# MATESA Report Summary

Project ID: 608534
Funded under: FP7-ENERGY
Country: Norway

## Periodic Report Summary 2 - MATESA (Advanced Materials and Electric Swing Adsorption Process for CO2 Capture)

Project Context and Objectives:
The MATESA project dealt with a hybrid temperature swing adsorption (TSA) technology based on the utilization of two sources of heating: steam and electricity. The technology was at very low Technology Readiness Level (TRL) at the beginning, fundamentally limited by the available materials.
In the project, we have developed several hybrid materials based on a conductive binder based on carbon and on an active phase of a CO2 selective material. Such active phase were zeolites (ZSM-5 and zeolite 13X) and metal-organic frameworks (CPO-27-Ni and UTSA-16). All hybrid materials were produced by extrusion. For production of the MOF materials, its successful scale-up to batches with homogeneous properties at scales > 100 g was made. Although the extrusion of MOF materials was successful, the final product material has a very low capacity towards CO2. The zeolite honeycombs kept their original capacity with the possibility of using them for processes for CO2 capture.
Simultaneously to material developments, the hybrid process was developed. The project started by pure ESA simulations (heating only wit electricity) with hypothetical hybrid materials allowing to define a proper ESA cycle to produce CO2 with a purity of 95% and a capture rate of 90%. The estimation of many transfer coefficients were made based on results obtained from 3D modelling from the honeycomb monoliths.
Additionally it was possible to use the life-cycle assessment (LCA) to estimate the environmental impact of the CO2 capture process. An interesting approach of the LCA analysis was indeed made for understanding the importance of the chemicals used in the large-scale synthesis of novel materials.
The main results from the project indicate that a hybrid ESA process is able to capture CO2 from natural gas combined cycles (NGCC) flue gases with an initial concentration of about 4% and concentrate it to > 95% purity with over 90% capture rate. This can be done with materials based on zeolite 13X and UTSA-16, provided that the properties of the original powder materials are not damaged by the process to shape them into monoliths. The energy required to capture the CO2 is higher than the amine scrubbing process used as reference for benchmarking. Moreover, the process suffered for a large energy consumption from fans to speed up the heating and cooling of the monoliths used. Overall, the Specific Primary Energy Consumption for CO2 Avoided (SPECCA) is 9.05 MJLHV/kgCO2 compared with 3.36 MJLHV/kgCO2 for amine scrubbing using MEA.

Project Results:
results are summarized in the file: main S & T results_foregrounds.pdf attached to this report

Potential Impact:
results are summarized in the file: potential impact.pdf attached to this report

List of Websites:
www.sintef.no/matesa

## Related information

| | |
|---|---|
| **Documents and Publications** | periodic2-publishable-summary.pdf |

## Contact

Tove Lillian Hønstad, (Controller)
Tel.: +47 982 43 437


Research and Innovation

E-mail

## Subjects

Energy Saving - Energy Storage and Energy Transport

**Last updated on** 2017-01-17
**Retrieved on** 2017-06-07

**Permalink**: http://cordis.europa.eu/result/rcn/193314_en.html
© European Union, 2017