

# Uniform Cu-Doped Carbon Inherited From Plant Growth for Electrocatalytic CO<sub>2</sub> Reduction to CH<sub>4</sub>

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In observance of the fast and continuous growth of global CO<sub>2</sub> atmospheric level, the recent development of electrocatalytic CO<sub>2</sub> reduction features as an attractive approach that can convert excess CO<sub>2</sub> into value-added fuels/chemicals to replace conventional fossil fuels, as well as reducing CO<sub>2</sub> level for realizing carbon neutral economy. Key to the success of goal is the development of Cu-based electrocatalysts with accurate structural tuning, which has been intensively investigated by complicated chemical synthetic methods. Distinctive from the conventional chemical methods, here we have proposed a paradigm-shift concept of Cu catalyst growth, during which Cu ions are absorbed into a plant's root (such as bean sprouts) and homogeneously distributed. This uniform distribution of Cu ions is inherited after subsequent calcination to obtain a Cu-doped carbon nanosheet catalyst, which features efficient electrocatalytic CO<sub>2</sub> reduction activity. Under the optimal conditions investigated in this work, this "planted Cu catalyst" enabled highly selective (~ 95%) conversion of CO<sub>2</sub> into methane (CH<sub>4</sub>), substantially exceeding the control sample where Cu ions were directly impregnated on bean sprout's surface and calcinated. This concept of "planted catalyst" suggests a general but powerful means to prepare uniformly metal-doped electrocatalysts directly from biomass, with high and selective catalytic conversion capability.

## Awards Won:

Fourth Award of \$500