



DETERMINATION OF THE PERFORMANCE OF FUNCTIONAL MATERIALS FOR FILTER APPLICATIONS

Task

In many fields of everyday life, the removal of pollutants, especially harmful gases, plays an essential role. Therefore filter concepts, which are based on adsorptive processes, are of crucial importance. Apart from an enormous variety of well-known and established porous adsorbents for filter cartridges, interesting and innovative materials are continuously developed and can serve as substances for the filtration of pollutants in specific applications. The suitability of such "new" materials for the filtration of specific gas mixtures can be studied under realistic conditions by means of breakthrough measurements. Based on the determined material parameters, the design of an application-specific filter cartridge with the required performance is possible.

Solution

At the Fraunhofer IWS Dresden an apparatus for measuring breakthrough curves under realistic conditions was built up. The breakthrough of the test gas is detected by a broadband IR-sensor. The IR-detection enables a specific and selective evidence of nearly every sort of gas, even if small concentrations are present. The evaluation of the obtained breakthrough curves (gas concentration plotted versus time) enables the determination of the uptake capacity and other dynamic parameters of functional materials for the respective test gas. Thus the suitability of a desired material for the aspired application can be analyzed. This enables the design of an effective and application-oriented filter concept.

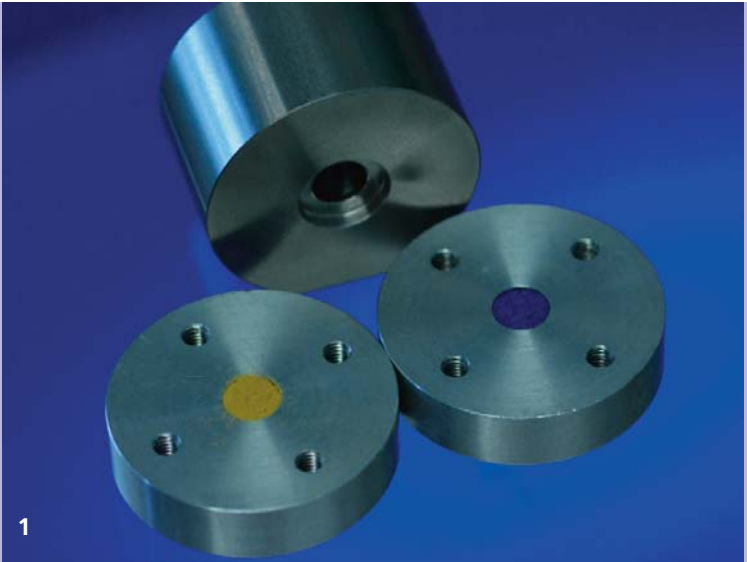
Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS

Winterbergstraße 28, 01277 Dresden, Germany

Fax +49 351 83391-3300
www.iws.fraunhofer.de

Kontakt:
M.Sc. Elke Schade
Phone +49 351 83391-3289
elke.schade@iws.fraunhofer.de

Dr. Jens Friedrich
Phone +49 351 83391-3430
jens.friedrich@iws.fraunhofer.de



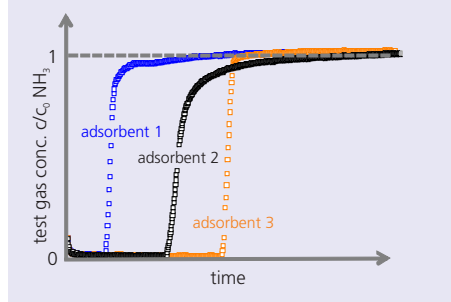
1

Application

Adsorption of toxic industrial chemicals (TICs)

- determination of uptake capacities and dynamic parameters of e.g. ammonia, formaldehyde, ethylene oxide, carbon dioxide, etc. with different adsorbent materials

NH₃-breakthrough measurements of different kinds of adsorbents



Recycling of exhaust gases from atmospheric pressure plasma processes

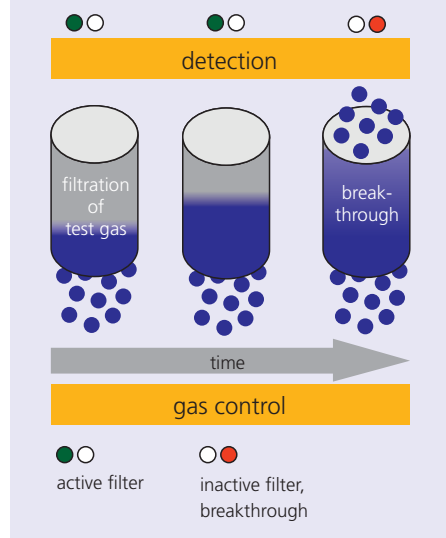
- studies of different functional materials with regards to their capability for the removal of different exhaust gas species (e.g. CVD-precursors (HMDSO), carbon dioxide, carbon monoxide, water, etc.).

Key parameters of the breakthrough apparatus

gas flow rate:	max. 700 ml/min
volume of sample holder:	0.03 – 0.8 ml
detection:	FTIR, mass spectroscopy and electrochemical sensor
measuring temperature:	room temperature

- combined filter systems made of different functional materials (porous adsorbents, catalysts)
- application of bulk solids or processed filter media

Schematic representation of the apparatus for breakthrough measurements



Our Offer

- determination of the uptake capacity of specific test gases of functional materials (porous adsorbents, fabric filters, etc.) under the given measurement conditions
- determination of breakthrough times of functional materials regarding sample volume or mass
- studies of the breakthrough behavior of gas mixtures
- studies of the breakthrough behavior of gases enriched with humidity
- selection of functional materials for the filtration of desired gases
- studies of the breakthrough behavior of functional materials with different outward appearances (powders, extrudates, flat filter media, etc.)

1 Example of an adsorption column for the breakthrough apparatus