

Supplementary Materials

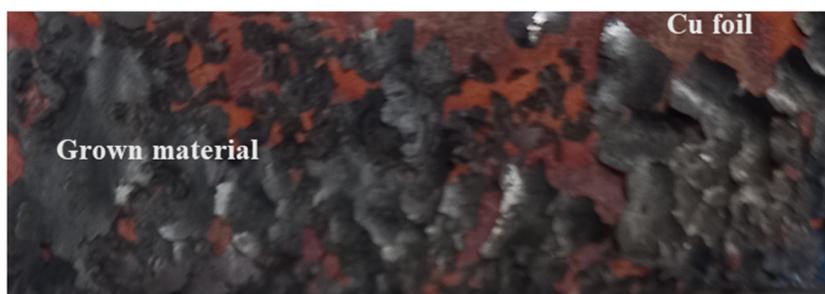
# One-Step Synthesis of a Binder-Free, Stable, and High Performance Electrode; Cu-O|Cu<sub>3</sub>P Heterostructure for the Electrocatalytic Methanol Oxidation Reaction (MOR)

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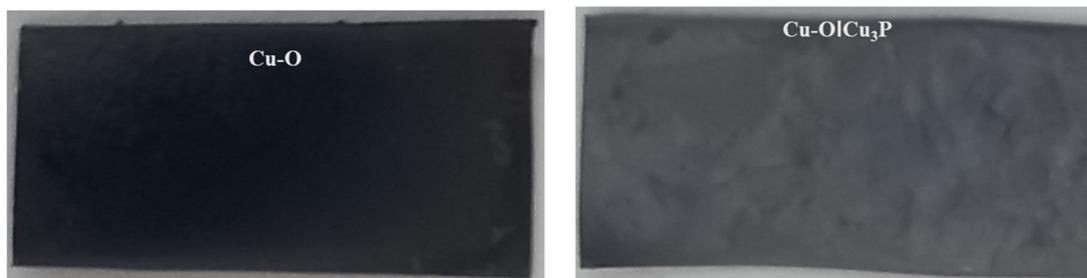
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**Figure S1.** The optical photograph represents the Cu foil heated at 500 °C in air. The material formed with it are found to be ruptured and thus it is not suitable to act as a binder free electrode.



**Figure S2.** Left image stands for mixed Cu oxides (Cu-O) grown over Cu foil (heated in air at 350 °C) and the right one denotes the optical image of Cu-O|Cu<sub>3</sub>P that grown over Cu foil. In both cases the front and rear sides are fully converted to Cu based oxides and phosphide.

**Table S1.** represent the deconvoluted compositions of elements and C 1s arises from the substrate (carbon tape) while measuring the XPS.

Elements	Atomic percentage
Cu 2p	12.66
P 2p	15.56
O 1s	63.48
C 1s	8.3

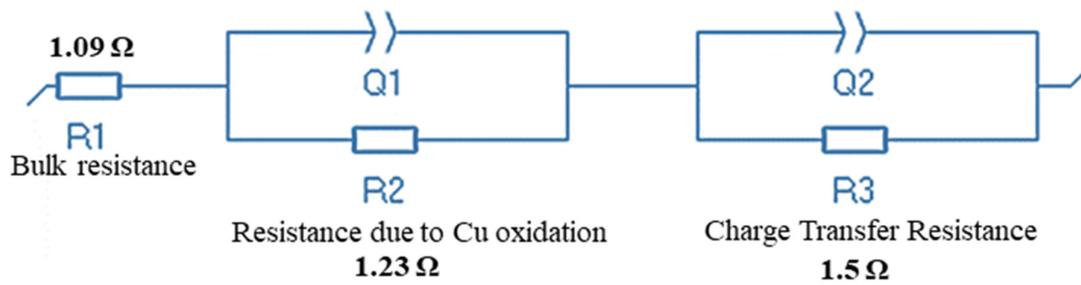


Figure S3. The equivalent circuit diagram fitted from the Nyquist data of Cu-O|Cu<sub>3</sub>P.

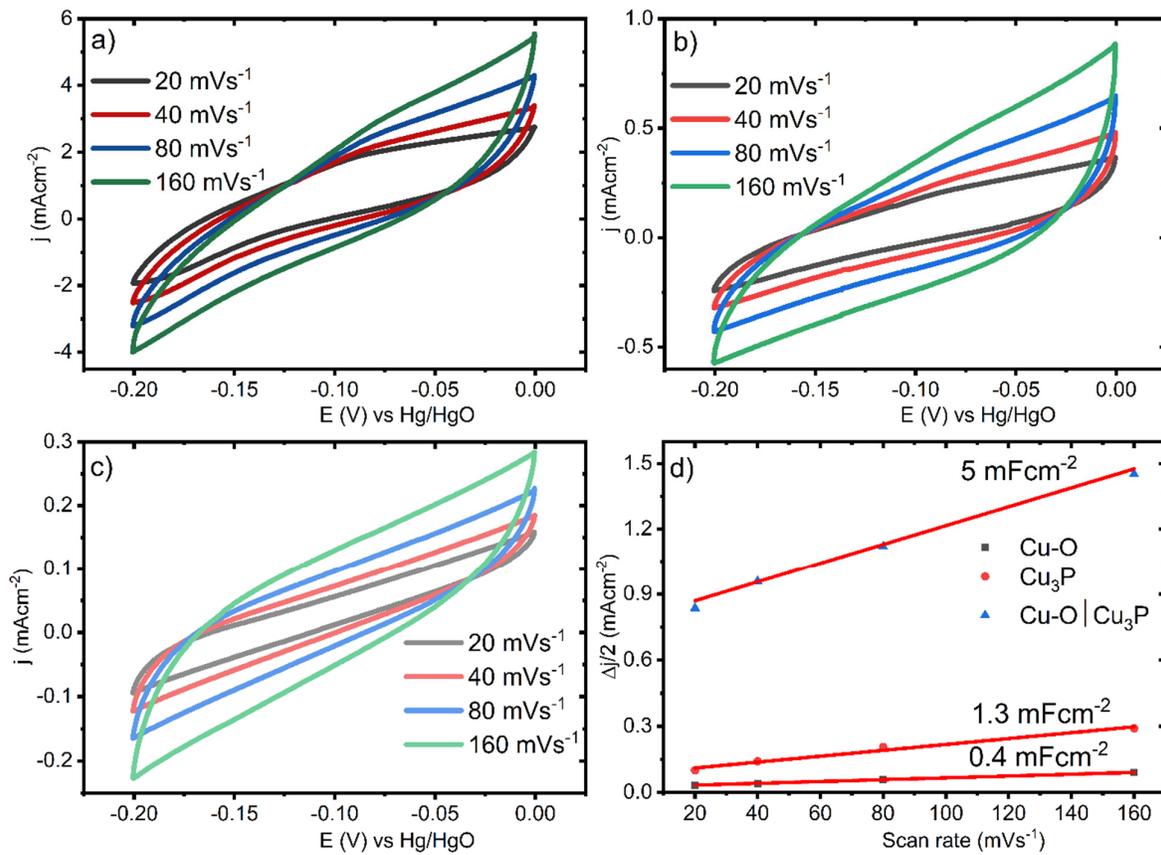
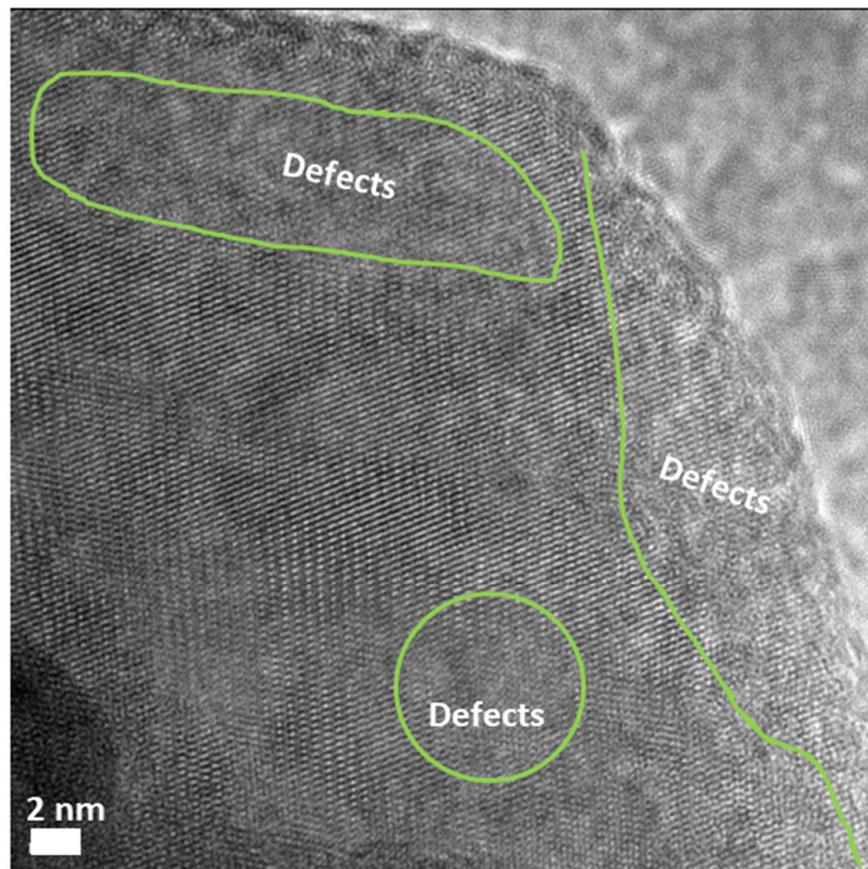
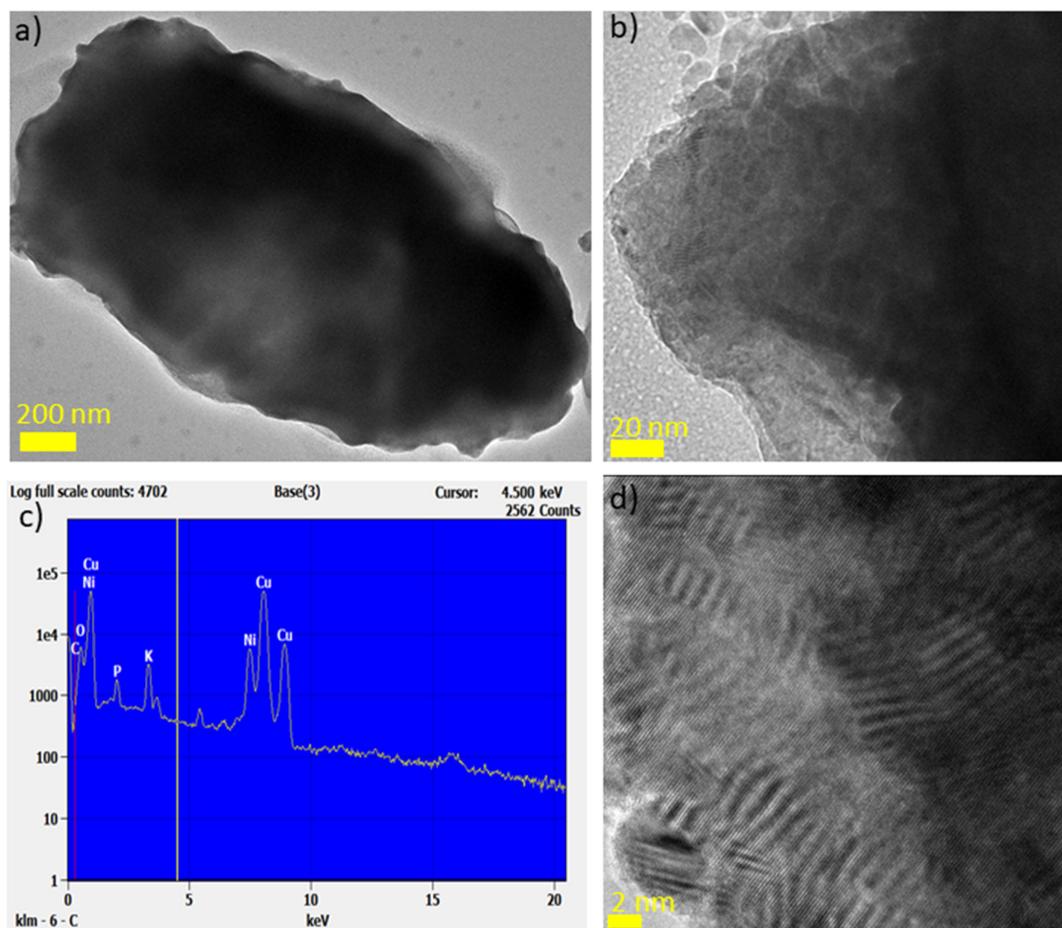


Figure S4. The cyclic voltammograms carried out at different sweep rates (a) Cu-O, (b) Cu<sub>3</sub>P and (c) Cu-O|Cu<sub>3</sub>P and (d) the double layer capacitance plots of three different catalysts.



**Figure S5.** The HR-TEM of Cu-O|Cu<sub>3</sub>P demonstrates the defects and randomness of the planes.



**Figure S6.** (a) the morphology of Cu-O|Cu<sub>3</sub>P after MOR, (b) the high-resolution image after MOR, (c) demonstrates the disorderness of the planes after MOR and (d) EDS of the post MOR sample to notice the presence of various elements.