Our Achievements

What difference have we made?

Nanocem was founded in 2004, and has grown to a network of 24 academic partners and 9 industry partners.

We conduct research at a fundamental level. Yet high levels of industry involvement allow us to focus on solutions that can work in practice and not just in theory.

Our unique model of cooperation between industry and the academic community has led to the identification of common issues, shared knowledge and clear benefits for all those involved. For instance Nanocem has been able to help map the research needs for lower carbon concrete. This guidance helped focus research by companies and third parties. By improving our understanding of cement and concrete, our research leads to innovation that benefits society as a whole.

We run two types of projects – Core Projects and Partner Projects.

- **Core Projects:** fundamental, long-term research projects carried out by two or more partners, funded by the resources of the Nanocem Consortium.

  Eleven core projects have been completed and five are ongoing covering a wide range of subjects from thermodynamics to kinetics of cement hydration, from admixtures interactions with cement to durability of concrete structures. Most of the results have been published in scientific journals and presented at international conferences. A list of publications is available on the Nanocem website.

- **Partner Projects:** externally funded projects conducted by academic partners, who contribute by sharing the principal results with Nanocem members.

  Over ninety Partner Projects have been completed on an even broader range of subjects.

Our pre-competitive research activities have also included two **Marie Curie training networks** funded within European Framework Programmes 6 and 7 – NANOCEM “Fundamental understanding of cementitious materials for improved chemical physical and aesthetic performance” and TRANSCEND “Understanding TRANSport for Concrete which is Eco friendly iNNovative and Durable” have been awarded to subgroups of Nanocem.

Between our sixteen Core Projects, the EU funded projects NANOCEM and TRANSCEND, we have trained over fifty fellows in cement and concrete science; many of them continue working in the industry.

The dialogue between partners has inspired ambitious research aimed at answering key questions underlying the behaviour of cementitious materials. We run an average of twenty events per year, from conferences attracting up to a hundred attendees to targeted workshops to discuss selected topics in small groups. Seventy to eighty members of the consortium attend two annual meetings and the majority regards these as outranking most conferences in terms of scientific information gained.

This fundamental, open work has a multiplier effect and will enable innovation that makes a real difference.

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Buildings, dams and roads are built with a long term perspective and so is our research. Having to withstand anything from extreme weather to earthquakes, the quality and long term performance of concrete are paramount. Over the past decade our research formed the basis for innovation used on a daily basis. Many of our current research projects are studying some of the most exciting fields in the development of cement and concrete. Our research aims to understand these materials better as to make them more durable, stronger whilst reducing the need for resources and lowering CO_2 emissions.

- Our first PhD student, Thomas Matschei, developed a unique model to improve the quantification of cement hydration. The most popular cement type contains fine ground limestone that is mixed in with clinker. This significantly reduces CO_2 emissions, but also affects the properties of the cement. Thomas worked with a number of academics to develop a way for manufacturers to predict the hydrate mineralogy of their products that results from varying amounts of limestone content: a database that was developed which continues to grow from the work of other research groups, and is now used widely within the cement community. This work has been part of the scientific foundation for the development of new standards that will enable the wider adoption of lower carbon cements.
- For her PhD thesis, Sandra Galmarini developed atomistic simulation methods to describe cementitious systems at very early age. This promising new modeling technique will in time enable us to understand the microstructure and the macroscopic properties of cementitious materials.
- We perfected the analysis of the pore structure of concrete using Proton Nuclear Magnetic Resonance, a technology that is common in the medical field for scans. By teaming physicists with material scientists, we have been able to increase our knowledge of the pore structure which in term will lead to a better understanding of how concrete will behave over time.