Abstract

High current density electrodes for electroconversion of CO_2

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Feasible replacement of fossil fuels needs very high efficient CO_2RRs. Nevertheless, the improving of the carbon dioxide reduction reactions (CO_2RRs) for reducing anthropogenic greenhouse gas emissions or even removing CO_2 from the atmosphere while selectively producing chemicals and fuels must also to assess industrial productivity at competitive cost. Consequently, high current density working conditions and low cell bias are required for fulfilling all of these requirements. This contribution is focused on electrocatalytic conversion of CO_2 into useful products, such as carbon monoxide, methanol, formic acid, and C_2 products using highly tunable catalysts, electrode microstructures and electrochemical cell configuration for achieving high current densities in the electrochemical reduction of CO_2. Our interests are addressed into electrode for obtaining higher reaction rates to endeavor lower capital costs and increase flexibility against fluctuation of the renewable energies. Catalysts will be discussed from their ability to selectively and efficiently undergo CO_2RR by controlling defects, phases, sizes, dispersion, edge sites, interfaces, functional groups, etc. to enhanced kinetics or to increase the active site density. Likewise, electrode microstructure aspects controlling some limitation features like mass transport or hydrophobicity will also be discussed keeping in mind the objective to achieve current densities in the order of Acm^{-2}.