MOF-derived layered K-VO heterojunction material as a high-performance cathode for aqueous zinc ion batteries

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Materials characterization

Scanning electron microscopy (SEM, SU8220, Regulus) and transmission electron microscopy (TEM, JEM-2200FS, JEOL) attached with energy disperse spectroscopy (EDS) were used to analysis the morphology and microstructural characteristics of the samples. X-ray diffraction (XRD, Ultima IV, Rigaku) was employed to characterize the crystal structures, and X-ray photoelectron spectroscopy (XPS, EscaLab 250Xi, Thermo Scientific) were conducted to collect the chemical compositions.

Electrochemical measurements

The electrochemical performance tests were conducted by CR2032 coin cells. In order to prepare the working electrode, cathode slurry was firstly prepared by mixing the active materials (xK-VO) with conductive carbon black (Super P) and polyvinylidene fluoride (PVDF, 5 wt% in N-methyl pyrrolidone) binder with a mass ratio of 8: 1: 1. Then, the slurry was coated onto a clean graphite paper with a diameter of 10 mm, followed by drying at 80 °C in a vacuum oven for 12 h. Except for special instruction, the mass loading of active material in each electrode is about 1.2 mg cm^{-1}. Zinc foil, 3 M Zn $(CF_3SO_3)_2$ aqueous solution and glass fiber paper (Whatman D) were employed as the reference electrode, electrolyte and separator, respectively. The galvanostatic charge-discharge tests of

assembled batteries were performed on a multi-channel battery testing system (CT2001A, Wuhan LANHE Co. Ltd.) within the voltage range of 0.2−1.6V. Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) tests were performed on an electrochemical workstation with a frequency region from 100 kHz to 0.01 Hz. All electrochemical measurements and battery assemblies were carried out at room temperature (25°C).

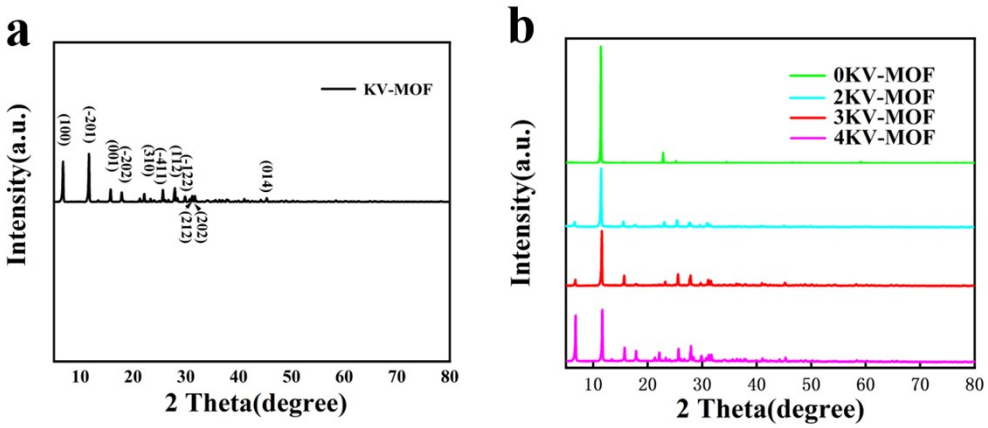

Figure S1.(a) crystal plane information of KV-MOF, (b) XRD patterns of xKV-MOF

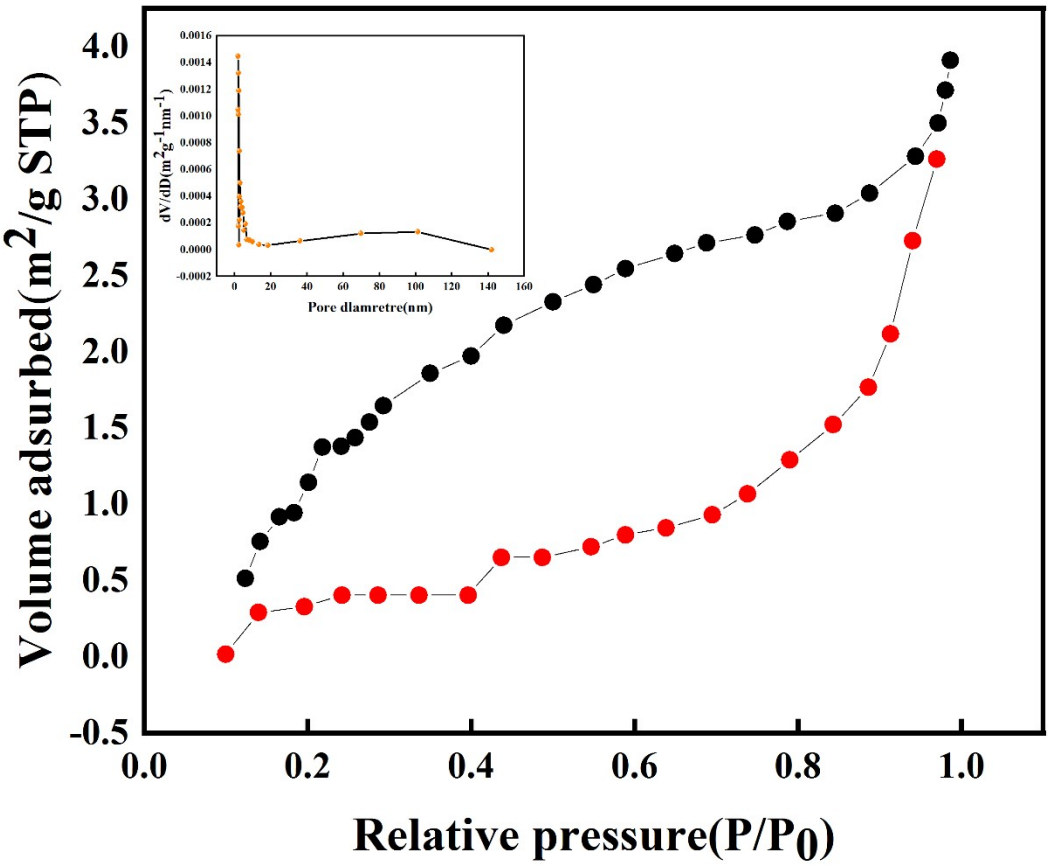

Figure S2.N_2 adsorption-desorption isotherms of 3K-VO

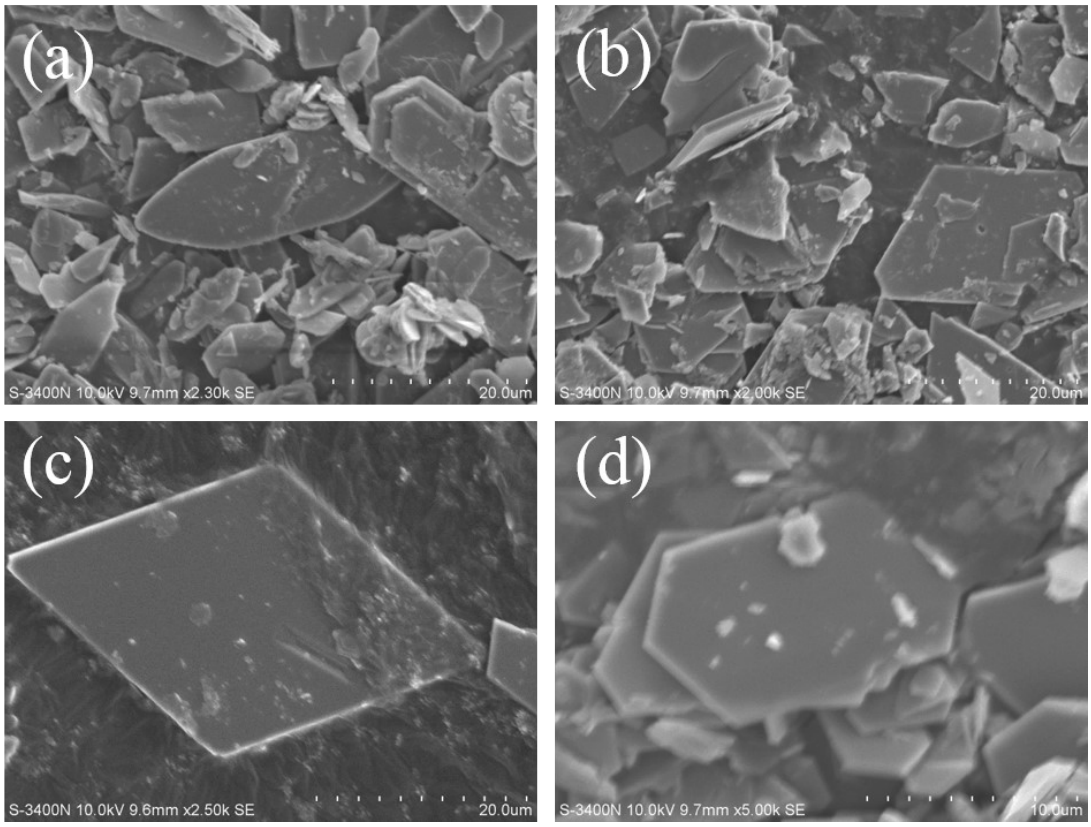

Figure S3 SEM of the (a)0KV-MOF;(b)2KV-MOF;(c)3KV-MOF;(d)4KV-MOF

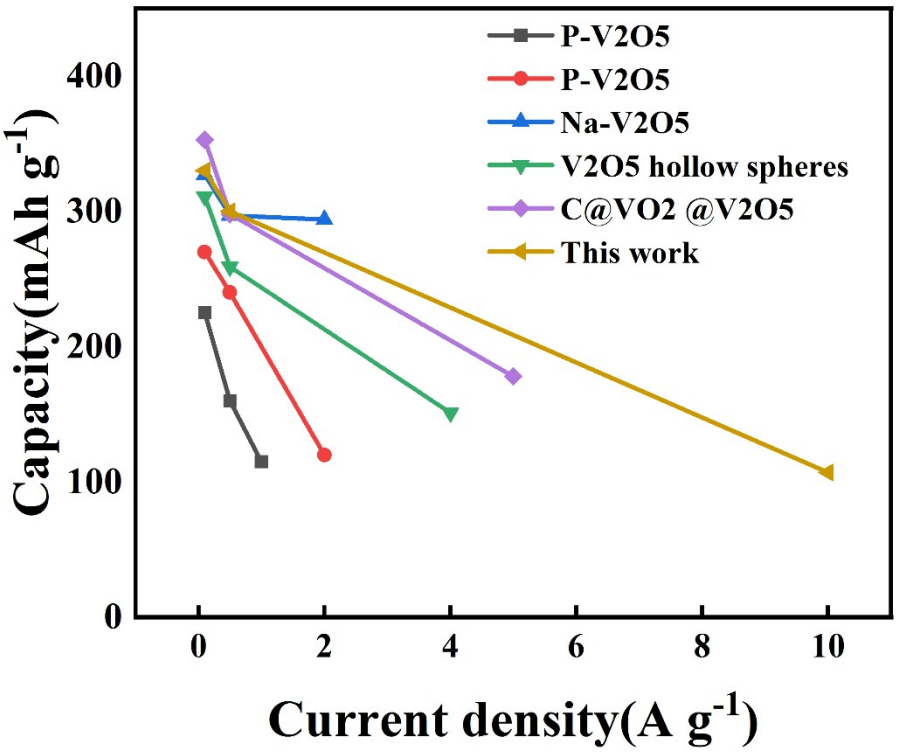

Figure S4. A performance comparison between this work and other reported works.