

## Green Cement

New Production Process Promises to Be Energy-efficient and Contributes to Climate Protection



*Reducing the "ecological footprint": Celitement® saves resources in production and emits less carbon dioxide. (Photo by: Dauthkaun)*

**The World Climate Conference that is currently taking place at Copenhagen aims at slowing down global warming and negotiating a new international climate agreement. A "green" cement production process developed by KIT scientists is expected to require far less energy than standard technology. The new cement is named Celitement® and has the potential to considerably reduce the worldwide emission of carbon dioxide in the next decades and, thus, to contribute to climate protection.**

Cement production is an energy-consuming process. Annually, cement plants emit more than a billion tons of the greenhouse gas carbon dioxide (CO<sub>2</sub>) – these are five percent of the worldwide CO<sub>2</sub> emissions. This means that carbon dioxide emissions of cement production exceed those of the worldwide air traffic by a factor of 3 to 4. KIT scientists have now succeeded in developing a new cement binder comparable to Portland cement, called Celitement®, which is based on so far unknown, hydraulically active calcium hy-



*KIT Energy Center: Having future in mind*

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drosilicates. In the simplest approach, the raw materials used in the two-stage Celitement<sup>®</sup> process are burnt lime and sand. Celitement<sup>®</sup> is produced at temperatures below 300°C, i.e. in a relatively “cool” environment compared to the temperature of about 1450°C that is usually required for cement production. Compared to the production of conventional Portland cement, up to 50% of the energy can be saved. Furthermore, KIT scientists also succeeded in strongly reducing the consumption of lime.

Apart from the decreased energy consumption, the emission balance is highly promising: In comparison to conventional processes for the production of Portland cement clinkers, the production of Celitement<sup>®</sup> is associated with the emission of half as much CO<sub>2</sub> only. Annually, about 2 billion tons of Portland cement are produced by cement plants worldwide for use in construction industry. “If all cement plants in the world would apply our process, half a billion tons carbon dioxide would be not emitted into the atmosphere every year. This would enormously contribute to climate protection!”, explains Dr. Peter Stemmermann from the KIT Institute for Technical Chemistry (ITC). Together with three other ITC scientists, he has developed the basic idea for the environmentally compatible cement and the new production process. Prior to process implementation, the cement was analyzed in the nanometer range with the help of synchrotron radiation.

All over the world, scientists are looking for new processes to improve the energy and ecological balance of cement production. “In this respect, we believe that Celitement<sup>®</sup> is a major progress”, says Dr. Hanns-Günther Mayer from the KIT Innovation Management Department. The inventors, KIT, and the industry partner SCHWENK have founded an enterprise, Celitement GmbH, to commercialize the new cement. The next step will be the construction of a pilot plant on KIT Campus North, which will start operation at the end of next year. “Then, we will be able to perform final tests required for long-term industrial application”, says Mayer.

Further information on Celitement<sup>®</sup> can be found at [www.celitement.com](http://www.celitement.com).

**Karlsruhe Institute of Technology (KIT) is one of Europe’s leading energy research establishments. The KIT Energy Center pools fundamental research with applied research into all relevant energy sources for industry, households, services, and mobility. Holistic assessment of the energy cycle also covers**

conversion processes and energy efficiency. The KIT Energy Center links competences in engineering and science with know-how in economics, the humanities, and social science as well as law. The activities of the KIT Energy Center are organized in seven topics: Energy conversion, renewable energies, energy storage and distribution, efficient energy use, fusion technology, nuclear power and safety, and energy systems analysis.

Karlsruhe Institute of Technology (KIT) is a public corporation and state institution of Baden-Württemberg. It fulfills the mission of a university and the mission of a national research center of the Helmholtz Association. KIT focuses on a knowledge triangle that links the tasks of research, teaching, and innovation.

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