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Reactive fingering instabilities in CO2 sequestration

Tuesday, 15 May 2018 14:00 (25 minutes)

To decrease the atmospheric concentration of CO2, sequestration techniques whereby this greenhouse gas is injected in saline aquifers present in soils are considered. Upon contact with the aquifer, the CO2 can dissolve in it and subsequently be mineralized via reactions with minerals like carbonates for instance. We investigate experimentally the influence of such reactions on the convective dissolution of CO2 by analyzing convective density fingering patterns developing when gaseous CO2 is put in contact with aqueous solutions of reactants in a confined vertical geometry. We show that the reactions can enhance convection inducing a more efficient sequestration [1,2]. In parallel, we also analyze precipitation fingering patterns obtained when a solution of carbonate is injected into an aqueous solution of calcium ions. We show that the amount and spatio-temporal distribution of the solid calcium carbonate phase produced strongly depends on the concentrations and injection flow rate [3,4,5]. Emphasis will be put on the possibility to control the convective and precipitation fingering pattern properties by varying the very nature of the chemicals or injection conditions. Implications on the choice of optimal sequestration sites will be discussed.

References

[1] V. Loodts, C. Thomas, L. Rongy, and A. De Wit, Control of Convective Dissolution by Chemical Reactions: General Classification and Application to CO2 Dissolution in Reactive Aqueous Solutions, Phys. Rev. Letters, 113, 114501 (2014).
[2] C. Thomas, V. Loodts, L. Rongy, A. De Wit, Convective dissolution of CO2 in reactive alkaline solutions: Active role of spectator ions, Int. J. Greenhouse Gas Control, 53, 230 (2016).
[3] G. Schuszter, F. Brau and A. De Wit, Calcium Carbonate Mineralization in a Confined Geometry, Environm. Sci. Tech. Letters, 3, 156–159 (2016).
[4] G. Schuszter, F. Brau and A. De Wit, Flow-driven control of calcium carbonate precipitation patterns in a confined geometry, Phys. Chem. Chem. Phys. 18, 25592 (2016).
[5] F. Brau, G. Schuszter and A. De Wit, Flow control of A + B ⟶ C fronts by radial injection, Phys. Rev. Lett. 108, 134101 (2017).

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