Supplementary Information

Graphene-Coated Copper Nanowire Networks as a Highly Stable Transparent Electrode in Harsh Environments Toward Efficiently Electrocatalytic Hydrogen Evolution Reaction

Arumugam Manikandan[†], Ling Lee[†,⊥], Yi-Chung Wang[†], Chia-Wei Chen[†], Yu-Ze Chen[†], Henry Medina[†,η], Jiun-Yi Tseng[†,#], Zhiming M. Wang[‡] and Yu-Lun Chueh[†,‡,⊥,‖*]

[†]Department of Material Science and Engineering, National Tsing Hua University, Hsinchu 30013, Taiwan, ROC

[‡]School of Material Science and Engineering, State Key Laboratory of Advanced Processing and Recycling of Non-ferrous Metals, Lanzhou University of Technology, Lanzhou City 730050, Gansu, P.R. China

[⊥]Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu 611731, P. R. China.

[‖]Department of Physics, National Sun Yat-Sen University, Kaohsiung, 80424, Taiwan, ROC.

[#]Graduate School of Material Science, National Yunlin University of Science and Technology, Yunlin 64002, Taiwan, ROC

[η]Institute of Materials Research and Engineering, A*STAR (Agency for Science, Technology and Research), 2 Fusionopolis Way, Innovis, Singapore 138634

*Corresponding author: ylchueh@mx.nthu.edu.tw

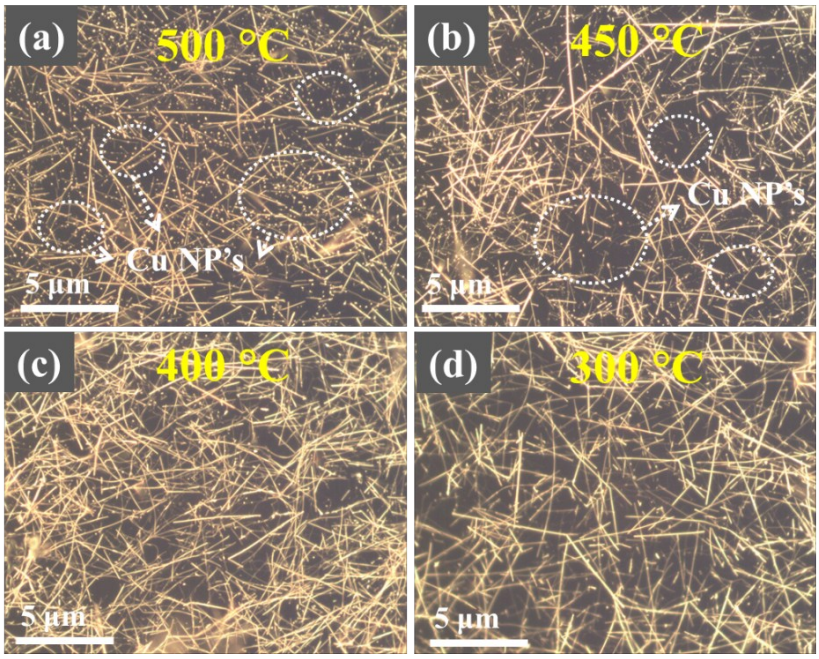

Fig.S1 (a-d) OM images of graphene-coated Cu NWs at different growth temperatures.

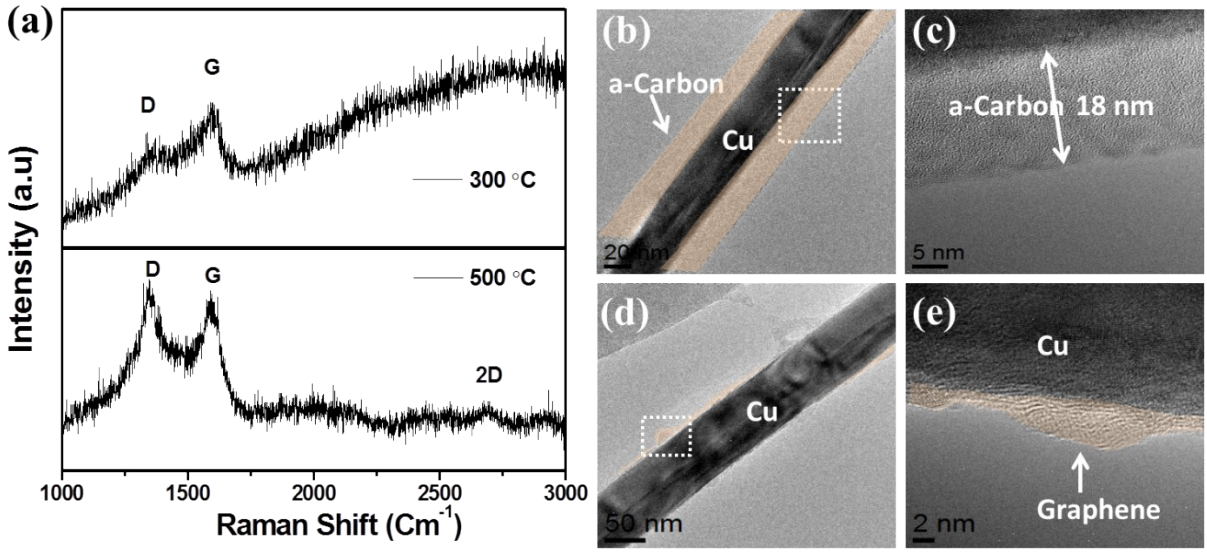

Fig. S2 (a) RAMAN spectra of a-carbon-coated Cu NWs grown at 300 °C (top) and graphene-coated Cu NWs grown at 500 °C (bottom), (b and c) HRTEM images of a-carbon coated Cu NW and (d and e) HRTEM image of graphene-coated Cu NW grown at 300 and 500 °C.

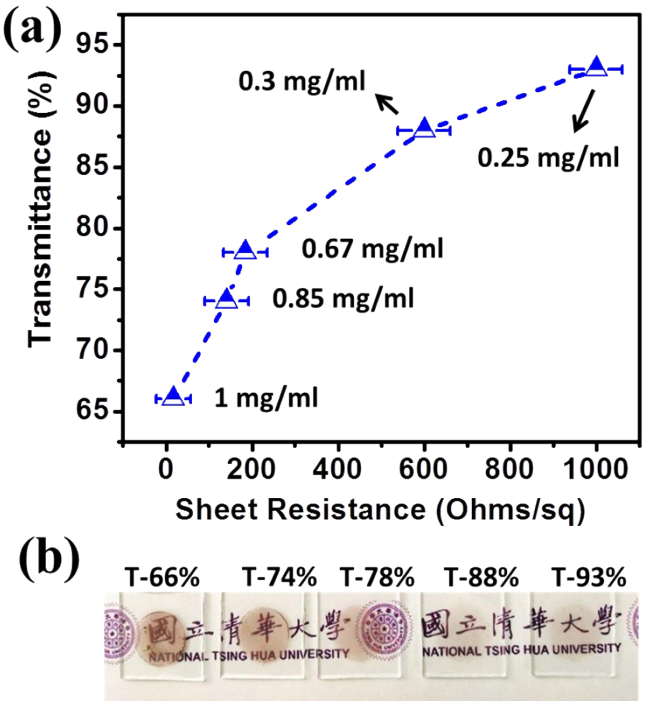

Fig. S3 (a) Rs Vs T% of a-carbon coated Cu NW TCE at 300 °C (b) photographic images of different concentration of samples.

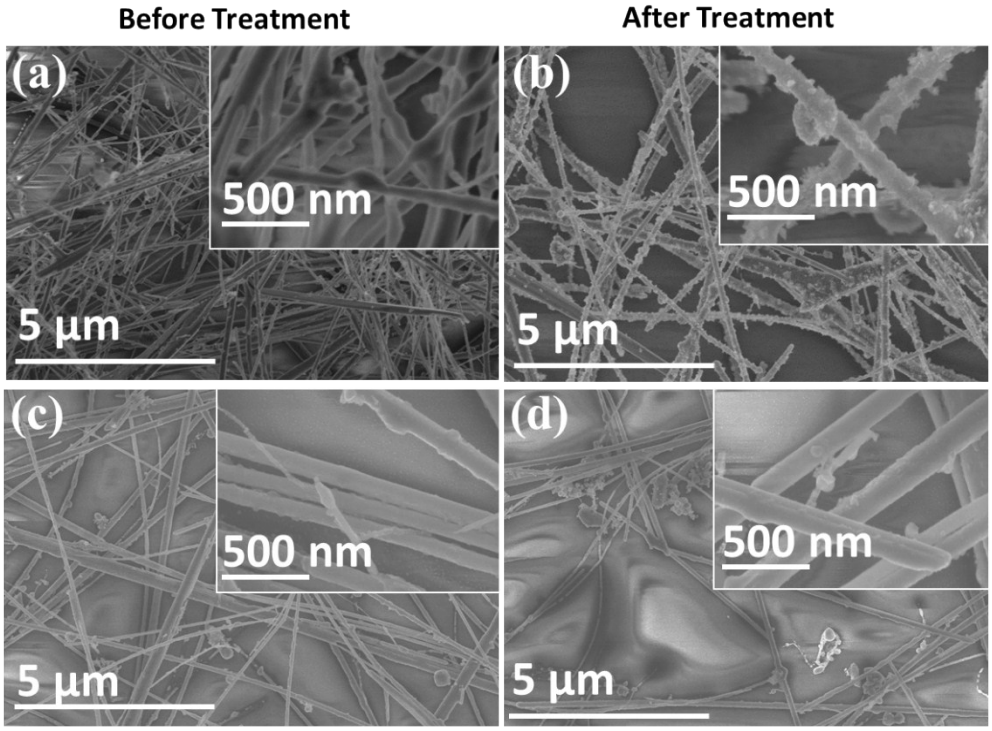

Fig. S4 SEM images of Cu NWs TCE (a and b) and graphene-coated Cu NWs TCE (c and d) before and after oxidation tests at 240 °C in the presence O_2 gas of 300 sccm.

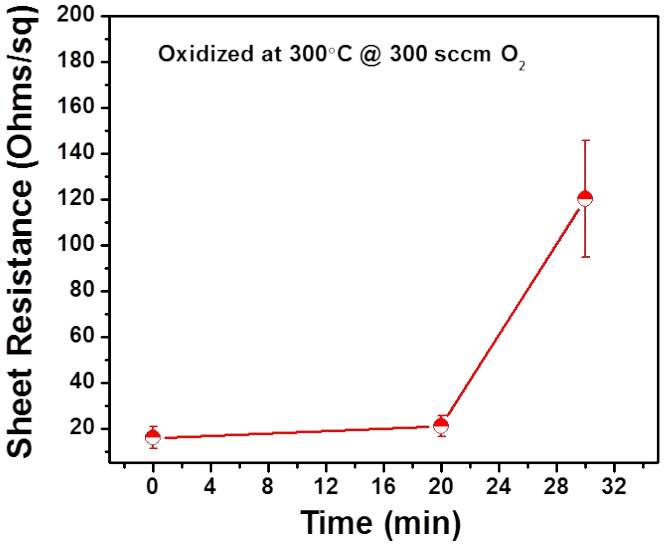

Fig. S5 Rs vs Time plot of graphene-coated Cu NWs TCE after oxidized at 300 °C in the presence O_2 gas of 300 sccm.

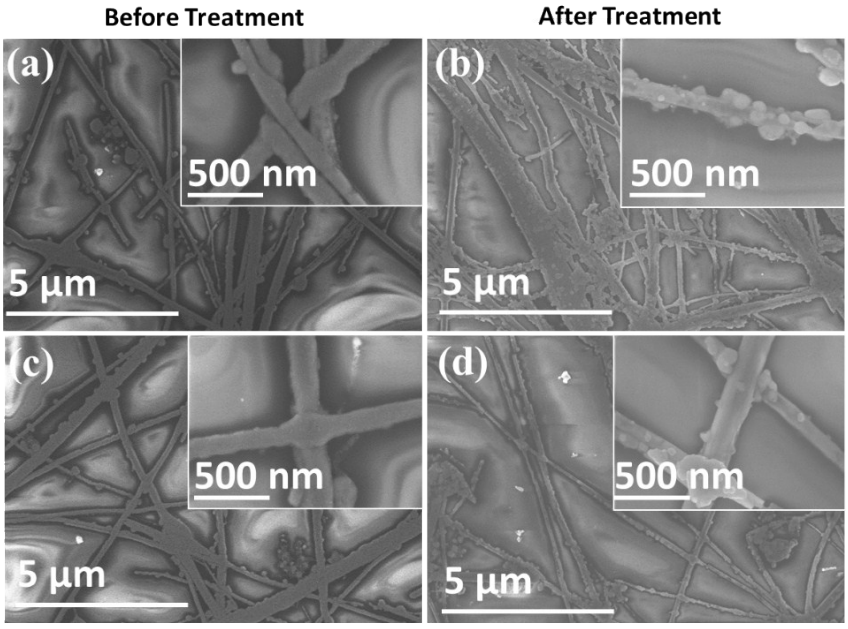

Fig. S6 SEM images of Cu NWs TCE (a and b) before and after basic tests in the presence of 0.5 M NaCl (c and d) before and after acidic tests in the presence of 0.5 M H_2SO_4, respectively.

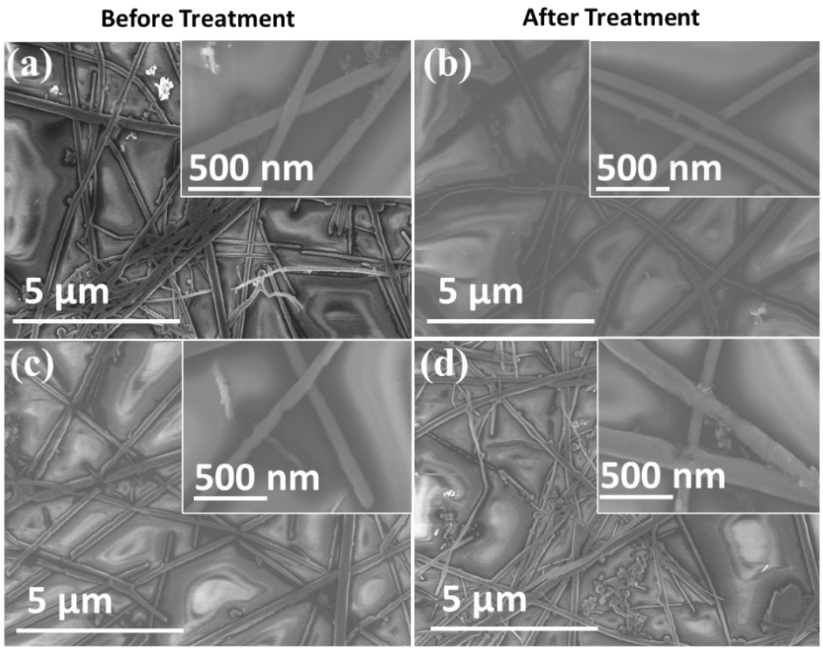

Fig. S7 SEM images of graphene-coated Cu NW TCE (a and b) before and after basic tests in the presence of 0.5 M NaCl (c and d) before and after acidic tests in the presence of 0.5 M H_2SO_4.

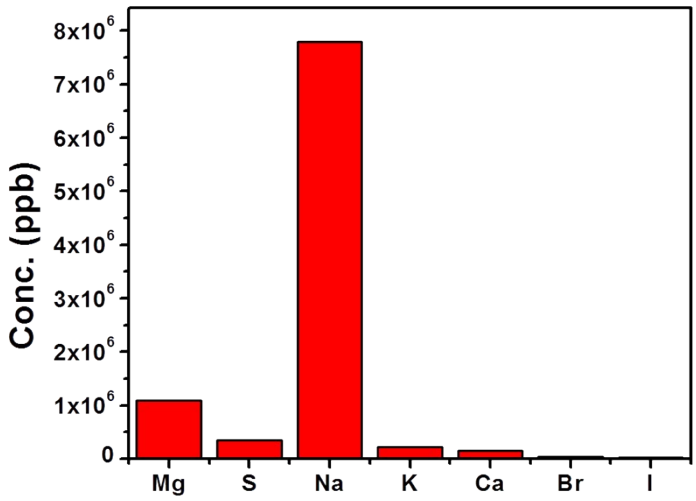

Fig. S8 ICPMS results of the sea water collected from Penghu Island, Taiwan (concentration of element in ppb)

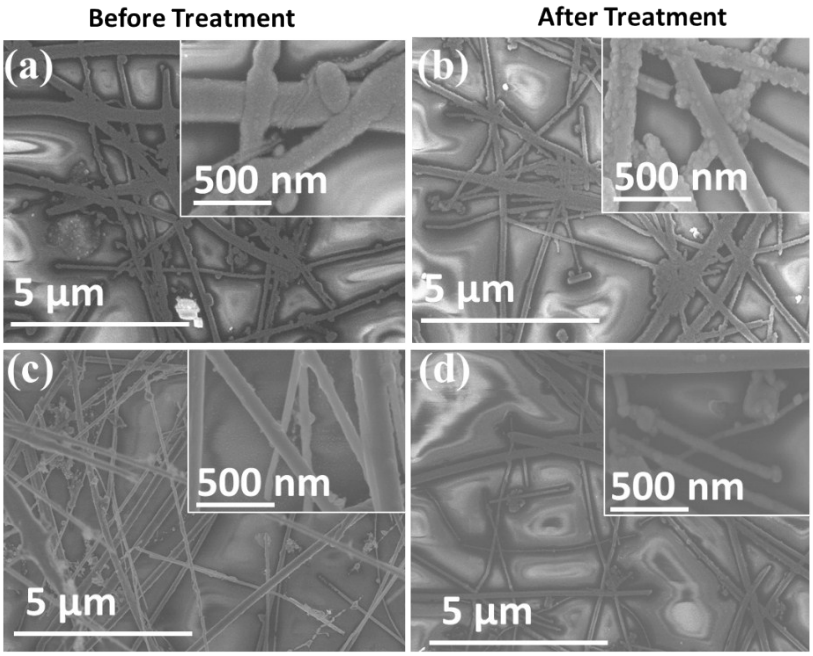

Fig. S9 SEM images of Cu NW TCE (a & b) and graphene-coated Cu NW TCE (c & d) before and after sea water test.

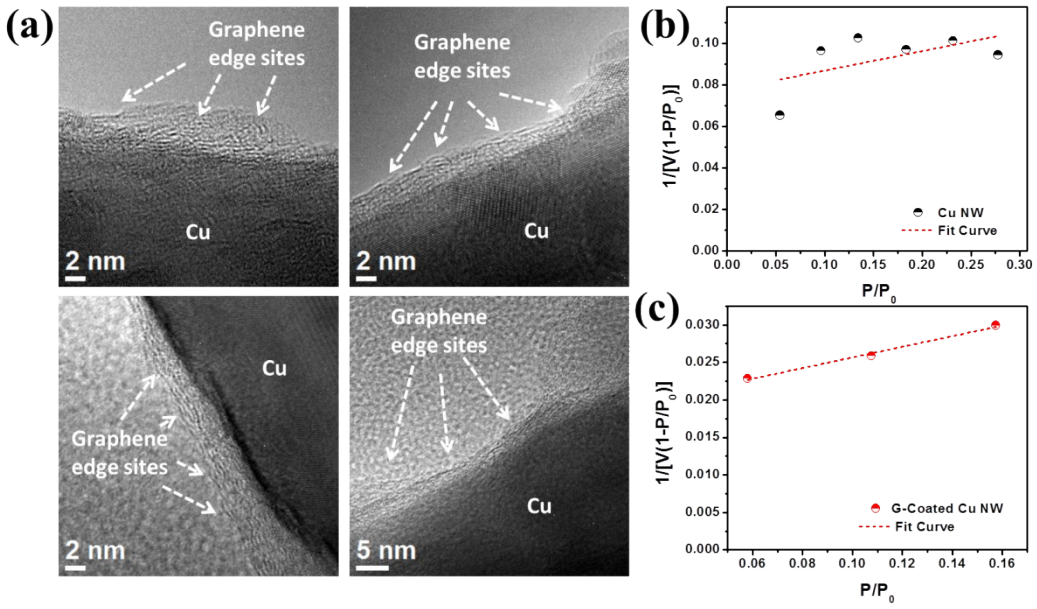

Fig. S10 (a) HRTEM images of graphene-coated Cu NWs grown at 400 °C. (b) and (c) show brunauer–emmett–teller (BET) measurements of Cu NWs and graphene-coated Cu NWs, respectively.

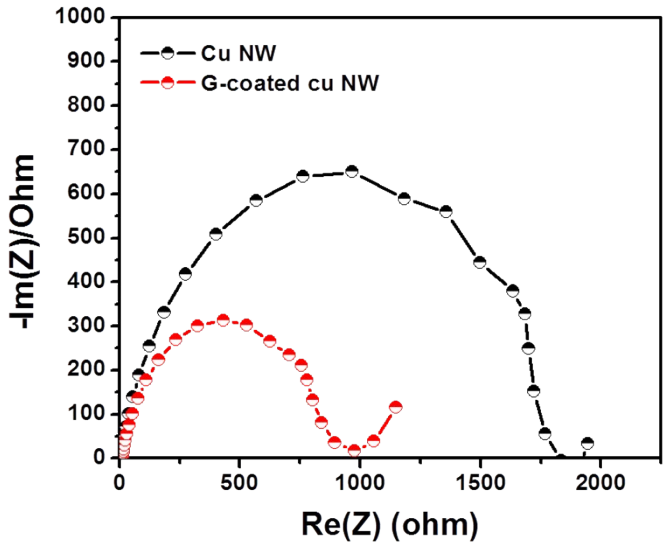

Fig. S11 Electrode kinetics of Cu NWs and graphene- coated Cu NWs by Nyquist plots.

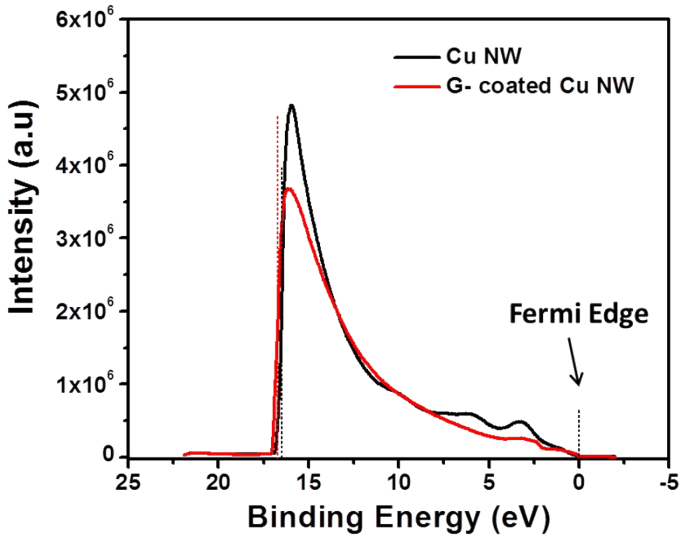

Fig. S12 UPS plots of pure Cu NWs and graphene-coated Cu NWs.