Control of polymorphism of calcium carbonate compounds in the cementitious materials by pH control

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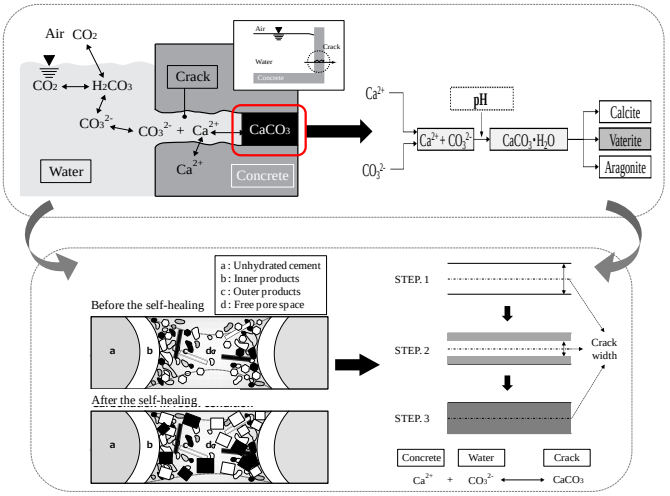
Abstract (300 word limit)

Generally, cracking is inherent in reinforced concrete structures and leads to serious damage during it's service period. Repeated occurrence of such damages will lead to the enlargement of the cracks, thereby allowing other deteriorating elements such as CO2 and Cl- to further penetrate the concrete, and this can have serious consequences for the concrete structure.

On the other hand, in an environment where there is supply of water, concrete structures display "self-healing," in which some of cracks close up naturally, and this phenomenon is closely associated with the hydrates that are newly generated in the areas of crack formation.

This study focuses on the type of CaCO3 crystals generated by the self-healing phenomenon. CaCO3 is crystal polymorphism and it's reported that crystal forms can be controlled by the relationship of temperature and pH. Generally, CaCO3 consists of the three kinds, such as calcite, vaterite and aragonite for crystal formation. On the other hand, vaterite is also generated most densely among these, and self-healing can be expected. Therefore, an experiment is made for the purpose of establishing the conditions to generate vaterite. The supplied a saturated Ca(OH)2 solution is used for the effective self-healing. Conditions of the pH are managed pH 9.0-12.0. The results showed that self-healing occurred and the product of the self-healing phenomenon was mostly vaterite to a crystal of CaCO3 under the condition of pH 9.0.

Image



Recent Publications (minimum 5)

1. Heesup Choi, Masumi Inoue, Risa Sengoku, Hyeonggil Choi (2017) Control of polymorphism of calcium carbonate compounds produced in cracked part of cementitious materials by self-healing. Journal of applied sciences 7(6):1-16.
2. Heesup Choi, Masumi Inoue, Risa Sengoku, Hyeonggil Choi (2017) Strength recovery of concrete exposed to freezing-thawing by self-healing of synthetic fiber and cementitious materials. Journal of Advanced Materials Letters 8(10):993-998.
3. Heesup Choi, Masumi Inoue, Hyeonggil Choi, Myungkwan Lim, Tomoya Nishiwaki, Kawajiri Shunzo (2016) The fundamental study of the crack control by self-healing of PVA fiber reinforced cementitious composites. Journal of Civil Engineering and Architecture Research 3(9):1680-1688.
4. Heesup Choi, Masumi Inoue, Sukmin Kwon, Myungkwan Lim, Hyeonggil Choi, Ryoma Kitagaki and Takafumi Noguchi (2016) Mechanical characteristics and recoverability of low-quality crushed coarse aggregate by surface modification and microwave heating. Journal of Asian Concrete Federation 2(1):24-30. 365: 519-530.
5. Heesup Choi, Masumi Inoue, Sukmin Kwon, Hyeonggil Choi, and Myungkwan Lim (2016) Effective Crack Control of Concrete by Self-Healing of Cementitious Composites Using Synthetic Fiber. Journal of the Materials 9(4):1-14.



Biography (150 word limit)

I have my expertise in evaluation and passion for improving the self-healing of concrete. I have built this technique after years of experience in research, evaluation, teaching and administration both in Tokyo Univ. and Kitami Institute of Technology of JAPAN. The foundation is based on autogenous healing of concrete (Edvardsen, C, 1999) which is a methodology that Water permeability and autogenous healing of cracks in concrete. It allows for prevention of micro crack by various degradation of concrete.

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Notes/Comments: