ccsp
Carbon Capture and Storage Program

DEVELOPMENT OF MINERAL CARBONATION

Summary

Two process routes that involve the fixation of CO_2 by mineral matter have been under development in Finland for quite some time. Currently, these are being scaled up from lab-scale to application on a larger, demonstration scale, towards commercial application. **The pilot-scale test facility for the concept that aims at converting calcium containing industrial by-products** (such as steel converter slag) **into valuable precipitated calcium carbonate (PCC) product is already being built** and first tests are scheduled for the end of year 2013. Also, **a draft process route and lay-out has been developed for the staged magnesium silicate rock carbonation route** and detailed design as well as cost calculations should be ready by the end of the next program period.

Figure 1. Slag2PCC pilot-scale test facility at its current state.

Background

Fixation of CO_2 to mineral matter offers **an alternative for geological CO_2 storage**. This topic has been studied in Finland for more than a decade on laboratory scale and results have encouraged continuing **development work towards piloting and demonstration**. In addition, a lot of expertise and industrial activity in the field of geology and large-scale mineral and ore processing is already available in Finland, while the work has resulted in **significant international interest and cooperation** too. An interesting feature is the option to apply mineralization directly to CO_2-containing gases, avoiding a costly and problematic CO_2 separation step.

Of the **two process routes being developed in Finland**, one (Slag2PCC) aims at converting calcium containing industrial by-products (with main focus on steel converter slag) into valuable precipitated calcium carbonate (PCC) product. The other process route is a staged process for magnesium silicate -based rock carbonation with – within Cleen CCSP – special focus on process integration with lime production.

Solution description

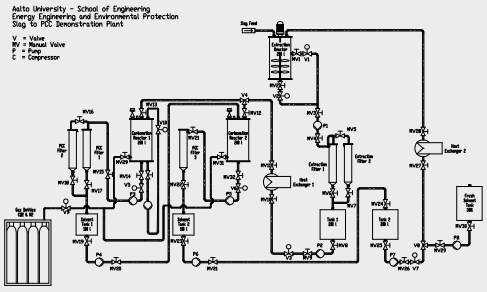

Figure 2. A layout design for the Slag2PCC pilot-scale test facility.

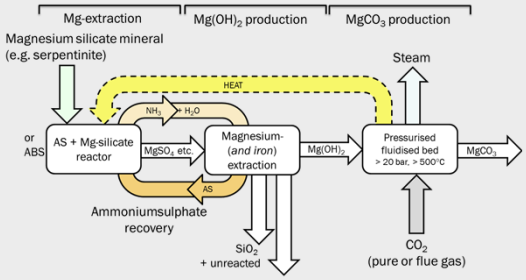

Figure 3. Process schematic of the staged Mg-silicate carbonation route.

Collaboration and continuation

Co-operation between researchers and partners from industry enabled by SHOK has significantly helped designing the test facility for example by helping to make decisions on the equipment. This task also benefits from international cooperation with actors in e.g. Singapore, Portugal, USA, Canada, Baltic states.

During the next program period the Slag2PCC unit at Aalto will be taken into use. Supporting experience will be gained from bench-scale tests at ÅA, aiming at optimizing solid/liquid separations and PCC quality control. The issue of recovering vanadium from the residual slag by-product will be addressed as well. All **this moves the concept further towards commercial application**. Furthermore, **the feasibility of scale-up of the magnesium silicate carbonation route needs further study** in order to make decisions on issues such as 1) the use of a circulating or bubbling fluidised bed carbonation reactor, or 2) the rock material to be used. **The information would support the engineering design and costing assessment.**

More Information

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