

MS14-P40 | CALCIUM OXALATE CRYSTALLIZATION FOR A NON-CONVENTIONAL CO₂ STORAGE

METHOD

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The increase in the concentration of carbon dioxide in the atmosphere is a relevant and outstanding problem. A synergic approach to the problem is needed: many complementary methods of sequestration should be combined with the reduction of production to decrease the total amount of CO₂ in the atmosphere.

A direct and green method to convert C(IV) into C(III) and trap CO₂ into a stable crystalline structure other than a carbonate (*i.e.* calcium oxalate, weddellite) is proposed¹. CO₂ is reduced and precipitated as weddellite through Ca-ascorbate (CaAsc) as a sacrificial reductant. The reaction has been validated. Reaction's kinetics and trapping yield are under evaluation. Weddellite crystals precipitated show very high quality, as demonstrated by single crystal X-ray measurements. Moreover, crystals obtained exhibit stable flat (F) forms, even if the morphology reflects the crystal growth conditions. The crystal quality of the precipitate reflects on its stability, essential for storage purposes.

The precipitation of weddellite from CO₂ was described as a two-step process, following two separate reactions: i) a red-ox reaction that involves the reductant (CaAsc); ii) the nucleation of calcium oxalate. The red-ox is the rate-determining step of the process and should be enhanced to increase the overall reaction rate. The reaction rate of the whole process is dependent on the extent of the interface between the solution and CO₂ as well. The reaction yield could be increased explosively working with very large reaction surface.

[1] Pastero et al. (2019), STOTEN, 666, 1232-1244; doi: 10.1016/j.scitotenv.2019.02.114