

Supplementary information

Graphene nanosheets loaded with Pt nanoparticles with enhanced electrochemical performance for sodium-oxygen batteries

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Materials Characterizations: Morphologies of the synthesized electrodes were observed on a transmission electron microscope (TEMJEM-2100F). The discharge products were analyzed by the X-ray photoelectron spectroscopy (ESCALAB 250). The samples for X-ray photoelectron spectroscopy (XPS, Thermo Fisher Scientific) measurements were prepared in the argon-filled glove box. The cells were disassembled after cycling and cycled cathode samples were washed with 1,2-dimethoxyethane (anhydrous, Sigma) and then dried for 2h. A special transfer system was employed to transfer cycled cathode samples from the glove box to a XPS system without being exposed to air.

Electrochemical Measurements: The oxygen electrodes were prepared by mixing catalyst (GNSs and Pt@GNSs respectively) and binder (PVDF) with weight ratio of 9:1. Figure S1 shows the Na-O₂ battery configuration used in this study, consisting of a high purity sodium pressed on Cu foil and a PVDF-bonded cathode spreaded on a nickel foam. The positive and negative electrodes were separated by the electrolyte. The cells were assembled in an Ar-filled glove box with oxygen and water contents less than 1 ppm. The electrolyte was 1M sodium perchlorate (NaClO₄, Sigma-Aldrich) in propylene carbonate (PC, Sigma-Aldrich, 99.7%), PC was dried over molecular sieves (3 Å for 1 week), sodium perchlorate under vacuum at 100 °C for 24 h. The discharge/charge measurements were performed at room temperature in the pure oxygen with a Land BT 1-40 battery test system.

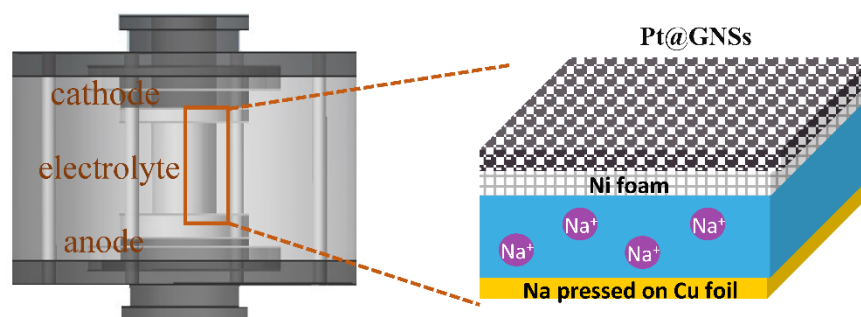


Fig. S1 Na-O₂ single-cell configuration

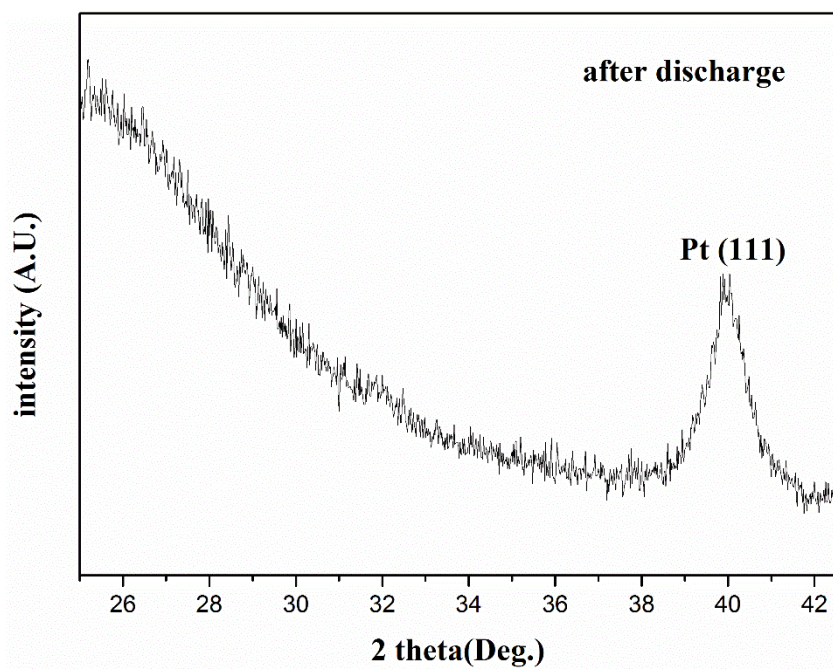


Fig. S2 XRD pattern of the positive after discharge to 1.8V