

Local ionic liquid environment at a modified iron porphyrin catalyst enhances electrocatalytic performance of CO₂ to CO reduction in water

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Limiting CO₂ emission in our atmosphere is one of the most important environmental, energetic and scientific contemporary challenges. To mitigate the concentration of CO₂ in our atmosphere, a gradual replacement of fossil fuel by more sustainable energy sources should be accompanied by the capture, separation, storage and utilization of CO₂ to produce zero-carbon fuel such as methane, methanol, ethylene, etc.¹

Because of the high thermodynamic stability of the CO₂ molecule, chemists have developed several catalysts to promote its transformation. Metalloporphyrins, particularly those of iron and cobalt,² are among the most efficient molecular catalysts for converting CO₂ through redox reactions. However, the reduction of CO₂ requires significant energy inputs and the use of acids as a proton source as well as organic solvents.

Inspired by the active site of enzymes capable of performing CO₂ reduction, we develop new modified iron porphyrins with a local ionic liquid environment to enhance the electrocatalytic performance of CO₂ to CO reduction (Fig.1). As a result, our new catalyst can selectively reduce CO₂ to CO in water and without any external source of protons. This original concept enabled us to optimize the energy costs of the capture, activation and transformation of the CO₂ molecule.³

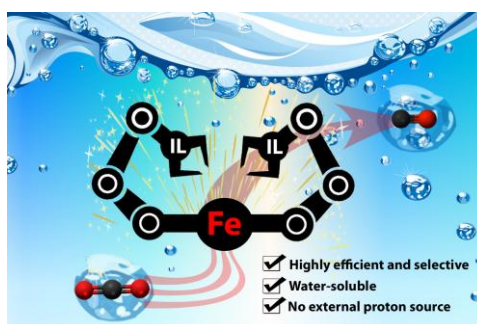


Figure 1 electrocatalytic reduction of CO₂

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