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Copper Selenide Nanobelts: An Electrocatalyst for Methanol Electro-Oxidation Reaction

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Abstract : The energy crisis of the current society has attracted research attention for alternative energy sources. Methanol oxidation is the source of energy but needs efficient electrocatalysts like Pt. However, their practical ability is hindered due to cost and poisoning effects. In this regard, an efficient catalyst is required for methanol oxidation. Herein, high temperature, pressure, and diethylenetryamine (DETA) as reaction medium/structure directing agent during the solvothermal method are used for nanobelt $Cu_3Se_2/Cu_{1.8}Se$ (mostly hexagonal appearance) formation. The electrocatalyst shows optimized methanol electrooxidation reaction (MOR) response in 1 M KOH and 0.5 M methanol at a scan rate of 50 mV/s and delivers a current density of 7.12 mA/mg at a potential of 0.65 V (vs Ag/AgCl). The catalyst exhibits high electrochemical active surface area (ECSA) (0.088 mF/cm^2) and low Rct with good stability for 3600 s, which favors its high MOR performance. This high response is due to its 2D hexagonal nanobelt morphology, which provides a large surface area for reaction. The space among nanobelts reduces diffusion kinetics, and the rough/irregular edge increases the reaction site to improve the methanol oxidation reaction overall.

Keywords : energy application, electrocatalysis, MOR, nanobelt
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