

## Accepted Manuscript

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PII: S0021-9797(18)30127-9  
DOI: <https://doi.org/10.1016/j.jcis.2018.01.109>  
Reference: YJCIS 23267

To appear in: *Journal of Colloid and Interface Science*

Received Date: 20 December 2017  
Revised Date: 30 January 2018  
Accepted Date: 31 January 2018

Please cite this article as: T. Xiang, F. Xin, C. Zhao, S. Lou, W. Qu, Y. Wang, Y. Song, S. Zhang, X. Yin, Fabrication of nano copper oxide evenly patched on cubic sodium tantalate for oriented photocatalytic reduction of carbon dioxide, *Journal of Colloid and Interface Science* (2018), doi: <https://doi.org/10.1016/j.jcis.2018.01.109>

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# Fabrication of nano copper oxide evenly patched on cubic sodium tantalate for oriented photocatalytic reduction of carbon dioxide

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**Abstract:** A synthetic process was exploited to fabricate patchy CuO evenly planted on cubic NaTaO<sub>3</sub> for photocatalytically reducing CO<sub>2</sub> in isopropanol. The nano patches of CuO with about 15 nm in size were uniformly distributed on the surface of NaTaO<sub>3</sub> via a phase-transfer protocol and solvothermal synthesis. The crystal phase, morphology, composition, optical absorption and charge separation of as-prepared CuO-NaTaO<sub>3</sub> were characterized by XRD, SEM, TEM, EDX, XPS, UV-Vis and PL. The results of photocatalytic reduction of CO<sub>2</sub> confirmed that the CuO patched NaTaO<sub>3</sub> possessed better ability to separate charge carriers and selectively reduce CO<sub>2</sub> to methanol than CuO directly loaded NaTaO<sub>3</sub> using the traditional liquid phase reduction procedure after comparing the methanol yields. Furthermore, 5wt% CuO patched NaTaO<sub>3</sub> led to the highest methanol yield of 1302.22  $\mu\text{mol g}^{-1} \text{h}^{-1}$ . A redox mechanism was proposed and illustrated in a schematic diagram.

Keywords: photocatalysis, NaTaO<sub>3</sub> nanocube, patchy CuO, reduction of CO<sub>2</sub>, methanol yield

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