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Valorization of polluted biomass waste for the fabrication of Gas Diffusion Electrodes for CO_2 electroreduction to formate.

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One of the main goals of the United Nations Climate Change Conference (COP26) is to limit the global temperature increase to 1.5°C. Achieving this target requires the reduction of CO_2 emissions from anthropogenic activities to mitigate climate change. Several strategies are available to achieve this, including the development of new technologies for CO_2 capture, utilization, and valorization, the use of renewable energy sources, and the employment of neutral or carbon-free fuels [1]. Currently, a variety of approaches for converting CO_2 into chemicals have been developed. Among these, the electrochemical reduction of CO_2 is a promising process that combines CO_2 emission reduction with the production of value-added products, such as formic acid and formate, using renewable energy. This study focuses on evaluating the performance of Gas Diffusion Electrodes (GDE) using materials derived from the valorization of biomass waste to synthesize a microporous layer [2]. This layer aims to replace the conventional carbon black derived from fossil fuels in the CO_2 electroreduction to formate process, carried out in a two-compartment flow cell reactor. The carbon materials used to fabricate the GDEs are pretreated via hydrothermal carbonization at 200ºC and 130 g soil·mL^{-1} water, followed by pyrolysis at various temperatures (300ºC, 500ºC, and 1000ºC) using chemical precursors such as KOH and H_3PO_4 [3]. The microporous layer prevents flooding of the GDE by providing hydrophobicity and enhances the contact between the CO_2 stream and the catalyst [4]. These new materials could be beneficial by significantly reducing soil contamination and contributing value towards minimizing the impact of climate change through the CO_2 electrochemical reduction to formate process.

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