An ultra-reactive low CO2 binder for mortar

To help reduce the carbon footprint of the cement and concrete industry, Imerys offers a low CO2 ultra-reactive mortar binder technology solution.

Starting date of the project	2019
Project Localisation Places of implementation of the project at this stage and targeted geography if replicable.	Lyon and Fos Sur Mer, France
Project objectives Type of climate innovation of the project with a description of the problem/issue addressed	Reducing the carbon footprint of concrete by developing a new range of bindings.
Detailed project description	Carbon emissions of the cement and concrete industry represents around 8% of the world CO2 emissions. To contribute to the reduction of cement carbon footprint, Imerys is developing an ultra-reactive and low CO2 concrete. The innovation is Imerys advanced range of specialized calcium aluminate's binders. It dissolves much more rapidly in water that traditional calcium aluminate. This ultra-reactivity enables Imerys clients to adjust their formulations, and to reduce the global quantity of binder used in fast concrete setting, and dry mortar, while keeping the same performance level. Diminishing the binder content can reduce CO2 emissions by 40% in technical mortar application. This contributes to reducing the global impact of the construction sector.

Main project's drivers for reducing the greenhouse gas emissions

Reduction levers	Details on the aspects of the project
☐ Energy and resource efficiency (including behaviour)	
☐ Energy Decarbonisation	
☐ Energy efficiency improvements	
☒ Improving efficiency in non-energy resources	Reducing the quantity of binder needed in fast setting concrete and dry mortar with the same performance level.
☐ Emissions absorption: creation of carbon sinks, negative emissions (BECCS, CCU/S, ...)	
☐ Financing low-carbon producers or disinvestment from carbon assets	
☐ Reduction of other greenhouse gases emission	

Emission scope(s) on which the project has a significant impact and quantification of GHG emission reductions per emission scope

	Aspects of the project contributing to the reduction of emissions by emission category	Quantification of associated GHG emissions by emission category Please follow the quantification methodology used in the Afep guidelines.
Reduction of the company's carbon dependency		
Scope 1 *Direct emissions generated by the company's activity.*	Manufacturing of U-Technology binder	775 kgCO2e/t of mortar
Scope 2 *Indirect emissions associated with the company's electricity and heat consumption.*		95 kmCO2e/t of mortar

<table>
<tr><td></td><td>
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<tr><td>Scope 3
Emissions induced (upstream or downstream) by the company's activities, products and/or services in its value chain.</td><td></td><td>30 kmCO2e/t of mortar</td></tr>
<tr><td colspan="3">Increase of carbon sinks</td></tr>
<tr><td>Emissions Absorption
Carbon sinks creation, (BECCS, CCU/S, …)</td><td></td><td></td></tr>
<tr><td colspan="3">GHG emissions avoided by the company at third parties</td></tr>
<tr><td>Avoided Emissions
Emissions avoided by the activities, products and/or services in charge of the project, or by the financing of emission reduction projects.</td><td>Reducing need of binder for concrete and dry mortar</td><td>90 kmCO2e/t of mortar</td></tr>
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Clarification on the calculation or other remarks : The solution contributes to reducing downstream emissions of Imerys clients. Thanks to a reduction of the binder ratio from 25% to 15%, the carbon footprint CO2 (kg CO2/t mortar) will be reduced by 40%, compared to a technical mortar formulated with ordinary Portland cement (OPC). CO2 emissions linked to the binder manufacturing are based on the first prototype data, and will be actualized as the project progress.

To compute emission reduction linked to the decrease in binder's ratio in the formulation, an emission factor of 896 kgCO2e/t of OPC (CEM 1) has been used.
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<tr><td>Modality of verification of the quantification.</td><td>Calculation standard used (ADEME base, GHG protocol, etc.): Life Cycle Analysis (ISO 14040 and ISO 14044)

Verification of the calculation (internal or external): computation done by external experts and internal verification</td></tr>
<tr><td>Other environmental and social benefits of the project</td><td>This project contributes to SDG goal 12 “Ensure sustainable consumption and production patterns”. In fact, the binder’s ratio in the formulation is reduced. It thus contribute to the SDG target 12.2 : “ By 2030, achieve the sustainable management and efficient use of natural resources”.</td></tr>
<tr><td>Project maturity level</td><td>☐ Prototype laboratory test (TRL 7)
☐ Real life testing (TRL 7-8)
☒ Pre-commercial prototype (TRL 9)
☐ Small-scale implementation
☐ Medium to large scale implementation

Remarks: click here to enter the level of maturity of the project</td></tr>
<tr><td>Capacity and conditions of the project reproducibility, with associated climate impact mitigation potential</td><td>This technology has a wide range of potential applications. Research continues to develop additional applications.</td></tr>
<tr><td>Amount of investment made (in €)</td><td>€10 m of investment (preliminary amount) – financed by Bpifrance :
- Financing industrial research and development of new technologies for production of calcium aluminate production technology (ultra-reactive cements manufacturing process).
- Financing the development of ultra-reactive materials and the use of these materials in three application developments.</td></tr>
<tr><td>Economic profitability of the project (ROI)</td><td>☐ ST (0-3 years)
☒ MT (4-10 years)
☐ LT (> 10 years)

Remarks: Developing solutions enabling reduction in downstream emissions for the cement industry presents business opportunities for Imerys.</td></tr>
<tr><td>Engaged partnerships</td><td>Partnerships with private actors (major manufacturers of ready to use mortar industry) have been engaged.</td></tr>
<tr><td>Open comments from the project owner</td><td>The project is currently in its pre-commercial prototype phase, and will continue through to full scale commercial development.</td></tr>
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More about the project	
Contact the company carrying the project	gaelle.rodary@imerys.com
Project URL links	/
Illustrations of the project