

Electrochemical reduction of carbon dioxide in the presence of a cobalt schiff base complex synthesized from 2, 4-dinitrophenylhydrazine and acetylacetone

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The concentration of carbon dioxide in the atmosphere has been increasing drastically during the last few decades. Industrialization and development in transportation have caused a massive increase of consumption of fossil fuel, which is the major cause of the carbon dioxide into emission atmosphere. Excessive amounts of carbon dioxide in air can cause global issues such as elevation of temperature, climate changes, acid rains, elevation of the sea level etc. Converting carbon dioxide into useful organic compounds is a potential way to reduce the amount of carbon dioxide in the atmosphere. However, the major obstacle preventing efficient fixation of carbon dioxide is its inertness. Therefore, scientists are interested in increasing the efficiency of this conversion via association of catalysts. Transition metal complexes have been studied widely for their electrocatalytic activity on reducing CO₂. These complexes act as homogeneous catalysts for the reduction process and have reached efficiencies as high as 43 in terms of iCO₂/iN₂. Schiff bases are nitrogen analogues of carbonyl groups. The nitrogen centre of these compounds can be used to coordinate with metal centres to form Schiff base metal complexes. These sorts of complexes have shown promising results on electrocatalytic activities in recent years. In this study, a Schiff base complex of cobalt was studied for its electrocatalytic activity on reduction of carbon dioxide. Cyclic voltammetry is used to study the electrochemical behaviour of the complex throughout the study. The reduction potential of carbon dioxide was found to be -0.86 V in the presence of the complex in DMF with respect to the saturated calomel electrode. This potential is very low compared to cyclam which reduces CO₂ at a potential of -1.5 V, making the process of reduction of CO₂ more thermodynamically feasible in the presence of the studied complex. The efficiency of reduction in terms of iCO₂/iN₂ was found to be 1.76.