Super liquid-repellent membranes for efficient carbon dioxide capture

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Limiting carbon dioxide emission into the atmosphere to reduce global warming is a major challenge of our times. However, carbon dioxide capture is still highly energy consuming. Therefore, more efficient techniques are required [1,2].

Here, we introduce super liquid-repellent membranes for efficient carbon dioxide capture. Unique to our super liquid-repellent membranes is that the capturing liquid stays on the top-most part of the membrane, preventing wetting of the membrane, which would otherwise reduce the membrane performance. To fabricate mechanically, chemically and thermally robust super liquid-repellent membranes, we coated polyester fabrics with silicone nanofilaments. Subsequent fluorination renders them super liquid-repellent even against concentrated amine solutions, which are most commonly used for carbon dioxide capture in industry and academia. The uptake of carbon dioxide in the capturing medium, here a concentrated N-methyldiethanolamine (MDEA) solution, was monitored by infrared spectroscopy. The carbon dioxide capture rates of our super liquid-repellent membranes were enhanced by more than 20% compared to high-end commercial membranes and remained unaltered within 50 hours of operation. We anticipate that this new design principle will stimulate the development of the next generation of highly efficient gas contactor membranes [3,4].

Acknowledgements The financial support of ERC Advanced Grant 340391-SUPRO and COST MP1106.

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