2018-IP07: UKCCSRC- Delivering the new CCS Agenda
(26th - 27th March 2018, University of Cambridge)

As part of the UKCCSRC events, this biannual meeting took place in the University of Cambridge between 26th - 27th March, where we obtained an updated global overview of CCS and technical sessions on capture, storage and integration. The second day of the UKCCSRC agenda started with three parallel sessions on Capture, Storage and Systems. I joined the capture sessions, which included a varied panel, from academia, a spin-off and a consolidated research centre. Those presentations gave an overview of different technologies, development stages and approaches.

Rahul Anantharaman, from SINTEF, presented their approach for membranes design for post-combustion capture applications. Interestingly, Rahul commented on the differences on reporting costs included in the literature. For example, energy consumption vs cost or CO_2 purity vs capture ratio. This non- homogeneous information makes difficult to compare and validate results. In SINTEF, they have developed a model to design optimum membrane-based systems which include a parametric variation based design (sensitivity analysis) and an optimization-based design. The idea was to integrate those adjusted designs in the materials development stages. Later, that can be integrated by simulation at process scale to extract economic information on FOAK (First-Of-A-Kind) and NOAK (Nth-Of-A-Kind) plants, or include data on partial capture and from power or industrial sources. Additionally, through a collaboration with NETL, SINTEF is combining this tool with molecular simulation, which give additional understanding and benefits. Rahul mentioned that this tool has been validated at lab scale and there are expected technical differences between lab and large-scale tests such as reduced selectivity and efficiency in modular systems. It is encouraged to get bigger demonstration projects which can serve as input information for the model. Nevertheless, the model is able to identify target characteristics and further development of existing membranes materials, help to reduce development costs in a shorter timeframe and support industry and funding bodies to identify the best strategies for membranes development.

Javier Fernandez Garcia, from University of Leeds, presented their idea on radiofrequency heating for CO_2 capture. The concept is based on adsorption with advanced solid sorbents with initial trials planned with calcium oxide (approximately at 665 and 850°C during adsorption and desorption). The operational strategy of the capture system is based on adsorption during the day and desorption at night time, taking advantage of the most convenient electric tariff for the energy demand during the solids regeneration. The sorbents preparation would be in partnership with other research groups and SEM and XRD tests would be carried out for characterization. The experimental set-up would be installed in the University of Leeds, including a Ni-based reactor and one infrared camera to check temperature while a lab-view system would control the temperature. Initial calculations show that this system would reduce the calcium looping cycle by 21%. Additionally, radiofrequency heating will enhance heat transfer, avoid hot spots and make the separation of catalysts easier. While radiofrequency heating showed similar adsorption efficiency, 9 times lower heat losses were identified. Javier will continue on the study and analysis of post-transformation possibilities of desorbed CO_2 into biofuels, use of new absorbents and scaling-up activities.

Pieter Verberne, from Carbonoro, presented their advanced CO_2 capture technology, based on a low temperature absorption solution which absorbs at 70°C instead of traditional systems at 120°C. The one phase solvent at high temperature becomes two-phases (solid-liquid) during desorption. Contrary to first thoughts on potential troubles about handling solids, Carbonoro also patented an optimized system to mix and heat up the solution, avoiding any inconvenience on treating a biphasic solvent.

The analysis claims to reduce the cost by 50% compared to the traditional amine solution and aims to reduce the cost of CO_2 capture to 30€/tonne. While OPEX is reduced by a reduction on electricity consumption, CAPEX is expected to be reduced too. Additionally, Carbonoro claims the application of this advanced system to low and high concentrated CO_2 fluegas from multiple sources, either from industrial or power production environment. For more information: http://www.carbonoro.com/

Finally, the three speakers highlighted the need of support to CCS from a policies perspective, while international collaborations seem to be key to obtain optimum results.

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