Foam Based Gas Diffusion Electrodes for Reversible Alkaline Electrolysis Cells

Alkaline electrolysis cells operated at 250 °C and 40 bar have shown to be able to convert electrical energy into hydrogen at very high efficiencies and power densities. Foam based gas diffusion electrodes and an immobilized electrolyte allow for reversible operation as electrolysis cell or fuel cell. In the present work we demonstrate the application of hydrophobic, porous, and electro-catalytically active gas diffusion electrodes. PTFE particles and silver nanowires as electro-catalysts were used in the gas diffusion electrodes. Impedance spectroscopy and cyclic voltammetry were performed to determine the cell characteristics. The thickness of the electrolyte matrix was only 200 µm, thereby achieving a serial resistance and area specific resistance of 60 mΩ cm² and 150 mΩ cm², respectively, at 200 °C and 20 bar. A new production method was developed to increase the cell size from lab scale (1 cm²) to areas like 25 cm².