Mineralogical and micro-textural characterization of the target layers for the CO_2 injection in the Pohang Basin, Korea

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The target layers of the Pohang Basin including conglomerates and sandstones are reservoir for carbon capture and storage (CCS). This study aims to provide better understanding of the diagenetic history relating to the tectonic evolution in the reservoirs of the offshore Pohang Basin during the East Sea opening in Neogene through mineralogical analysis and microstructural analysis. Total 55 samples were collected from the core. Major mineral components were analyzed by XRD. SEM-BSE and EPMA-COMPO image analyses examined for the texture observation shows that detrital grains are composed of quartz and feldspar with K-feldspar dissolution, and primary pore is filled with kaolinite, calcite, pyrite and chlorite. Chlorites are distinguished as five types by textural characteristics, and all is categorized as one of brunsvigite, diabantite, and ripidolite by EPMA analysis. Diagenetic temperature is estimated as 170℃ on average by chlorite thermometry. Taken all results together, the target layers have undergone diagenetic processes from eogenesis to mesogenesis, and uplifted at least once meaning telogenesis. After sedimentation of the Pohang Basin, kaolinite, calcite, and pyrite were cemented in the pore and detrital mica was replaced to chlorite. As burial depth become deeper, k-feldspar dissolution had proceeded. Siderite, authigenic silica polymorph, and chlorite were formed under the influence on hotter fluid by depth. The Eoil Orogeny could become a heat source that had made high temperature; and high geothermal gradient and tectonically compressional environment may have influenced on fluid flow. From the point of view of implication as CO_2 reservoir, Target 2 has dominantly kaolinite as a pore-filling mineral, maintaining secondary pores, in comparison with target 1 filled with calcite, densely filled the pore. When CO_2 is injected, there could be newly formed minerals, in short term, that become obstructions of micro-pores, for instance, calcite recrystallization and precipitation of ferric hydroxide. In the long term, chlorite could be a source of Mg, Fe for forming carbonate minerals that could become a positive effect on storage of CO_2 as a mineral carbonation.