

## Silver nanoparticles decorated NiFe<sub>2</sub>O<sub>4</sub>/CuWO<sub>4</sub> heterostructure electrocatalyst for oxygen evolution reaction

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# Equal contribution as a first author

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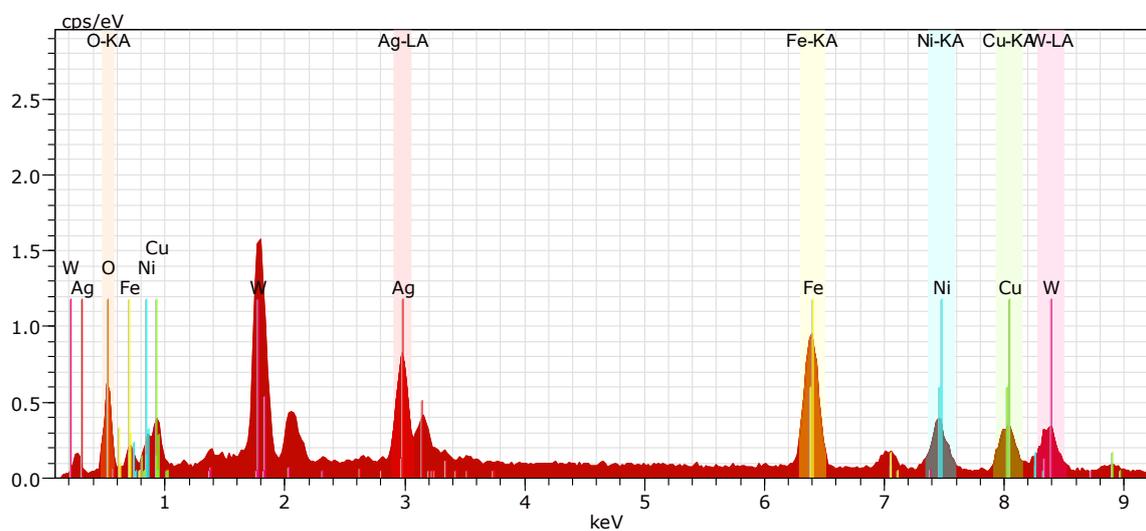
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### Synthesis of CuWO<sub>4</sub>

In this typical experiment, two separate solutions were prepared, consisting of Cu (NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O (0.77mmol) and Na<sub>2</sub>WO<sub>4</sub>·2H<sub>2</sub>O (0.77mmol), which was dissolved in 30ml of DW. Then, one weight percent of PVP was added to the mixture. Subsequently, the prepared Na<sub>2</sub>WO<sub>4</sub>·2H<sub>2</sub>O (0.77mmol) solution was gradually incorporated into the aforementioned mixture, and the stirring process was maintained for an additional 2 hours. This process resulted in the formation of a sea green precipitate. The precipitate underwent multiple wash cycles using a mixture of DW and ethanol. Afterward, it was subjected to drying at 70°C for 20 hours. The catalyst was further subjected to calcination at 500°C.

## 1. Characterization

The Powder-XRD patterns for the as-prepared electrocatalysts were obtained using a Rigaku Mini-X 600 diffractometer from Japan. The instrument was equipped with a Cu K $\alpha$  radiation source (wavelength = 1.540Å) and operated at a scanning rate of 5 degrees per minute with a step size of 0.01 degrees. Transmission electron microscopy (TEM) images were captured using a TECHNAI G220-electron microscope operating at 200kV. XPS analysis was conducted using an ESCA M-Probe instrument with an Al-K $\alpha$  source.



**Figure S1.** EDX data of 5AgNiCu electrocatalyst.

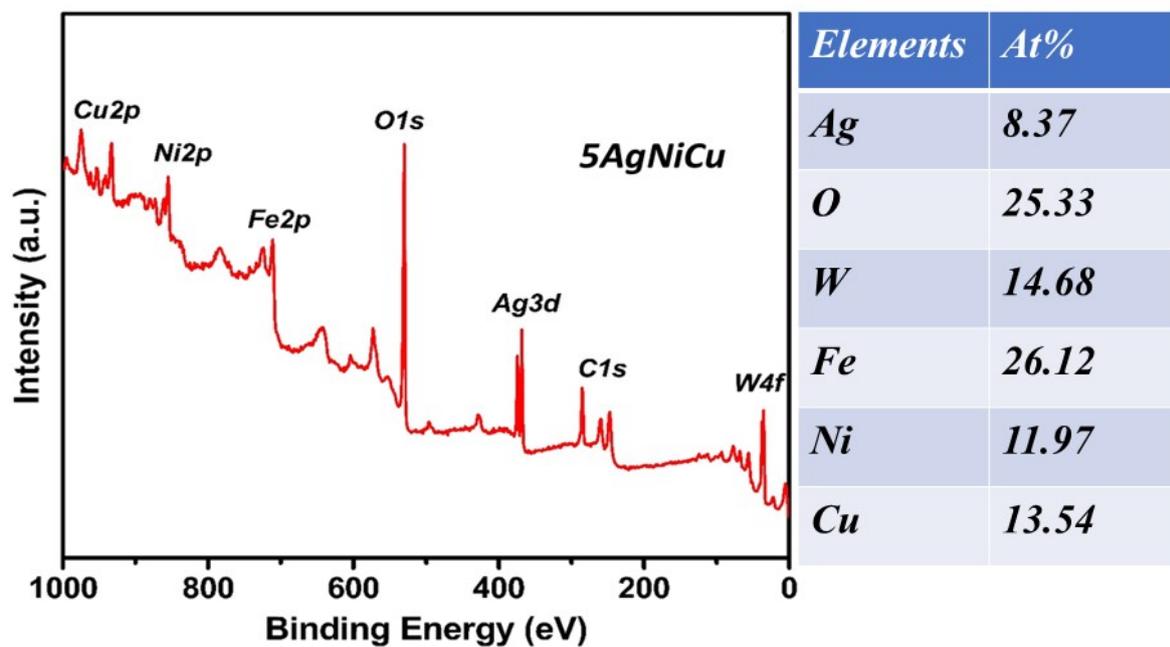


Figure S2. XPS survey spectrum of 5AgNiCu electrocatalyst

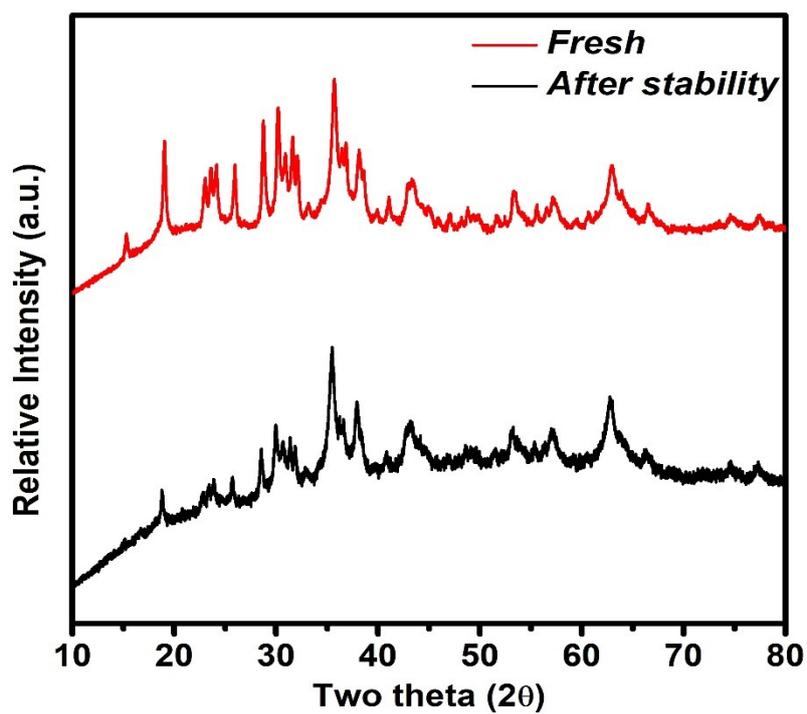
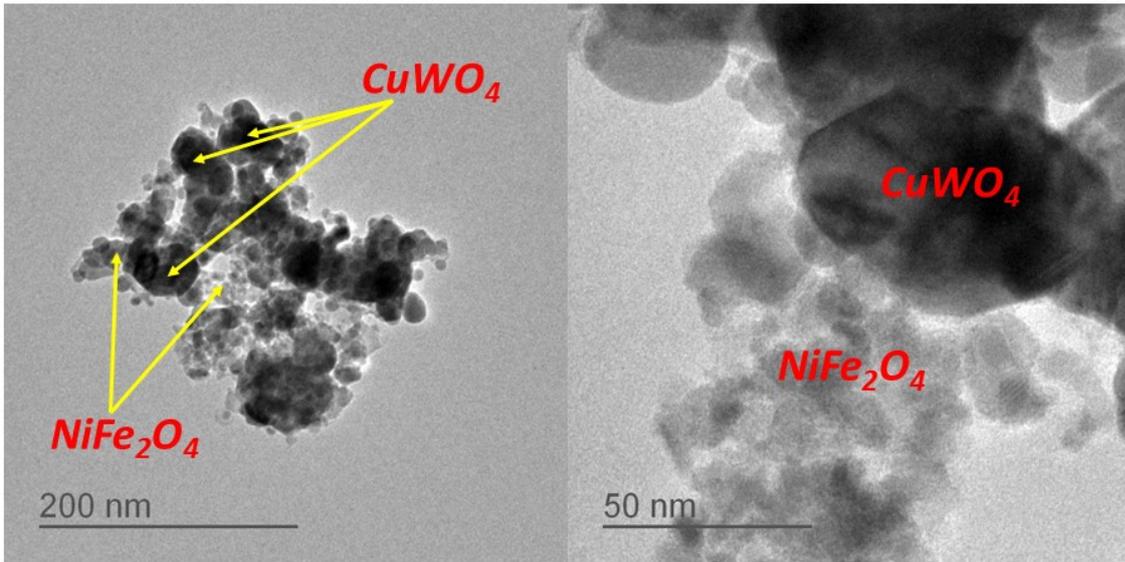


Figure S3. XRD pattern of 5AgNiCu before and after stability test.



**Figure S4.** TEM images of 5AgNiCu after stability test.