



Permanent CO₂ sequestration into basalt: the Hellisheidi, Iceland project

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The reduction of industrial CO₂ emissions is considered one of the main challenges of this century. Among commonly proposed CO₂ storage techniques, the injection of anthropogenic CO₂ into deep geological formations is quite promising due their large potential storage capacity and geographic ubiquity. Carbon dioxide is typically injected into a deep geologic formation as a separate supercritical fluid in addition to the water phase already present. The effectiveness of this method of CO₂ storage and sequestration depends strongly on the retention time, reservoir stability, and the risk of leakage. One estimate suggests that if we anticipate another 200 years of fossil fuel consumption at 4 times today's rate, then a typical CO₂ storage must last at least 1600 years to avoid legacy problem caused by CO₂ that potentially escapes into the atmosphere by leakage (Lackner, 2003). Finding a storage solution that is long lasting, thermodynamically stable and environmentally benign would be ideal. Storage of CO₂, as solid calcium carbonate, in basaltic rocks may provide such a long lasting, thermodynamically stable and environmentally benign solution. In nature, the carbonization of basaltic rocks occurs in a variety of well-documented settings, such as the hydrothermal alteration at volcanic hot springs, in deep ocean vent systems and through surface weathering. The goal of this proposed research project is to optimize industrial methods for storing CO₂ in basaltic rocks through a combined program consisting of, field scale injection of CO₂ charged waters into basaltic rocks, laboratory based experiments, large scale plug-flow experiments, study of natural CO₂ waters as natural analogue and state of the art geochemical modelling. A second and equally

important goal of this research project is to generate the human capital and expertise to apply the advances made in this project in the future. Towards this goal the bulk of the research is to be performed by graduate student and post-doctoral trainees.

References.

Lackner, K. S. (2003). A guide to CO₂ sequestration. *Science* 300: 1677-1678