

# The Unique Icosahedral PdRu Nanoframes: A Innovative and Cost-Efficient Nanostructure for CO<sub>2</sub> Reduction

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## Abstract

Nanoframes creative the unique 3D open structures, has a high surface-to-volume ratio, which are expected to possess abundant low-coordinated surface atoms that give high affinity to adsorbates. However, the nanoicosahedron has a tensile strain on its surface and it can increase its catalytic activity. The synthesis concept depends on these two strategies to synthesize icosahedral nanoframes. Synthetic bimetallic catalysts for the electrochemical that alcohols were formed by CO<sub>2</sub> reudction reaction is one of the critical discover in catalysis of result. In this research, we developed a one-step and one-pot synthetic method to synthesize Ru-alloying icosahedral Pd nanoframes. Three different icosahedral nanostructures were obtained at different reaction times. In TEM image, the hollow structures can be clearly observed. However, the XPS spectrum peaks attribute to Pd and Ru. To unravel the mystery of nanoframe catalysis in CO<sub>2</sub> reduction reaction, we firstly aimed to investigate the CO<sub>2</sub> reduction reaction behavior of PdRu NCs with CV (Cyclic Voltarmmetry) spectrum. The unique tension straim of the icosahedron was observed in the XRD patterns. In order to confirm the activity of nanoicosahedral catalysts, we conducted and measure electrochemical CO<sub>2</sub> reduction reaction. The faradic efficacy plot be able to prove the nanoframes structure have potentiality activity for CO<sub>2</sub> reduction reaction.

**Keywords – Icosahedral, Nanoframe, Bimetallic, Catalysis, CO<sub>2</sub> reduction reaction**