Fabrication of a Dense Calcium Carbonate using a Warm Press Method

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When a pure phase of calcium carbonatepowder with 10 mass % of fresh water was heated at 150℃ and uniaxially pressed at 240 MPa using a cylindrical mold for 180 min simultaneously, the relative density of the hardened body with 15 mm in diameter was 87 % in relative density and its average compressive strength of the bodies was approximately 40 MPa. According to XRD analysis, calcium carbonate was only detected after warm press treatment. Authors are calling this fabrication method 'Warm Press' compared to conventional hot press for general ceramic sintering. Because maximum heating temperature was 280℃, although the maximum uniaxial pressing value was 240 MPa. Furthermore, this maximum warm press condition is nearly equal to the environmental 10 km depth from the surface of the crust, the warm press method is thought to be one of the fabrication methods for geomimetic ceramics. Literally, we think that geomimetic ceramics are defined as making ceramics by mimicking the manner in which rock or mineralis densely formed in the Earth's crust under lower temperature compared to conventional ceramic sintering and high pressure simultaneously. So far, hardened bodies derived from geopolymer paste and calcium hydroxide have been fabricated using this warm press method [1,2]. If the calcium carbonate body by this warm press method can be fabricated, this warm press method will be expected to be used as not only a novel and lower energy consumption ceramic fabrication method but also one of fabrication methods for geomimetic ceramics.

[1] H. Takeda, S. Hashimoto, H. Matsui, S. Honda and Y. Iwamoto, "Rapid fabrication of highly dense geopolymers using a warm press method and their ability to absorb neutron irradiation," *Constr. Build. Mater.* **50**, 82-86 (2014).

[2] S. Hashimoto, W. Shimoda, H. Takeda, Y. Daiko, S. Honda and Y. Iwamoto, "Fabrication of slaked lime compacts (plaster) with high compressive strength using a warm press method," *Constr. Build. Mater.*, 110, 65-69 (2016).