



Can iron-making and steelmaking slag products be used to sequester CO₂? Passive weathering and active carbonation experiments.

Fred Worrall and Andrew Dobrzański

University of Durham, Earth Sciences, Durham, United Kingdom (Fred.Worrall@durham.ac.uk)

The high calcium content of iron and steel-making slags has been highlighted as providing a suitable feedstock material and medium with which to sequester CO₂ into geologically stable carbonate phases. Optimisation of the natural carbonation process provides the potential for increasing the degree of carbonation above that possible via passive weathering.

This study has assessed the baseline passive carbonation potential of several different slag products (graded steel slag aggregate, pellite, GBFS) within the climate of the northern UK. This baseline was then used as a comparison to the carbonation values achieved by the same products when actively reacted in a CO₂-rich environment. The active carbonation phase of the project involved a factorial experimental study of materials reacted at 1MPa/10MPa CO₂ pressure and 25°C/125°C.

This study has shown:

- 1) That active carbonation of these products can successfully sequester additional CO₂.
- 2) Carbonation potential in general is highly dependent upon grain size within material types,
- 3) There is a material-dependant cost-benefit issue when using different active carbonation conditions as well as the choice to use active vs. passive carbonation.

The median sequestration potential of the slag products in this study is equivalent to the total emissions from 910 people from the UK; the CO₂ emissions from 10000 tonnes of cement production; or 340000 tonnes of steel production.