Carbon Storage in a Waste Rock Pile, Dream or Reality?

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Mineral carbonation has the potential to represent a viable long-term storage option for CO_2 management. Recent studies, e.g.[1], indicate an economic potential for integrating industrial scale carbon storage into mining operations. Ultra-mafic rocks, with their wide availability and high content of Mg-bearing silicates have long been considered the most promising rocks for Carbon Capture and Storage (CCS).

Beyond thermodynamic considerations to allow for industrial CCS to proceed, a reasonable carbonation efficiency has to be achieved, therefore reaction rates have to be increased. As part of their activities, the mining industry typically extract, crush, mill and expose to the atmosphere tens or hundreds of million tonnes of rock per mine. In areas with large amounts of mafic rock, these lithologies may represent a significant percentage of the waste material left on the surface. This might represent a locally important source of readily available material for CCS if the conversion process is sufficiently efficient.

In this study, a waste rock sample from serpentine skarn lithologies was reacted for sixty weeks in humidity cells at 25 °C. The results indicate olivine dissolution an increase in the amounts of serpentine and in the neutralisation potential of the samples as well as the appearance of inorganic carbon in the sample. It is understood that at ambient temperature the sluggish precipitation kinetics of secondary phases will favor the formation of more hydrous Mg silicate phases such as serpentine lowering considerably the efficiency of forsterite carbonation.

The aim of this study is to quantify the amount of carbonate produced and the efficiency of the reaction in order to assess the economic viability of integrating CCS into mine development operations.

[1]Hitch *et al* (2012) *Miner. Engin.* **39**