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Title of Ph.D. thesis: Experimental determination of the effect of precipitated mineral coatings on the rates of basaltic mineral and glass dissolution rates

Description: Basaltic rocks consist of minerals (mainly pyroxenes and plagioclase) and basaltic glass rich in calcium (Ca), magnesium (Mg) and iron (Fe). The hypothesis is when CO₂-rich water is pumped into the basaltic rocks it will dissolve the minerals and glasses and thereby release Ca, Mg and Fe that can lead to the formation of carbonate minerals like calcite (CaCO₃) and magnesite (MgCO₃) and maybe siderite (FeCO₃).

Modelling predicts that not only carbonates may form when injecting CO₂ into basaltic rocks, but also different clay minerals and zeolites. This can cause a problem as the clays and zeolites consume the Ca, Mg and Fe meant to go to carbonate minerals and thereby limiting the amount of CO₂ trapping. Furthermore, the precipitation of clays, zeolites and carbonates can coat the surfaces of crystals and lower the dissolution of basaltic minerals and glass. This might even clog the pores and severely reduce the flow of CO₂ water through the basalt. Therefore this experimental study focus on the effect of coatings of carbonate, clay and zeolite precipitates to determine if they decrease the dissolution rates of minerals and glasses in the basalt. The result of the study will be included in reactive transport models, used to optimize the injection conditions at the Hellisheidi site.

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Education: M.Sc. in geology and B. Sc. in chemistry from the University of Copenhagen, Denmark 1998.

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