SUBLime
Sustainable Building Lime Applications via Circular Economy and Biomimetic Approaches

Marie Skłodowska-Curie Actions

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.

ESR9 – TU Darmstadt

Cradle-to-grave sustainability of novel lime-based materials

Objectives: The main aim is to quantify improvements in Environmental and Economic sustainability indicators of the innovative solutions developed by the SUBLime partners, in comparison to current lime-based mortars and plasters. Life cycle assessment (LCA) analysis will include the baseline scenario and following innovative solutions: a) use of lime waste materials such as paper mill $Ca(OH)_2$ sludge or carbide lime (a byproduct of the acetylene industry), taking into account impacts of purification steps versus avoided impacts of landfilling and related environmental hazards; b) novel biomimetic metal-enzymes as carbonation accelerators, increasing CO_2 capture and reducing greenhouse gases; c) hydrophobic and self-cleaning lime-based mortars and plasters and self-healing mortars with increased durability, which through increased service life reduce use of raw materials and creation of waste; d) use of recycled fines from the construction industry in lime-based applications, reducing the need for virgin raw materials; e) life cycle inventory data will be obtained from existing databases as well as from the lime producers and EU Lime association (EuLA). The functional unit will comprise multiple criteria: a volume of the mortar/plaster material as well as including functional specifications such as strength and thermal properties. Open source (e.g. Open LCA, CCaLC, Bees) and commercial (SimaPro) tools will be used.

Expected Results: Established baseline environmental profile for the current lime-based mortars and plasters. Filling the gap in literature on LCA results considering the synthesis and applications of the innovative smart additives, and use of waste as raw materials. Improved sustainability of the SUBLime innovative solutions will be quantified. Advanced LCA approach focused on detailed description of the cradle-to-gate processes, and extended with novel approaches to predict service life and CO_2 capture.

Keywords: Life cycle assessment (LCA), lime, mortar, smart additives, waste raw materials, service life, CO_2 capture.

Applicant Profile: Master level in Chemical (Materials or Process) Engineering, Structural Engineering (building materials) or related field, ideally with background in LCA and/or numerical methods for design of sustainable construction materials. Excellent communication skills, both written and oral in English.

PhD main locations: The recruited ESR is given the opportunity to conduct 3 years of PhD studies at Institute of Construction and Building Materials at the TU Darmstadt and to visit other network partners for secondments (Magnel-Vandepitte Laboratory for Structural Engineering and Building materials of Ghent University and EuLA), and to attend the training events of the network. The plan is to arrange a double PhD degree in collaboration with Ghent University.

Main contacts:

Eddie Koenders, Full Professor, **koenders@tu-darmstadt.de;**
Neven Ukrainczyk, Senior Scientist, **ukrainczyk@tu-darmstadt.de;**
Nele De Belie, Full Professor, **nele.debelie@ugent.be**

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