LONG LASTING REINFORCED CONCRETE FOR ENERGY INFRASTRUCTURE UNDER SEVERE OPERATING CONDITIONS

Introduction

As population is steadily growing, there will be an increasing demand for energy worldwide in the coming 30 years. New infrastructure projects for energy require long service life spans (up to 100 years) which are particularly hard to achieve in aggressive environments and extreme operating conditions like arctic and sub-arctic areas (low temperatures), desert areas (high temperatures), coast lines (high chloride content), deep-sea or underground (large temperature gradients and high pressure), etc. when conventional concrete materials are used. Durable materials however are paramount for safety and functionality of constructions.

Objectives

The main goal of the LORCENIS project is to develop long lasting reinforced concrete for energy infrastructures with lifetime extended up to a 100% under extreme operating conditions.

ChemStream

ChemStream will develop super absorbing polymers (SAPs), also named hydrogels, to be mixed within the concrete matrices for improving the active internal curing, self-healing and self-sealing properties of the concrete. Up till now most applications of SAPs in concrete are based on commercial SAP powders that have a given composition and particle size. The purpose of ChemStream is to base itself on other types of polyelectrolyte chemistry *(based on EP2835385A1 by Geert Deroover & Els Mannekens)* and in varying the particle sizes by grinding the synthesized SAP materials using the RETSCH ZM200 centrifugal mill.

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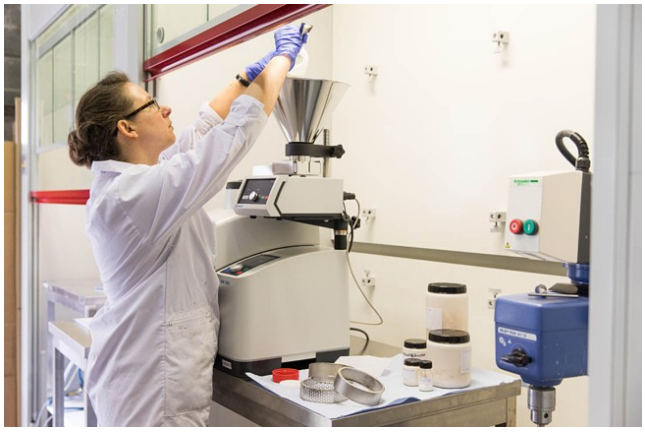

Figure 1: Grinding the synthesized SAP materials using the RETSCH ZM200 centrifugal mill

In the first stage of the work the Magnel Laboratory at Ghent University, specialized in concrete research, will test the different SAPs in standard concrete mixtures at lab level. From these tests the preferred compositions, particle sizes and concentrations will be deduced. At a later stage, the best SAPs will be further incorporated in specific reinforced-concrete mix designs for extreme operating conditions by other partners in the project at a larger scale. Therefore, ChemStream will equally upscale the synthesis protocols in order to foresee the partners with batches up to 2 to 3 Kg in scale.

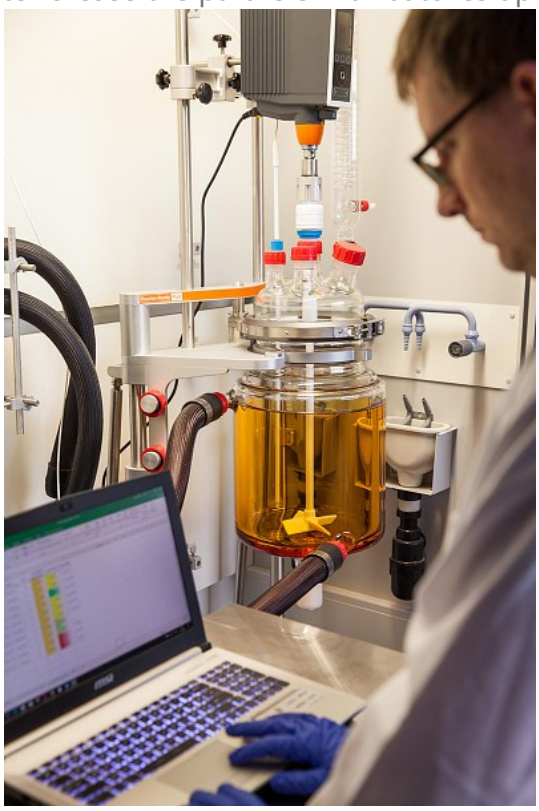

Figure 2: SAP synthesis protocols for upscaling

Project website: **https://www.sintef.no/projectweb/lorcenis/consortium/chemstream/**

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