

Electrochemical CO₂ transformation: Efforts and perspectives of an industrial plant constructor

Mohammad Rezaei, Theresa Jungwirth

GIG Karasek GmbH, Industriestraße 21, 4800 Attnang-Puchheim, Austria

As the reduction of CO₂ in the atmosphere and environmentally friendly production are ever-relating topics nowadays, the company GIG Karasek accelerates the agile change in industrial production towards a decarbonized and defossilized future through circular economy. CO₂ chemical conversion as a tool not only improves the environmental impact of the CO₂ emitting industries, but also generates a new stream of sustainable revenue by producing renewable materials.

GIG Karasek already achieved advances regarding the designing and manufacturing of an electrolyser and the corresponding cell periphery. With our system for the electrochemical conversion of CO₂, essential chemicals and fuels, e.g., syngas and formic acid, are simultaneously produced only by using CO₂ and aqueous electrolytes like diluted alkaline or acidic solutions under mild operating conditions, i.e., room temperature and atmospheric pressure. With our proprietary electrolyser design, the so-called 3-compartment stack electrolyser, using commercially available electrocatalysts enhanced CO₂ conversion is provided. The GIG Karasek patented stack electrolyser provides a scalability and configurability according to customer demands with high faradaic efficiency, high current density and low energy consumption.

Besides the electrolyser itself, also the cell periphery cannot be neglected. GIG Karasek uniquely developed and optimised a process, which focuses on the integration of the electrolyser cell in respect to the overall production throughput of the plant. Laboratory and demonstration plants were already installed in industrial sectors, e.g., in cement production plants, while systems with even higher conversion capacities are soon to be realised and the results as well as the status of the project are to be publicized.