

# GRAVIMETRIC ANALYSER FOR SELECTIVE SORPTION MEASUREMENT OF MULTI-COMPONENT GAS OR SUPERCRITICAL MIXTURES IN FLUIDISED-BED OR LIQUID SORBENTS.

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**Abstract:** Since decades sorption processes are used for cleaning or decomposition of gas mixtures. Nowadays, with rising interest in renewable energy supply and ionic liquids, requirements to processes for gas cleaning and storage are rising. Designing and optimisation of these processes need fully automated and precise measuring instruments, because the knowledge of sorption isotherms is essential for further development.

For high pressure gravimetric measurements the magnetic suspension balance (MSB) is widely used. Conventional MSBs with gas dosing units were able to measure with pure gases or binary mixtures, but in technical applications most multi-component gas/steam mixtures are used. To measure selective sorption of multi-component mixtures not only a gas/steam mixture generating unit is needed, the main problem is the continuous high pressure sampling for gas concentration analysis.

Therefore, we present a fully automated gravimetric analyser consisting of three main parts. First a MSB with new measuring principle that allows for the first time gravimetric sorption measurements of fluidised-beds in high pressure atmospheres. Also measurements of liquid samples are possible, 50 times faster with the new flow-through system. Second part is a gas/steam dosing unit generating dynamic atmospheres with up to four gases and two steams in pressure range from Vacuum to 40MPa and temperatures up to 200°C. Third part is a continuous sampling system for pressure range from 0.1 to 40MPa and temperatures up to 200°C that compares concentrations of measuring cell inlet and outlet flows. With the integrated concentration difference the selective sorption of each component can be calculated.

Using the example of a sorption measurement with four component gas mixture to ionic liquid the evaluation of measured data up to selective sorption isotherms will be presented.

Also a brief view on additional measurable properties like transition coefficients, diffusion coefficients, acceleration coefficients and reaction rates will be given.

**Keywords:** Sorption, High Pressure Sampling, Ionic Liquids, Fluidised-beds, Magnetic Suspension Balance

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