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Electrochemical reduction of carbon dioxide using AuCu nanoparticles supported in multi-walled carbon nano-tube and dispersed on carbon fiber paper

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Electrochemical reduction of CO_2 is an emerging and current issue for its conversion into valuable product upon minimization of its atmospheric level for the 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 to this research work. The two metal catalysts were prepared in an inert environment with different compositions through the co-reduction process from their corresponding precursors and then by adding multi-walled carbon nanotube (MWCNT) as a supporter and enhanced the conductivity. The catalytic performance of CO_2 reduction for each composition was performed and resulted in an outstanding catalytic activity with the generation of high current density (70 mA/cm2 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 nanoparticles in addition to the impact of grain size in the 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.

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