EXPERIMENTAL STUDY OF ANORTHITE DISSOLUTION AND ITS SECONDARY MINERALS UNDER HIGH PARTIAL PRESSURE OF CO₂: THE WEATHERING IN ARCHEAN. S. Utsunomiya¹, T. Murakami¹, H. Kadohara¹, and K. Tsukimura², ¹Mineralogical Institute, Graduate School of Science, University of Tokyo, Hongo, Tokyo, 113, Japan; ²Geological Survey of Japan, Tsukuba, Ibaraki, 305, Japan.

CO₂ is considered to be a main component of the primitive atmosphere after the formation of the Ocean on the Earth. A 10- to 20- atm carbon dioxide atmosphere, existing during the first several hundred million years of the Earth’s history, kept the surface temperatures approximately at 85°C to 110°C (Kasting, 1986). Weathering of silicates containing Ca, Mg played an important role for removing CO₂ from the primitive atmosphere in Archean. We made an hydrothermal apparatus with which CO₂ could be compressed directly into reaction vessels and be kept its partial pressure during reactions. We did hydrothermal experiments of anorthite under a high partial pressure of CO₂ (P_{CO₂} = 1.2 atm) at 150°C. The pHs of solutions were maintained by buffer (sodium acetate 0.03M - acetic acid); pH = 4.56. From the results of the solution analyses, there were less amount of Ca than that expected with anorthite stoichiometory after 10 days’ reaction and little amount of Ca was found to exist in the solution reacting for 89 days. The TEM (+EDS) and SEM (+EDS) observations and XRD analysis show that prosopite, CaAl₂(F,OH)₈ was formed as a secondary mineral after 89 days reaction. In general, prosopite is a hydrothermal product formed with volatile gas (H₂O, CO₂, etc.) from magma. Another hydrothermal experiment under present time partial pressure of CO₂ (P_{CO₂} = 10–3.5 atm) revealed stoichiometric dissolution of Ca and Si, and no formation of Ca-bearing phases. These results suggest that the weathering processes under high P_{CO₂} and specific pH conditions in Archean should be possibly different from those occurring in Phanerozoic as Ca mobility is concerned.