Electrochemical capture and release of CO_2 using anthraquinone

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Due to scientific as well as socio-political reports during the last years, carbon dioxide (CO_2) as a greenhouse gas is gaining increasing attention. One attempt to achieve a CO_2 neutral energy cycle is the general strategy of Carbon Capture and Utilization (CCU), where CO_2 is used as a feedstock for sustainable and fossil-fuel free chemicals. An important step prior the catalytic CO_2 conversion is a controlled capturing and release process of CO_2[1]. Starting from the introduction to established, industrial absorption processes of CO_2, this talk is going to discuss the (dis-)advantages thereof [2] as well as giving selected recent examples of electrochemical capture and release processes from the community as well as our group – using organic pigments.

A major part will be the discussion about our latest work, where we demonstrate that anthraquinone thin-film electrodes can electrochemically capture and release CO_2 with an uptake capacity of 5.9 mmol g^{-1}, which is comparable with that of an industrial amine process (8 mmol g^{-1})[3]. It is advantageous that anthraquinone is industrially used and therefore cheap and moreover fully operational in aqueous solution. In-situ spectroelectrochemistry with UV–vis and ATR–FTIR supported the proposed anthraquinone-carbonate structure formation[4].

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