

## Supplementary Materials

### Graphite Felt as an Innovative Electrode Material for Alkaline Water Electrolysis and Zinc-Air Batteries

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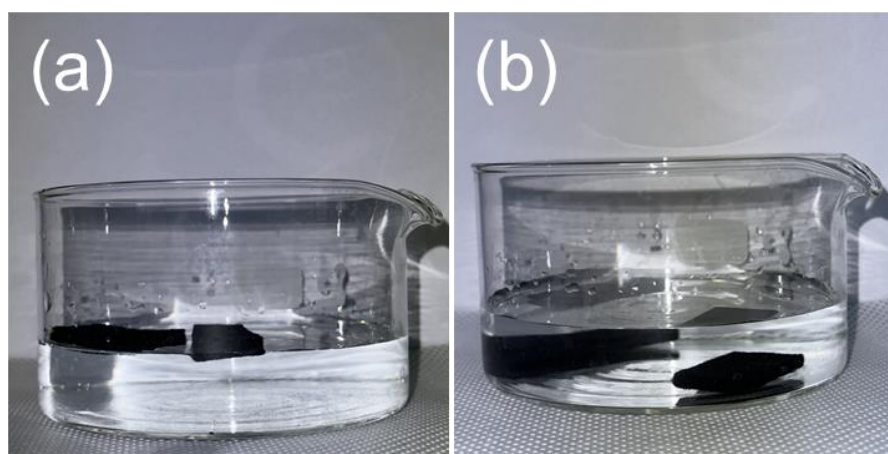


Figure S1. (a) Photograph images of untreated graphite felt floating on the surface of distilled water in a water bath, and (b) COOH-functionalized graphite felt fully immersed in water.

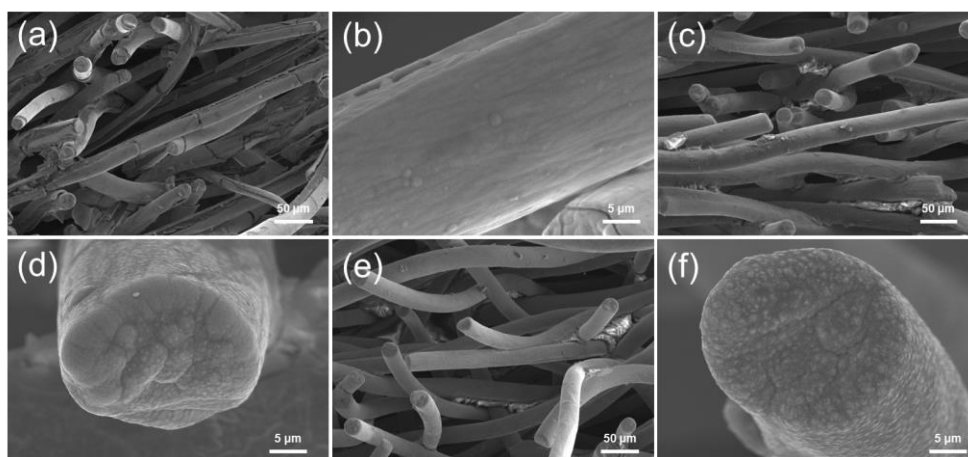


Figure S2. SEM images of nickel electroplated graphite felt samples at 4.0 V under various conditions: (a),(b) on untreated GF for 10 minutes, on AA-GF with nickel (GF@Ni) (c),(d) for 10 minutes, and (e),(f) for 20 minutes, respectively

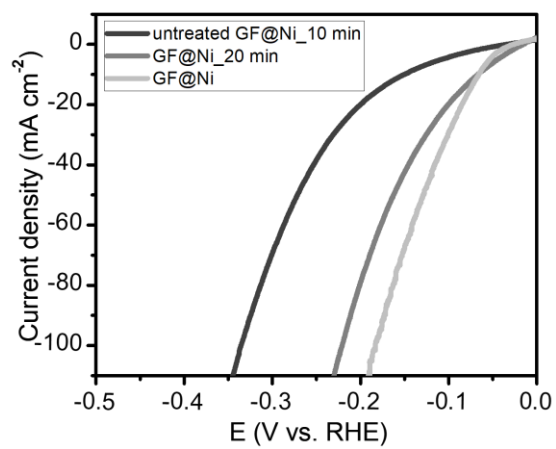


Figure S3. LSV curves of nickel electroplated graphite felt samples at 4.0 V under various conditions, tested in a 1.0 M KOH electrolyte for HER.

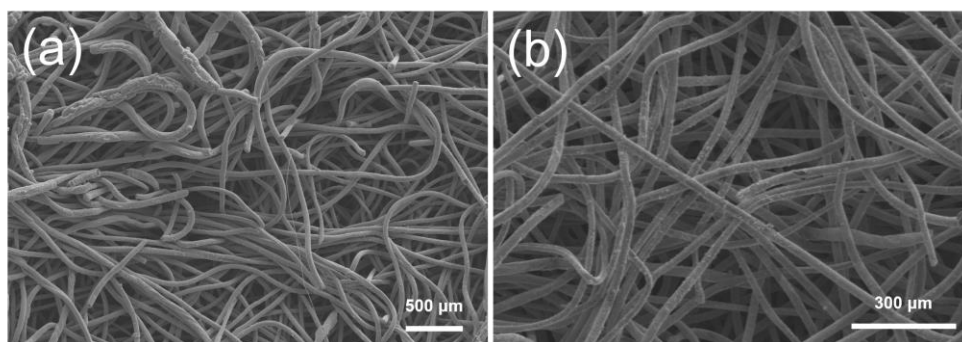


Figure S4. SEM images of (a) GF@Ni-Mn and (b) GF@Ni-Fe.

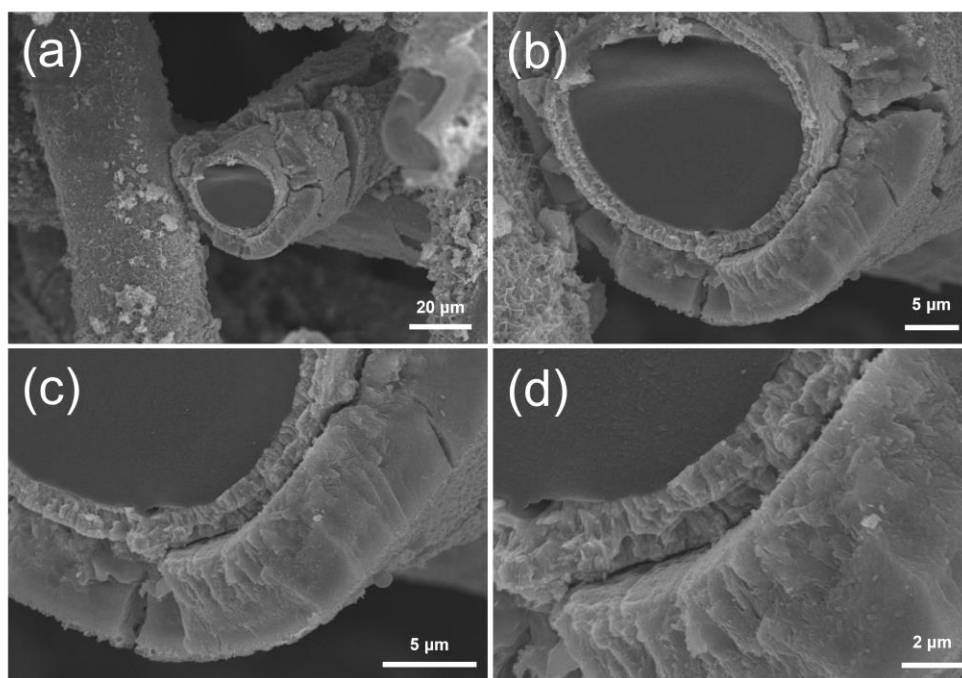


Figure S5. SEM images of cross-section of GF@Ni-Mn.

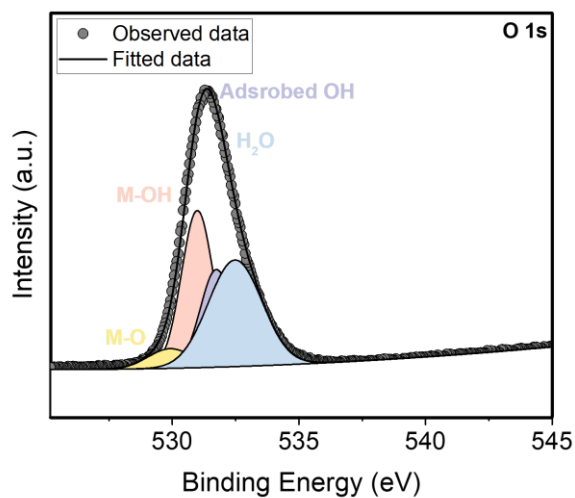


Figure S6. XPS survey spectrum of fine O1s spectrum of GF@Ni.

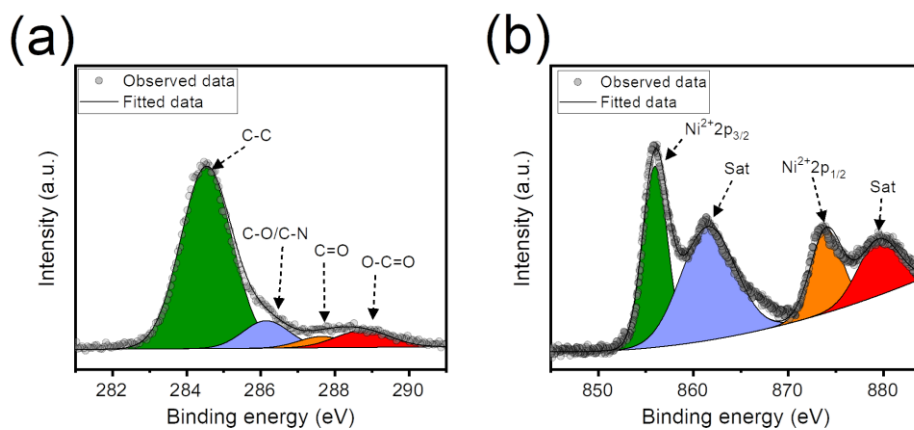


Figure S7. XPS fine (a) C1s and (b) Ni2p spectrum of GF@Ni-Mn

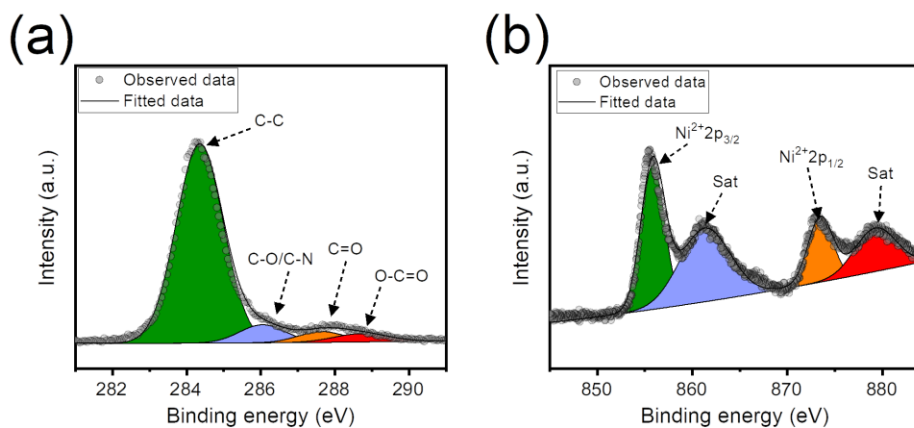


Figure S8. XPS fine (a) C1s and (b) Ni2p spectrum of GF@Ni-Fe.

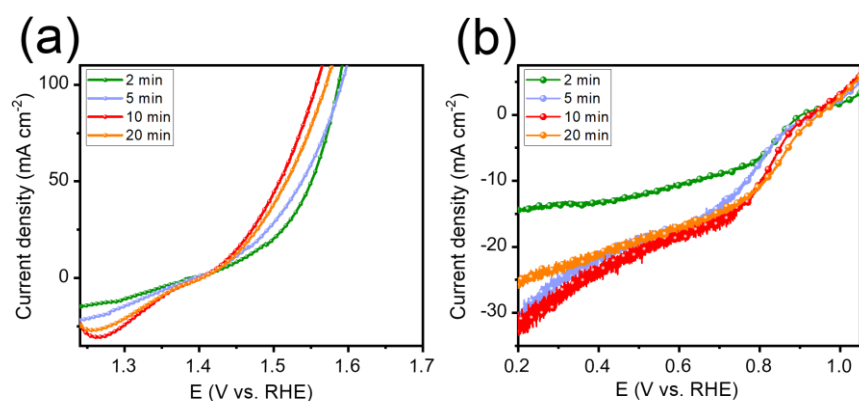


Figure S9. (a) LSV curves of GF@Ni-Fe electrodes subjected to varying electrodeposition times of 2, 5, 10, and 20 minutes in 1 M KOH electrolyte, aimed at evaluating the OER activity of these electrodes. (b) LSV curves of GF@Ni-Mn and GF@Ni-Fe electrodes, each with electrodeposition times of 2, 5, 10, and 20 minutes, conducted in O<sub>2</sub>-saturated 1 M KOH to assess the ORR activity of these electrodes.

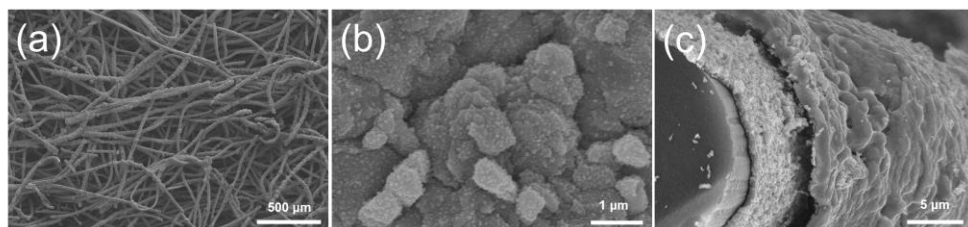


Figure S10. (a)-(c) SEM images of GF@Ni-MnS.

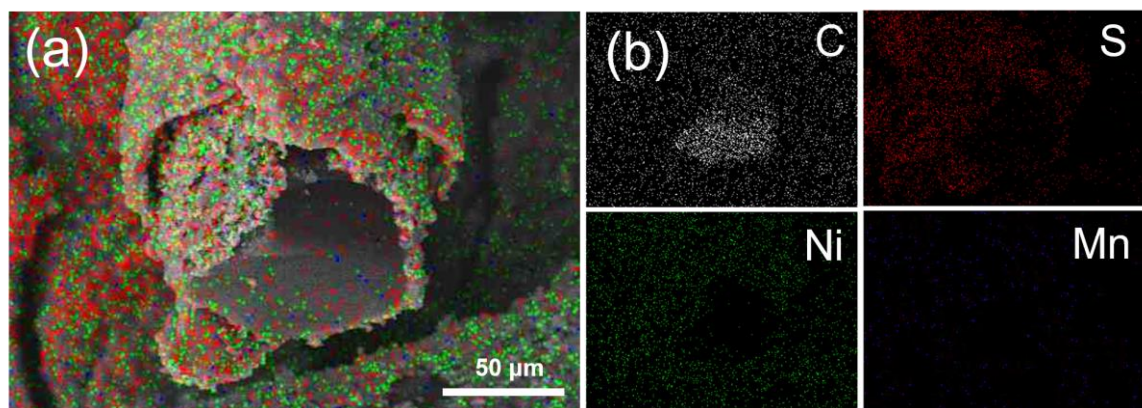


Figure S11. (a), (b) EDX elemental mapping images showing the distribution of elements for C, S, Ni, and Mn.

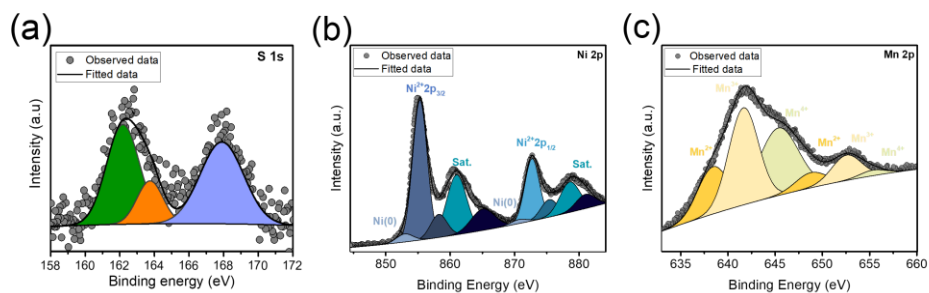


Figure S12. XPS fine (a) S1s, (b) Ni2p, (c) Mn2p spectrums of GF@Ni-MnS after cyclic test of ZABs.