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.

ESR6 – UGENT

New possibilities of recycling and new admixtures in lime-based mortar

Objectives: To enhance the sustainability of the construction industry, the construction and demolition waste should be recycled, as far as possible in high value applications. The overall quality of recycled concrete aggregates is generally lower than that of natural aggregate, due to the mortar that remains attached to the natural aggregate. Studies on the use of recycled concrete aggregates in concrete show that various mechanical and durability properties can be improved, if the attached mortar can be separated better from the recycled aggregates. When using a classic recycling process, exhibiting only one crushing action by a jaw or impact crusher, approximately 50 wt% of recycled aggregates and 50 wt% of recycled sand extremely high in filler (<63 µm), can be obtained. To improve this sand quality, the fines can be further separated from the sand. Another possible source of fines is washing sludge from aggregates production. The fines induce a high water and admixture demand in concrete, may have a higher content of SO_3, etc., making their use difficult. These fines, however, could find a positive use in lime mortars. Since they come as fines, the need to grind them as raw materials is omitted. Furthermore, the lime mortar could benefit from the unreacted cement and/or uncarbonated calcium silicate hydrates that are present, as nuclei for the further hydration reactions. To compensate for the water demand and to improve the mortar's performance, the combination with various types of (new) admixtures will also be investigated.

Expected Results: The research results will lead to increased sustainability of the construction industry, as recycled fractions from this industry are used in new buildings. Physical, chemical, and mineralogical characteristics of the fines and their variability will be determined. Their compatibility with different natural and hydraulic lime mortars will be investigated and their concentration in the mix will be optimized, in function of their characteristics. The effects on lime fresh/hardened properties and performance parameters will be analyzed.

Keywords: recycling, lime mortars, plasters, fines, admixtures.

Applicant Profile: Master level in Civil Engineering (building materials) or related field, ideally with background in relevant experimental research. 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 the Magnel-Vandepitte laboratory for Structural Engineering and Building materials of Ghent University. The ESR will visit also other network partners for secondments (Institute for Sustainability and Innovation in Structural Engineering (ISISE), University of Minho, Portugal; Fels, Germany), The ESR will in addition attend the training events of the network.

Main contacts:

Nele De Belie, Full Professor, nele.debelie@ugent.be (supervisor)
Miguel Azenha, Assistant Professor, miguel.azenha@civil.uminho.pt (co-supervisor)

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