Abstract:

The transformation of carbon dioxide (CO_2) into value-added products through the application of electricity is a promising method to mitigate climate change. We propose to develop reactors that allow for the practical and scalable electrochemical reduction of CO_2. This research will contribute to the development of a sustainable cycle of carbon emissions. The reactors will convert CO_2 to ethanol or methanol, which can be used in fuel cells or blended with gasoline to create a partially recycled fuel. We will test how CO_2 pressure, electrolyte flow rate, the spatial distribution of electrodes, and the chemical composition of the electrode-bound catalysts affect the selectivity and efficiency of CO_2 conversion. Additionally, we will explore the application of polymers and self-assembled monolayers (SAMs) to tailor reaction selectivity.