

ENVIRONMENTAL AND PROCESS ENGINEERING

# CARBON MODIFICATIONS FOR MEMBRANE APPLICATIONS

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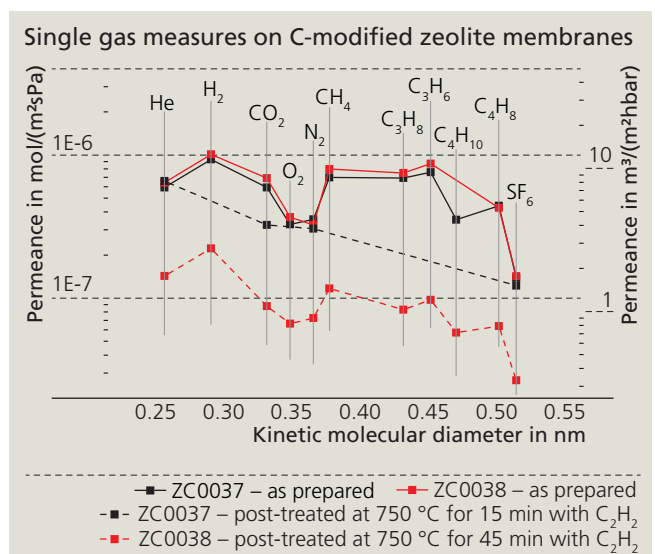
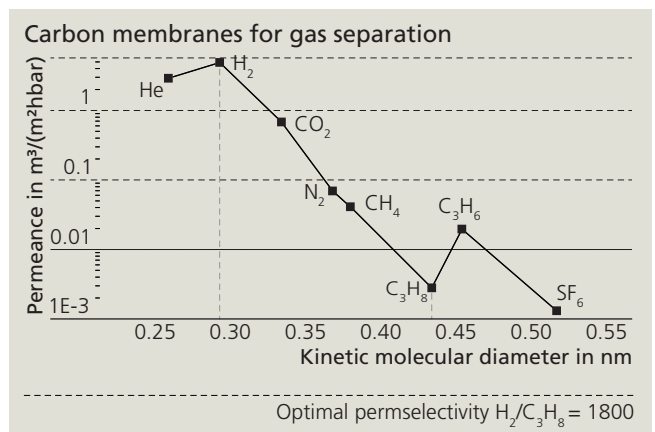
Membranes are becoming more and more important for industrial separation processes. Selectivity and permeance are critical properties for the use of a membrane. These two parameters are mainly influenced by the quality of the membrane, especially the amount of defects in the membrane. Carbon itself is a promising membrane material and can be used to close defects in membranes made of other materials. For both of these reasons, carbon is an interesting material for research on membrane applications.

Synthesis of carbon membranes on different kinds of porous support materials has been successfully performed at Fraunhofer IKTS for more than ten years now. The corresponding coating processes are based on chemical vapor deposition or on liquid-precursor processes followed by pyrolysis. This also allows for the modification of zeolite membranes.

Due to its structural properties, nanoporous carbon is well suited to liquid and gas separation. Depending on the synthesis parameters, different structural properties can be obtained. Hence, these membranes can be adapted to different kinds of separation processes with considerable selectivities.

Examples are:

- Separation of H<sub>2</sub> from mixtures with propane at 300 °C and 10 bar with J<sub>H<sub>2</sub></sub> = 5 m<sup>3</sup>/(m<sup>2</sup>hbar), PS<sub>H<sub>2</sub>/C<sub>3</sub>H<sub>8</sub></sub> = 300
- Treatment of biogas and separation in gas streams of 94 % CH<sub>4</sub> and 91 % CO<sub>2</sub>
- Drying of hot gases (300 °C, 10 bar, N<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, H<sub>2</sub>) and shifting of chemical equilibria by H<sub>2</sub>O separation



- 1 Coated and uncoated single-channel tubes.
- 2 Fully automated device for gas permeation measurements.