

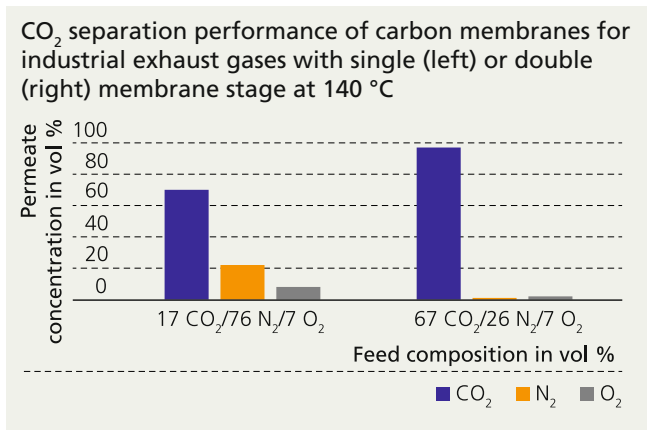


ENVIRONMENTAL AND PROCESS ENGINEERING

EFFICIENT CO₂ RECOVERY FROM INDUSTRIAL EMISSIONS THROUGH MEMBRANE SEPARATION

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In order to control CO₂ emissions at national and international levels, the acquisition of emission certificates has become mandatory. Particularly affected by this policy are industries which are inherently unable to eliminate the production of CO₂ for technological reasons, such as cement and chalk plants. In these cases, it is necessary to separate the generated CO₂. Ideally it can be converted afterwards locally into non-fossil fuels or chemicals. The separation of CO₂ from highly dusty exhaust gases requires a dedusting unit (see page 44) as well as an efficient gas separation unit based on membranes. The goal is to operate both cleaning processes at elevated temperatures, first to avoid expensive cooling and second to utilize hot CO₂ – ideally at its reaction temperature – for subsequent process steps, which is required for all CO₂ conversion reactions. At IKTS, all competencies are available for the development, manufacturing and testing of thermally stable ceramic membranes – from porous ceramic carrier structures to the final separating membrane layer. During multi-day on-site test runs with real exhaust gases at steel, chalk and dolomite plants, our improved carbon membranes generated a CO₂ flow with more than 70 % purity using a single-step separation setup (diagram, left bar). The application of a two-step separation led to CO₂ purities above 97 % (diagram, right bar), which enables direct chemical conversion. A main commercial factor for membrane separation of CO₂ is the manufacturing cost of the membranes. This is being addressed in current activities by upscaling the manufacturing process as well as increasing the membrane area for each support.



Services offered

- Development of gas-separating, inorganic membranes, in particular for the treatment of exhaust and natural gas, biogas, and for the chemical industry
- Customer-specific gas separation tests
- Planning and construction of membrane plants for gas separation up to pilot scale
- Development of membrane reactors and their processes for increasing yield or selectivity in chemical reactions



- 1 Test facility for on-site assessment of improved carbon membranes.
- 2 Operation of the test plant for CO₂ separation in containers at the steel, chalk and dolomite plant.