Mechanical Engineering Master's Defense

Optimizing parameters for the process of electrochemical reduction of Carbon-dioxide

School for Engineering of Matter, Transport and Energy

Santosh Shekar Mudunur

Advisor: Arunachala Mada Kannan

abstract

In this study, we primarily focused on optimizing the operating conditions, determining the better catalyst material, and analyzing the reaction products for the process of electrochemical reduction of carbon dioxide (ERC). Membrane electrode assemblies (MEA's) are developed by air bushing the metal particles with a spray gun on to Nafion-212 which is a solid polymer based electrolyte (SPE), to support the electrodes in the electrochemical reactor gas diffusion layers (GDL) are developed using porous carbon paper. Anode was always made using the same material which is platinum but cathode material was changed as it is the working electrode. The membrane electrode assembly (MEA) is then placed into the electrochemical reactor along with gas diffusion layer (GDL) to assess the performance of the catalyst material by techniques like linear sweep voltammetry and chronoamperometry. The reaction products of the process are analyzed using gas chromatography (GC) which has thermal conductivity detector (TCD) used for detecting hydrogen (H2), carbon monoxide (CO) and flame ionization detector (FID) used for detecting hydrocarbons. The experiments performed at 40o C gave the better results when compared with the experiments performed at ambient temperature.

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