World Academy of Science, Engineering and Technology
International Journal of Chemical and Molecular Engineering
Vol:18, No:06, 2024

Electrochemical Reduction of Carbon-dioxide Using Metal Nano-particles Supported on Nano-Materials

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Abstract : Electrochemical reduction of CO_2 is an emerging and current issue for its conversion in to valuable product upon minimization of its atmospheric level for contribution of maintaining within the range of permissible limit. Among plenty of electro-catalysts gold and copper are efficient and effective catalysts, which are synthesized and applicable for this research work. The two metal catalysts were prepared in inert environment with different compositions through co-reduction process from their corresponding precursors and then by adding multi-walled carbon nano-tube as a supporter and enhanced the conductivity. The catalytic performance of CO_2 reduction for each composition was performed and resulted an outstanding catalytic activity with generation of high current density (70 mA/cm^2 at 0.91V vs. RHE) and relatively small onset potential. The catalytic performance, compositions, morphologies, structure and geometric arrangements were evaluated by electrochemical analysis (LSV, impedance, chronoamperometry & tafel plot), EDS, SEM and XAS respectively. The composite metals showed better selectivity of products and faradaic efficiencies due to the synergetic effects of the combined nano-particles in addition to the impact of grain size in reduction of CO_2. Carbon monoxide, hydrogen, formate and ethanol are the reduction products, which are detected and quantifiable by chromatographic techniques considering their physical state of each product.

Keywords : carbondioxide, faradaic efficiency, electrocatalyst, current density
Conference Title : ICCME 2024 : International Conference on Chemical and Molecular Engineering
Conference Location : Istanbul, Türkiye
Conference Dates : June 27-28, 2024

Open Science Index, Chemical and Molecular Engineering Vol:18, No:06, 2024 publications.waset.org/abstracts/184733.pdf