ESR1 – TU DELFT

Reaction Kinetics and microstructural simulation of lime-based materials

Objectives: to build up a numerical model which can simulate the chemical reaction process, and microstructural formation of lime-based materials. The generated microstructures will be used as input for predicting the physical and transport properties of lime-based materials, and act as a tool for designing new generation of sustainable/functional lime mortars/plasters. The focus will be mainly in the development of reaction kinetics model which will consider the chemical composition of lime, liquid to powder ratio and reaction temperature. In the kinetics model the volume fraction of reaction production (mainly calcium hydroxide), unreacted lime and capillary pores will be simulated explicitly. Based on the reaction kinetics model developed above, the physical and chemical process, i.e., the dissolution, nucleation and growth of lime will be simulated by coupling ion transport and thermodynamics, where Lattice Boltzmann methods will be employed to deal with ions transport, while Phreeqc will be employed to simulate the chemical reaction and thermodynamics. In the end a comprehensive microstructure of lime mortar can be obtained, including the pore structures, pore solution chemistry, crystal phases and amorphous phases.

Expected Results: to produce a framework for simulating the chemical reaction and microstructural development of lime-based materials. And use as input to upscale to meso-, macro- scale of Lime-mortar.

Keywords: lime, mortar, reaction kinetics, microstructure, numerical simulation

Applicant Profile: Master level in Civil Engineering or Materials Sciences and Engineering, or related field, ideally with background in numerical simulation. Excellent communication skills (both written and oral) in English.

PhD main locations: The recruited ESR is given the opportunity to conduct 4 years of PhD studies at [Section Materials and Environment/Microlab](#) of the [Delft University of Technology](#) but also to visit other network partners for secondments ([University of Granada](#), [Carneuse](#)), and to attend the training events of the network.

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More details about SUBLime project, requirements for the candidates and recruitment procedure: www.sublime-etn.eu/jobs/

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