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Aerogel Cathodes for Electrochemical CO_2 reduction

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Electrochemical reduction of carbon dioxide powered by renewable energy to produce fuels and chemicals is a technology with potential to contribute to an economy based on a carbon neutral cycle. The development of cost effective, highly active and stable catalysts for CO_2 electro-reduction is being intensively researched. This work addresses the development of aerogel supported copper-zinc bimetallic catalysts[1]. Aerogels are substances with exceptional properties with many current and potential applications [2-3]. Due to their high surface area, stability in corresponding gaseous or liquid phases, transport through large meso and macropores they are especially suited as catalysts and carrier materials for catalysis and, when electric conductive for electro-catalysis. Aerogels prepared by the sol gel method and impregnated with metallic particles will be tested as cathodes for the co-electrolysis of CO_2 and water to produce syngas at temperatures near room temperature and high-pressure. In this way this process can be directly coupled to other high pressure processes, such as Fischer-Tropsch that use high pressure syngas as raw material. Productivities and faradaic efficiencies will be evaluated. The characterization of the aerogel-based cathodes will be undertaken by surface analysis techniques. BET surface areas will be determined. The catalytic cathodes will be tested in an ionic liquid-based electrolyte as a way to increase current densities, due to the high CO_2 solubilities exhibited by some ionic liquid families [4].

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