CaTi2O4-type aluminous phase in the lower mantle

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High-pressure polymorphs of MgAl2O4 are important minerals, which are host phases of alumina component in aluminous rocks, such as basalts and sediments, at the lower mantle conditions. Therefore, phase transitions and elastic properties of MgAl2O4 high-pressure phases have been the object of intense experimental and theoretical investigations. Previous studies suggested that a possible high-pressure polymorph of MgAl2O4 would take one of the similar CaTi2O4-, CaFe2O4- or CaMn2O4-type structures. We performed our experiments using a laser-heated diamond anvil cell (LHDAC), which made it possible to acquire precise data on the sample at high pressures and temperatures, and we also employed intense X-rays from a synchrotron radiation source. We report on the results of in situ X-ray observations of the high-pressure CaTi2O4-type aluminous phase in pure MgAl2O4 and MORB compositions. We also discuss the pressure-induced phase transition sequence and the compressibility of aluminous phase.