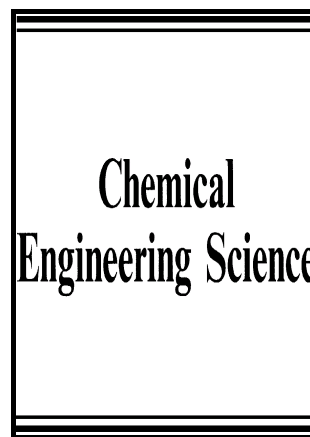


## Author's Accepted Manuscript

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PII: S0009-2509(16)30332-3  
DOI: <http://dx.doi.org/10.1016/j.ces.2016.06.035>  
Reference: CES13015

To appear in: *Chemical Engineering Science*

Received date: 20 February 2016

Revised date: 18 May 2016

Accepted date: 16 June 2016

Cite this article as: Muhammad Irfan Malik, Zuhair Omar Malaibari, Muata Atieh and Basim Abussaud, Electrochemical Reduction of CO<sub>2</sub> to Methanol over MWCNTs Impregnated with Cu<sub>2</sub>O, *Chemical Engineering Science* <http://dx.doi.org/10.1016/j.ces.2016.06.035>

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## Electrochemical Reduction of CO<sub>2</sub> to Methanol over MWCNTs Impregnated with Cu<sub>2</sub>O

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### Abstract

This study evaluated the reduction of CO<sub>2</sub> to methanol in the presence of effective and stable MWCNTs impregnated with Cu<sub>2</sub>O. A preliminary DFT study shows that the incorporation of Cu<sub>2</sub>O in MWCNTs improves the electronic properties of the electrocatalyst. The surface morphology and structural interaction between Cu<sub>2</sub>O and MWCNTs at different Cu<sub>2</sub>O loadings (10-50 wt %) were characterized by SEM, TEM, EDX, XRD, BET, TGA, and Raman spectroscopy. Characterization results show that the Cu<sub>2</sub>O particles are incorporated at defect sites in the MWCNT matrix. However, higher lodgings (40 and 50 wt %) result in the agglomeration of Cu<sub>2</sub>O particles and crystallite size growth. Electrochemical evaluation of the catalyst for CO<sub>2</sub> reduction was conducted in a two-component polycarbonate electrochemical cell. Linear sweep voltammetry results show that the 30% Cu<sub>2</sub>O-MWCNTs catalyst gives the highest current density in the entire potential range, and a faradaic efficiency of 38% was achieved at -0.8 V for the reduction of CO<sub>2</sub> to methanol. The study shows that the impregnation of Cu<sub>2</sub>O on MWCNTs affects the structural and electronic properties of the electrode, which in turn improves both the activity and stability of the catalyst as confirmed by chronoamperometry.

**Keywords:** Multi wall carbon nanotubes, CO<sub>2</sub> reduction, Cu<sub>2</sub>O electrocatalyst, Methanol, Faradaic efficiency

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