

Graphene Oxide from Graphite of Spent Batteries as Support of Nanocatalysts for Fuel Hydrogen Production

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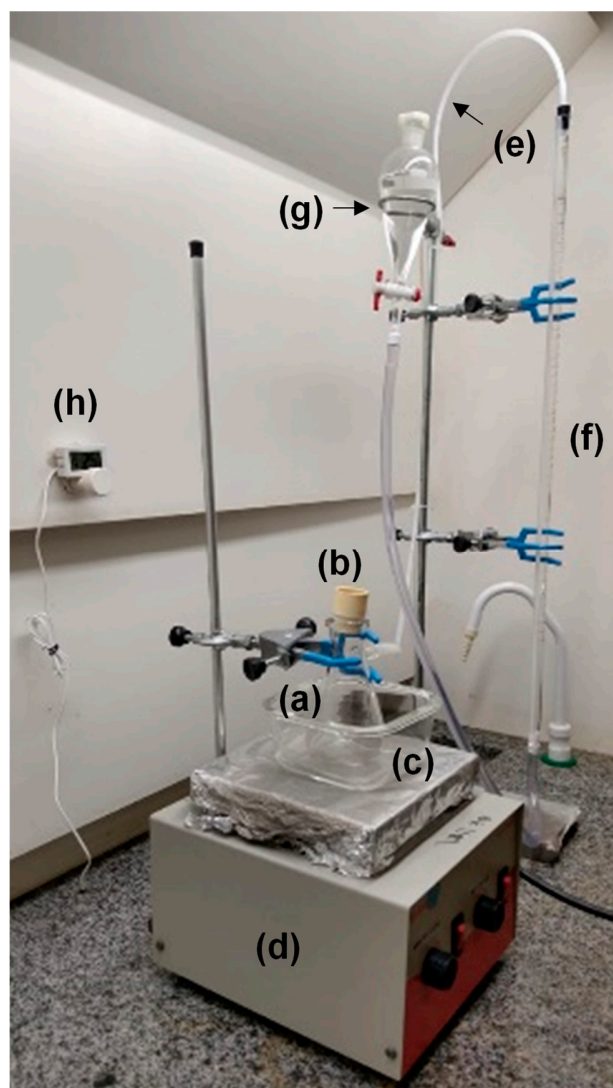


Figure S1. Hydrogen production reactor. Highlights: (a) Kitassato-type reactor. (b) rubber septum for sealing the system and injecting the NaBH_4 solution. (c) bath for temperature control. (d) magnetic stirrer with heating. (e) plastic hose connection between the reactor and the volume measurement system. (f) burette-type volume meter attached to the system to measure the volume of hydrogen gas produced. (g) water reservoir for water leveling in the volume measurement system. (h) digital thermometer.



Figure S2. Graphene oxide produced from the rods of used Zn-C batteries.

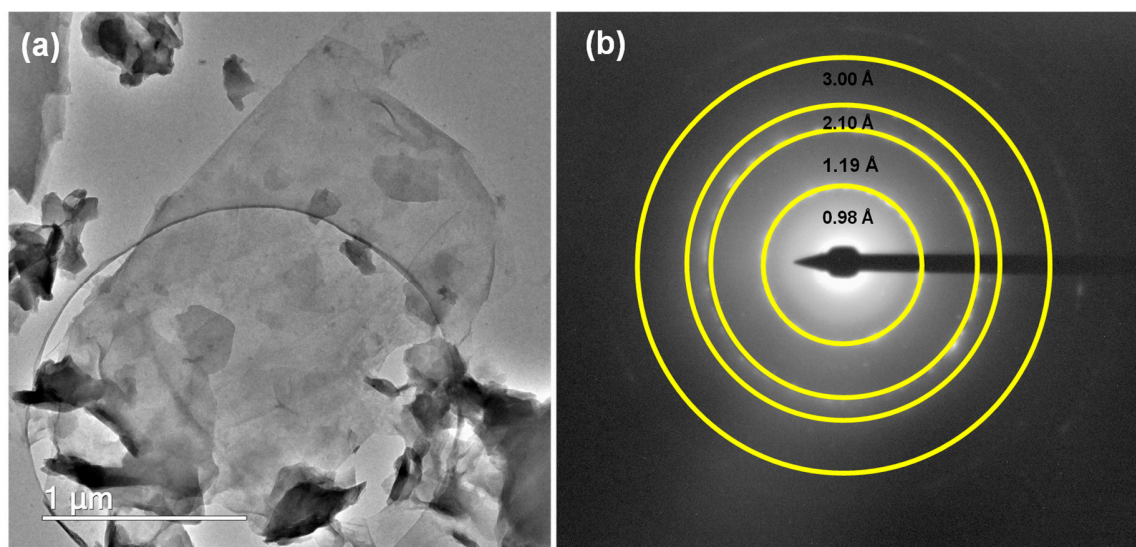


Figure S3. (a) Transmission Electron Microscopy (TEM) image of graphene oxide (GO) obtained from spent Zn-C batteries. (b) Selected-Area Electron Diffraction (SAED). Polycrystalline structure characterized by the main interplanar distances: 0.98 Å; 1.19 Å; 2.10 Å; 3.00 Å.

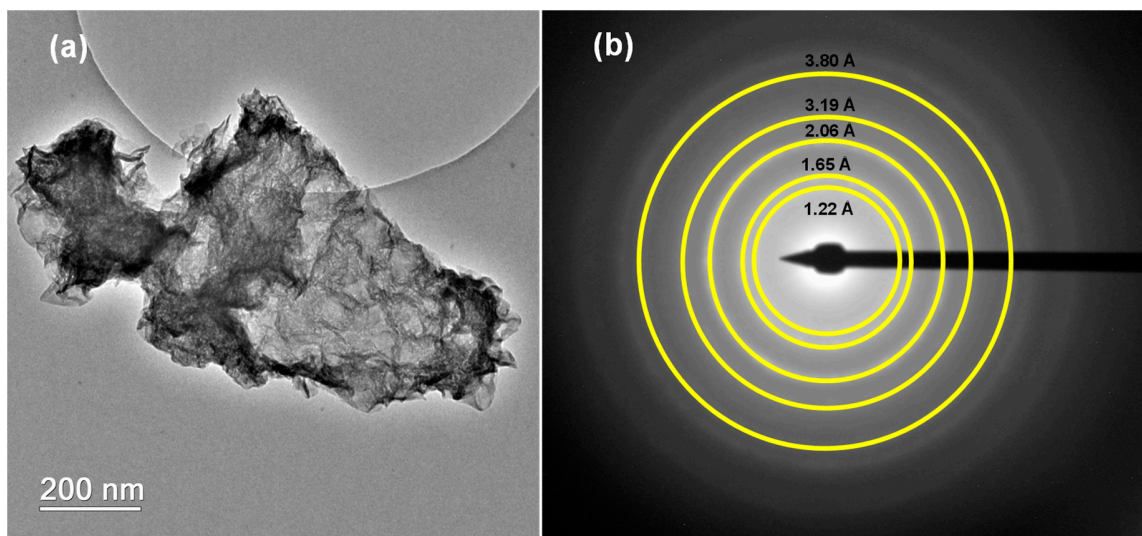


Figure S4. (a) Transmission Electron Microscopy image of Ni/Co-NPs-GO. (b) Selected-Area Electron Diffraction (SAED). Polycrystalline structure characterized by the main interplanar distances: 1.22 Å; 1.65 Å; 2.06 Å; 3.19 Å; 3.80 Å.

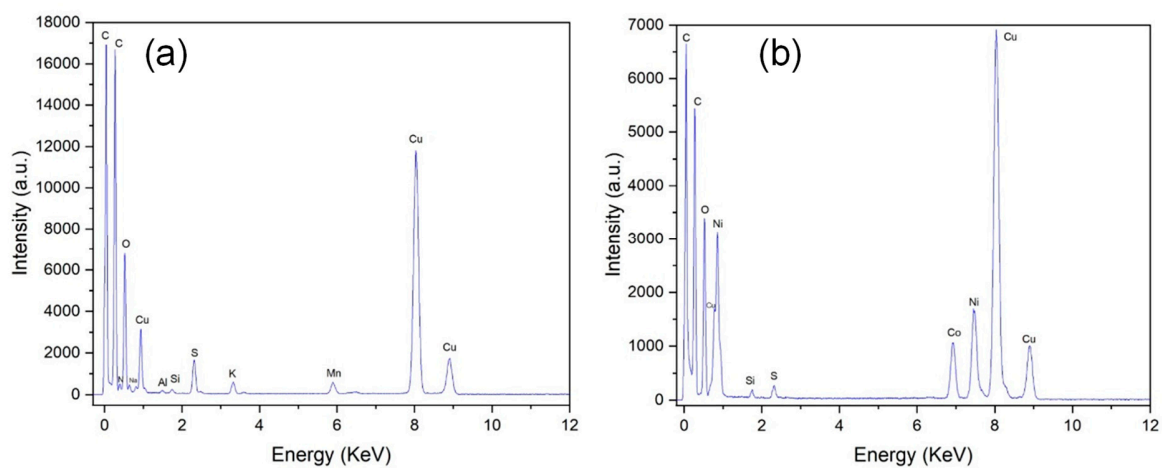


Figure S5. Energy Dispersive Spectroscopy (EDS) (A) Graphene oxide (GO) obtained from spent Zn-C batteries (B) Ni/Co-NPs-GO (60:40 w/w).

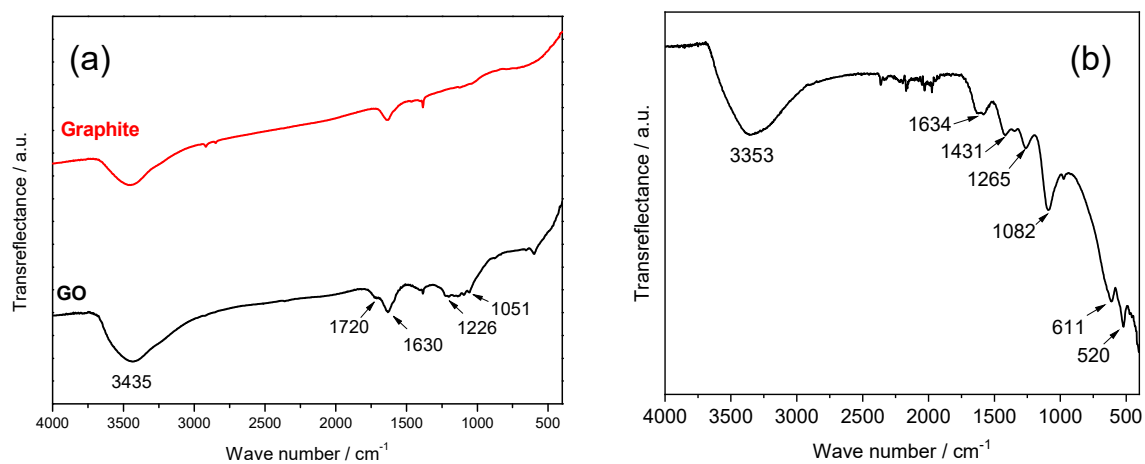


Figure S6. FTIR of (a) graphite obtained from spent Zn-C batteries (red) and graphene oxide (GO) obtained from spent Zn-C batteries (black) (b) Ni/Co-NPs-GO (60:40 w/w).

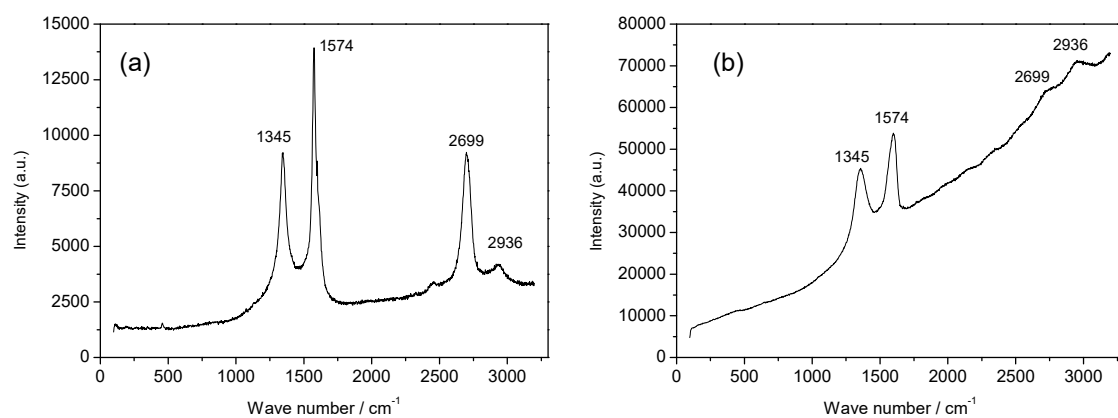


Figure S7. Raman spectroscopy. (a) graphite obtained from spent Zn-C batteries (b) graphene oxide (GO) obtained from spent Zn-C batteries.

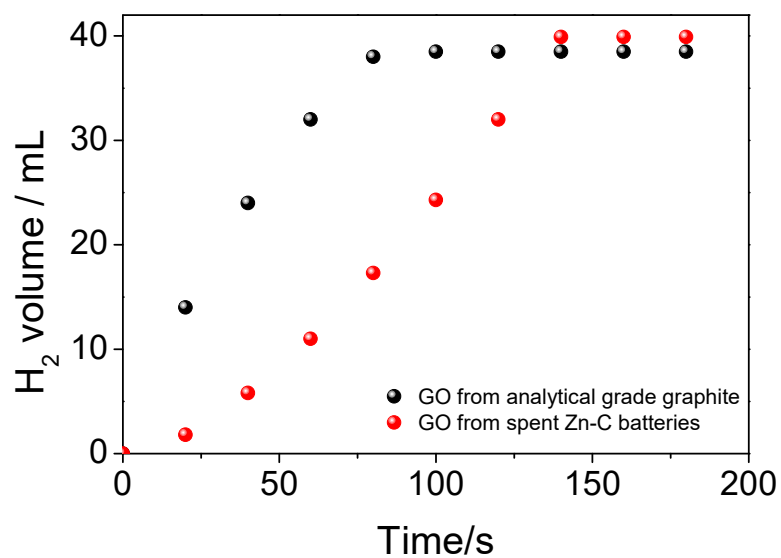


Figure S8. Hydrogen evolution from NaBH₄ mediated by Ni/Co-GO NPs. Reaction conditions: 0.700 mmol of Ni/Co NPs (60:40 w/w); GO support: 100 mg; 1.00 ml of NaBH₄ (0.500 mol L⁻¹); Temperature: 296.15 K.