EXPERIMENTAL STUDY OF REACTIONS BETWEEN GLAUCONITE AND CARBON DIOXIDE, IMPLICATION OF CARBON SEQUESTRATION

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ABSTRACT

Since the beginning of the industrial revolution in 1750, CO2 levels in the atmosphere have increased dramatically causing global warming and climate change. Much research has been done with the intent to store carbon dioxide, known as carbon sequestration. Mineral trapping is one potentially effective technology for long-term storage of carbon dioxide in geological sinks. Mineral trapping occurs in a subsurface environment that has high temperature and pressure. After injecting carbon dioxide as a supercritical fluid into geological formations, carbon dioxide may react with host rocks to form a secondary carbonate mineral. After the reaction occurs, carbonate minerals are stable, creating a long-term carbon sink. The goal of this study is to test the reaction between glauconite and carbon dioxide. Glauconite with the formula of (K, Na)(Fe3+, Al, Mg)2(Si, Al)4O10(OH)2 is a mineral, which occurs in many sedimentary rocks and is especially abundant in the Eutaw Formation in Mississippi, USA. Previous research showed a reactivity of carbon dioxide and olivine, a mineral with chemical formula of (Mg2+, Fe2+)2SiO4 occurring in mafic igneous rocks. The similarity in chemical composition between glauconite and olivine leads me to conduct graduate research with the expectation of glauconite reactivity. The objective of my research is devising an experimental protocol studying interactions between glauconite bearing rocks, various brines, and carbon dioxide. Besides the batch experiments, various methods of SEM – EDS, XRD, and brine analysis will be applied to investigate morphology, mineral composition, and chemical composition of rock samples before and after the experiment. The success of this work will contribute a mechanism of rock reactivity between the mineral and CO2, as well as the foundation for consideration of more carbon sequestration efforts in other rocks with an abundance of glauconite.

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