Development and upscaling of gas diffusion electrodes for CO_2 reduction and electrosynthesis of chemicals

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Recent years have seen a sharp rise in the share of renewable energy production. This renewable power usually leads to energy surplus. Storage (batteries, water pumping or hydrogen production) have been proposed to exploit this surplus. One of the novel alternatives is to use excess electricity to convert CO2 into organic chemicals and fuels. Electrochemical reduction of CO2 offers interesting pathways to use CO2 as a feedstock to produce value added products and chemicals. This technology still lacks the efficiency due to ohmic losses, electrocatalyst selectivity and accessibility of CO2 molecules on the surface of electrodes. Gas diffusion electrodes offer solutions to tackle abovementioned challenges. This technology shown to outperform most of other types of electrocatalyst. In the other hand the application of GDE processes suffer from challenges like high costs of platinized electrodes, rapid degradation, and poor performance due to non-uniform electrode quality, sub-optimal catalyst integration, and poor control of electrode morphology and robustness. VITO has developed GDEs tailored for both aqueous and non-aqueous electrolytes, which are characterized by controllable microstructure, mechanical robustness, and low water permeability. VITOCORE® electrodes based on carbon, Sn, Cu and Pb enable reproducible quality in sizes from 10cm² to 1m² and find application in CO_2 electroreduction and electrosynthesis. These electrodes are robust for efficient CO_2 electroreduction.