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Atmospheric CO_2 drawdown during lithification of slag-dominated artificial ground

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Legacy deposits of by-product slag from iron and steel making create significant volumes of artificial ground around the world. Composed mainly of calcium-silicate mineral phases, experimental and modelling studies have shown the potential of slag for capturing atmospheric CO_2 by mineralisation [1,2]. Artificial ground poses challenges around ground stability and ecotoxic element release but slag-dominated artificial ground also offers opportunities for atmospheric CO_2 drawdown. In this contribution, we document the lithification of legacy slag deposits – conversion of loose gravelly slag material into a rock-like mass through cementation with calcite via drawdown of atmospheric CO_2 at two case study sites (Glengarnock and Warton, UK). We present field, X-Ray Diffraction and carbon isotope data from these case study sites to document the lithification of slag-dominated artificial ground through mineralisation of atmospheric CO_2 as a cementing phase; we present scanning electron microscope data to show the microstructural evolution of this lithification. As well as drawdown of atmospheric CO_2, this lithification process has potential to help stabilise unconsolidated artificial ground and immobilise pollutants.

References

[1] Huijgen, Witkamp & Comans (2005), *Environmental Science and Technology* 39, 9676-9682.

[2] Renforth (2019), *Nature Communications* 10, 1401.