June 5, 2015

Taiheiyo Cement Develops New Cementitious Material with Compressive Strength of 400 to 500 N/mm^2

New product achieves record strength using normal concrete forming methods

Taiheiyo Cement Corporation is pleased to announce its successful development of a new cementitious material that delivers record compressive strength using normal pour-and-form techniques.

Since fiscal 2014 the company has pursued a research and development project to develop a new cementitious material that achieves a compressive strength of 400 to 500 N/mm^2*, which would be a world record. Although there have been reports that development efforts overseas using reactive powder concrete (RPC) technology have achieved a compressive strength of 673 N/mm^2, those products require use of fine ceramic forming, a special manufacturing technique in which the concrete is poured into forms under conditions of high temperature and pressure (specifically, hot-press forming at 250°C to 400°C). In contrast to this unrealistic manufacturing method, Taiheiyo Cement achieved a record compressive strength of 464 N/mm^2 using normal pouring and forming techniques without the need to rely on heating of the material to above 200°C, and without sacrificing the natural advantage of concrete which is the ability to shape it as desired simply by pouring it into a form.

The material properties and manufacturing method associated with the newly developed cementitious material are distinguished by two technological characteristics:

- The new cementitious material is designed so that multiple types of particles can be packed as closely together as possible based on the principles of micromeritics, the science and technology of small particles. To achieve this design, Taiheiyo Cement used new material microparticles that have not been used in the cement and concrete industry to date.
- After the new cement is poured into forms using the normal method, the forms are removed after one or two days, and the material is subject to a water-absorbing

process that lasts tens of minutes. During this process, the stoichiometric amount of water that the material lacks in absolute terms, due to the extremely small amount of water with which it is mixed initially, is supplied from the surface to the internal portion of the material by means of a reaction between the water and the cement. That water then reacts actively with the cement during a two-stage heat-curing process to yield an extremely dense, hardened material.

In addition to the newly developed technology described above, Taiheiyo Cement has also confirmed that further increases in compressive strength are possible by modifying the cement itself to further increase the powder's filling ability.

Going forward, Taiheiyo Cement will continue to conduct research and development into new cementitious materials in order to set new strength records while meeting customers' multifunctional needs in a variety of fields such as construction and civil engineering.

*N/mm^2: Newtons per square millimeter, a unit of pressure. A value of 1 N/mm^2 describes a force of 1 newton per square millimeter. 1 N/mm^2 = 10.2 kgf/cm^2 (kilogram-force per square centimeter). For example, a pressure of 500 N/mm^2 would result if a 5,100 kg weight were resting on a square area measuring 1 cm on each side.

1N/mm^2＝10.2kgf/cm^2（Kilogram-force par square centimeter）
500N/mm2 indicates it can endure 5,100kg in the area of the square that one side is 1cm