



Hydro-Mechanical properties changes in porous rock during immersion in hot water

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The effect of increasing temperature on the hydro-mechanical properties of rocks is a highly important topic. When we select a site for underground excavation for the disposal of high-level radioactive waste and CO₂-underground storage, it is necessary to know the effects of temperature and confining pressure with water, called the deep geological environment. With this objective in mind, Shirahama sandstones were immersed in 90 degrees Celsius water for 500 days. Using samples damaged by chemical weathering, triaxial compression tests were performed under a 10MPa confining pressure. In addition, the microstructure of damaged samples was observed using a secondary electron microscope (SEM), and we measured porosity using a mercury injection porosimetry method (MIP) in order to evaluate the damaged sample. In order to study the properties of sedimentary rocks under deep geological environments, laboratory chemical weathering tests were carried out by immersing Shirahama sandstone in 90 degrees Celsius hot water for 100 and 500 days. Using that immersed sample, we carried out mechanical tests, measuring porosity and made microstructural observations. We have the following conclusions: 1) The mechanical properties, strength, secant modulus E₁₀ and tangential modulus E₅₀, decrease with the time of soaking in hot water. E₁₀, especially, is much reduced by chemical weathering. 2) New clay minerals produced by chemical weathering can be observed not only in the matrix portion but also in the micropores so as to fill in space.