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Abstract

Titel:

Advanced characterization of materials for CO2 capture: accurate measurements, realistic conditions, and novel methods

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Firma:
Surface Measurement Systems

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Abstract:

Expanding populations and growing economies result in higher needs of energy and commodities. Meeting this increasing demand while lowering net carbon emissions calls for a broad energy mix and commercial deployment of solutions for carbon capture, utilisation, and storage (CCUS). Current pathways for CCUS implementation focus towards implementation at point sources (post-, pre- and oxy- combustion, cement production, steel mills) and through direct air capture (DAC). Identifying, characterizing and scaling-up solid adsorption-based carbon capture materials (like aminopolymers, hydroxides, carbons, MOFs, zeolites, etc.) has become crucial to implement solutions with high recovery and low energy use.

In this talk, several highly relevant topics will be discussed related to the advanced characterization of the performance of CO2 capture materials. In a first instance we will discuss common key performance indicators (KPI) used for screening, like CO2 uptake, working capacity, selectivity, regeneration potential etc. Special focus will be placed on measurement techniques that asses these KPI with sufficient accuracy, and in realistic, process-similar, conditions, such as the influence of water and other contaminants.

We will then critically assess and present an array of novel sorptive material characterization methods from Surface Measurement Systems can address open questions for CCUS:

-Understanding fundamental properties, such as uptake, affinity and porosity in hierarchical, complex materials,
-Measuring multicomponent adsorption, i.e. assessing the affinity towards CO2 from a realistic process mixture, particularly with N2, water, SOx, NOx,
-Achieving sufficient experimental throughput to screen and optimise large numbers of samples, particularly in cases where initial scale-up is challenging (e.g. 10-100 mg of material per batch).