

Electronic Supplementary Information

Nanocomposites based on Cu₂O coated silver nanowire networks for high-performance oxygen evolution reaction

Sergio Battiato^{a,b}, Abderrahime Sekkat^{c,d}, Camilo Sanchez Velasquez^c, Anna Lucia Pellegrino^e, Daniel Bellet^c, Antonio Terrasi^{a,b}, Salvo Mirabella^{a,b}, and David Muñoz-Rojas^{c*}

^a Dipartimento di Fisica e Astronomia “Ettore Majorana”, Università di Catania, Via Santa Sofia 64, 95123 Catania, Italy

^b CNR-IMM, Via Santa Sofia 64, 95123 Catania, Italy

^c Univ. Grenoble Alpes, CNRS, Grenoble INP, LMGP, Grenoble, France

^d Laboratoire de Génie Chimique, Université de Toulouse, CNRS, Toulouse, France

^e Dipartimento di Scienze Chimiche, Università di Catania, INSTM UdR Catania, Viale Andrea Doria 6, I-95125 Catania, Italy

*Corresponding author, Email: david.munoz-rojas@grenoble-inp.fr

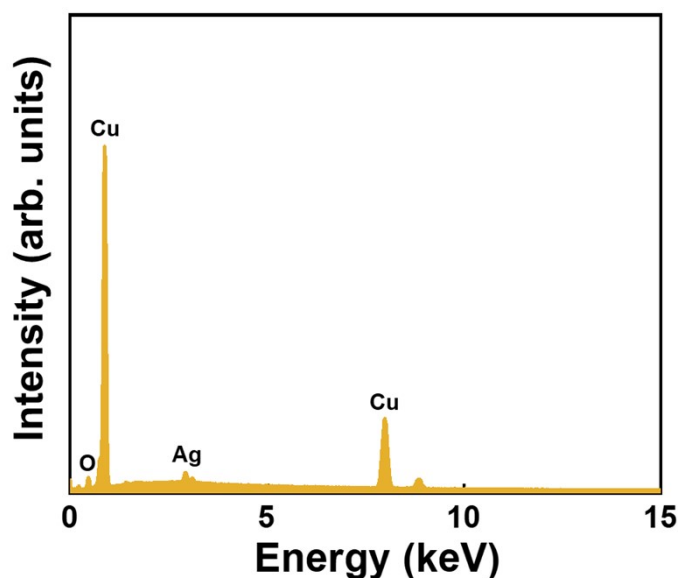


Fig. S1. EDS spectrum of AgNWs@Cu₂O100 nm.

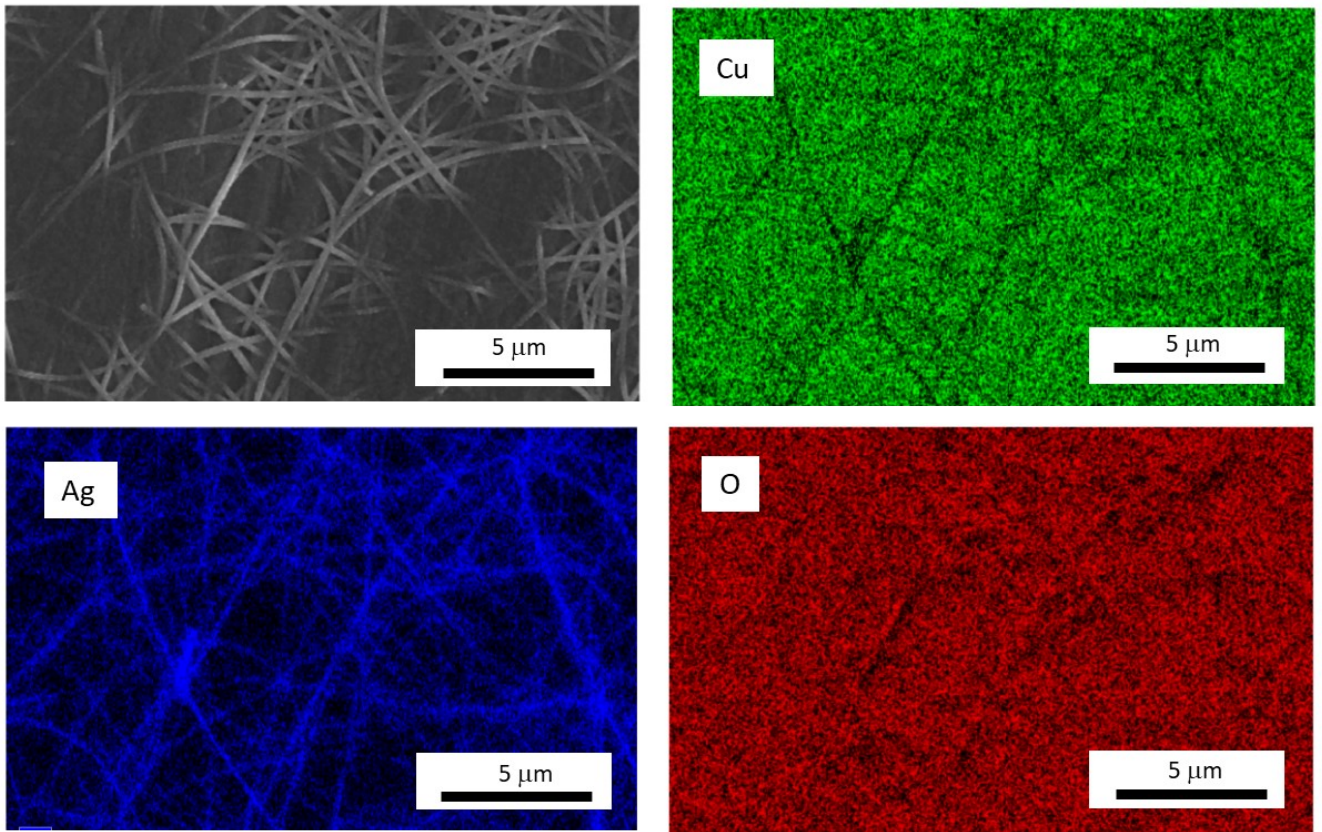


Fig. S2. SEM image and the corresponding elemental maps of AgNWs@Cu₂O100 nm.

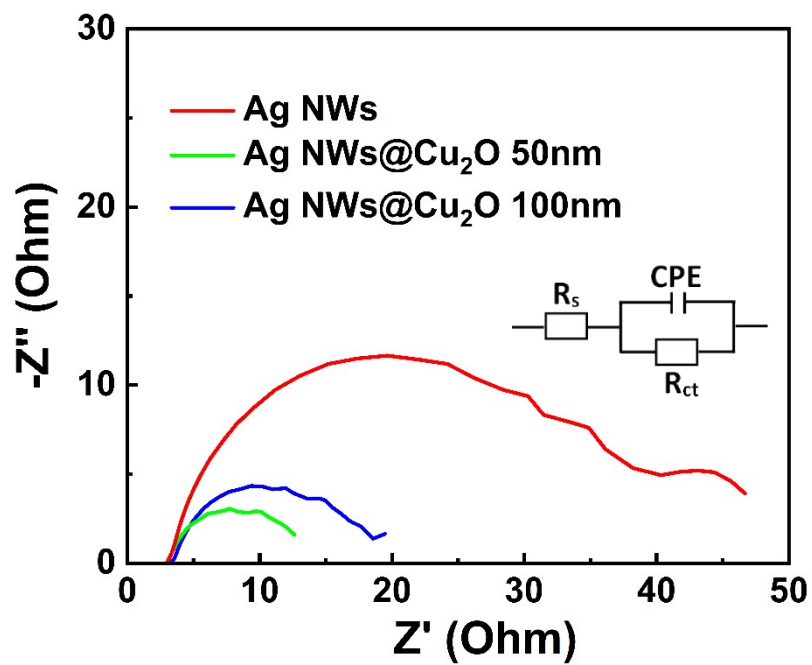


Fig. S3. Nyquist plots of various coatings deposited on Cu sheet in 1 M KOH. Inset shows the Randles equivalent circuit used for fitting the experimental data.

TOF calculation

The TOF is defined as the rate of production of oxygen molecules per available (and active) site:

$$\text{TOF} = j / 4nF$$

where j is the measured current density at a certain overpotential during the LSV measurements in 1 M KOH, A is the geometric area of the electrode, n is the number of active sites, and F is the Faraday constant ($96,485 \text{ C mol}^{-1}$)

Active Site Calculation [1-3]

The value of n can be calculated by CV measurements, carried out in PBS electrolyte (pH 7) from -0.2 to 0.6 V versus RHE, being the integrated charge over the whole potential range proportional to the total number of active sites.

The n is calculated according to the formula

$$n = \frac{Q}{2F} = \frac{it}{2F} = \frac{i \frac{V}{v}}{2F} = \frac{S}{2Fv}$$

where S is the area obtained by integrating the CV curve, F is the Faradaic constant ($96,485 \text{ C mol}^{-1}$), I is the current density (A m^{-2}), V is the voltage (V), and v is the scanning rate (V s^{-1}).

Calculation of C_{dl} and ECSA

The double layer capacitance (C_{dl}) was evaluated by cyclic voltammetry in non-Faradaic potential range 1.19 - 1.29 V vs. RHE at various scan rates (from 20 to 140 mV s^{-1}). Plotting the capacitive current density ($|j_a - j_c|$) determined at 1.24 V vs. the scan rate (v) yielded a straight line with a slope equal to twice the C_{dl} . The C_{dl} value can be then correlated with the ECSA, according to the expression [4]:

$$\text{ECSA} = C_{dl}/C_s$$

where C_s is the specific capacitance of the material or the capacitance of an atomically smooth planar surface of the material per unit area under identical electrolyte conditions. Here, we adopt a general specific capacitance of 0.04 mF cm^{-2} , typical value reported for a metal electrode in 1 M KOH solution [5].

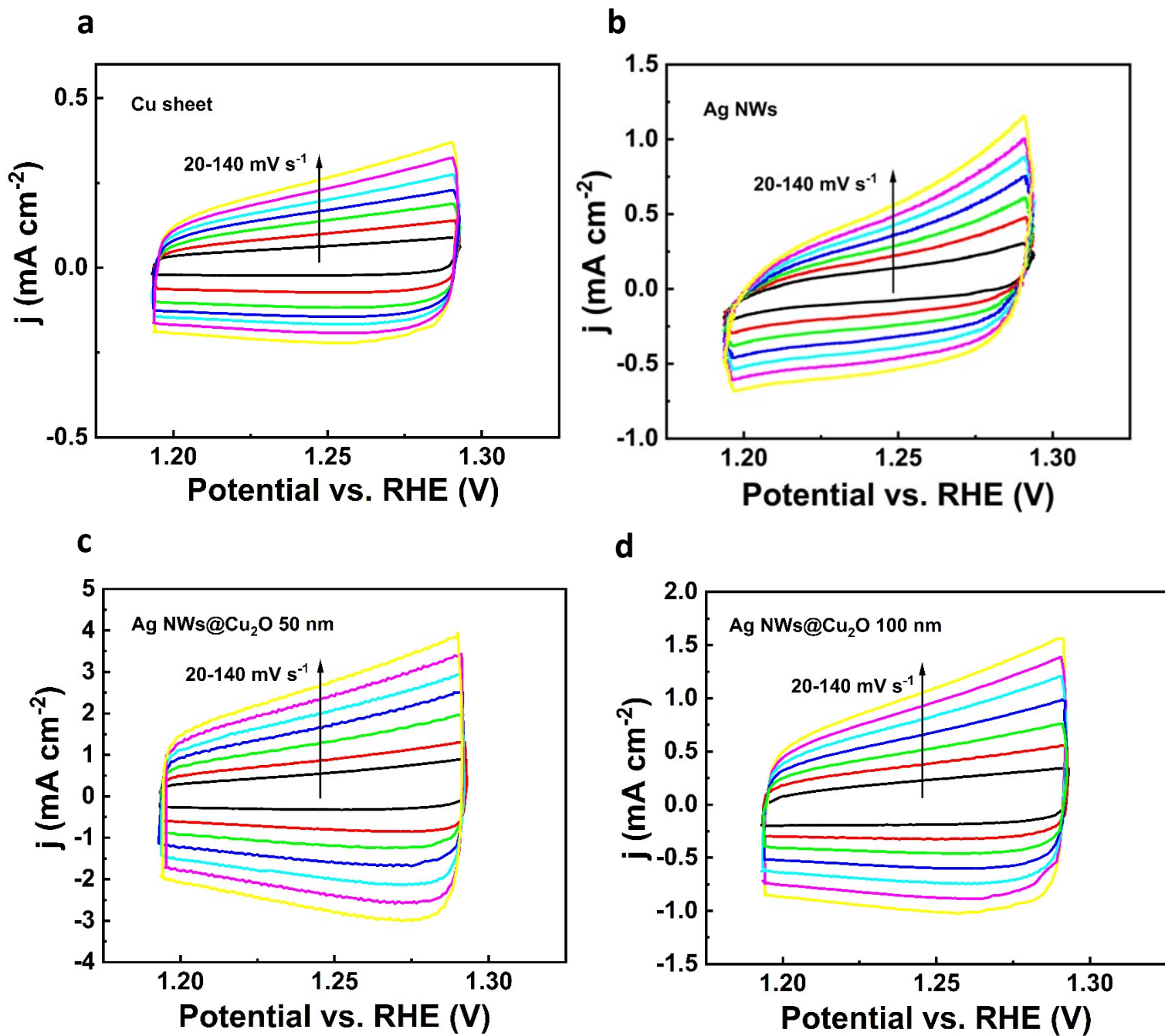


Fig. S4. CV curves in the non-faradaic region of 1.19-1.29 V vs. RHE of (a) Cu sheet, (b) Ag NWs, (c) Ag NWs@Cu₂O 50 nm, and (d) Ag NWs/Cu₂O 100 nm with various scan rates (20-140 mV s^{-1}).

References

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