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Supporting information

A facile method for pre-insertion of cations and structural water in preparing durable zinc storage vanadate cathodes

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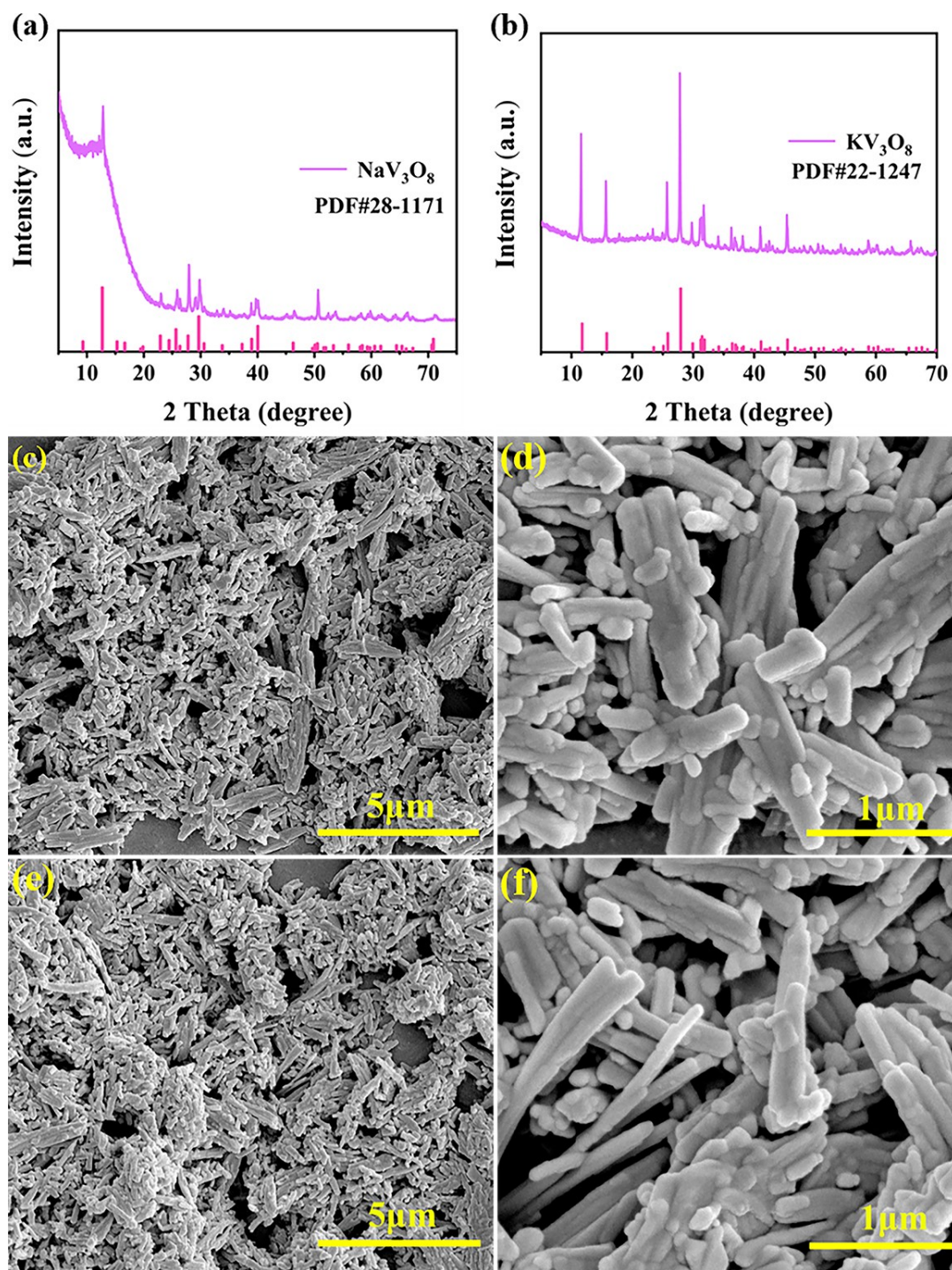


Fig. S1 (a) The XRD pattern of NaV_3O_8 . (b) the XRD pattern of KV_3O_8 . (c-d) The SEM images of NaV_3O_8 . (e-f) The SEM images of KV_3O_8 .

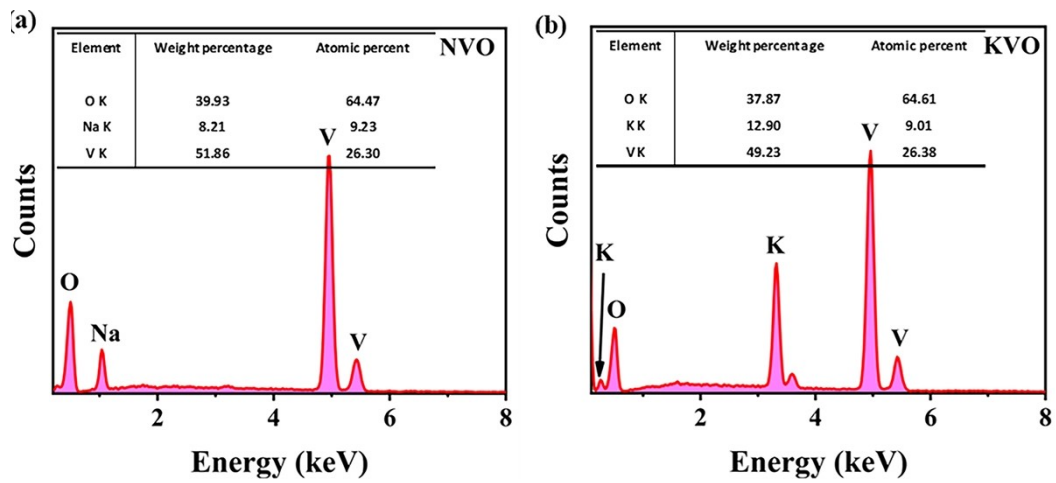


Fig. S2 (a), and (b) are the EDS of the NVO and KVO cathodes, respectively

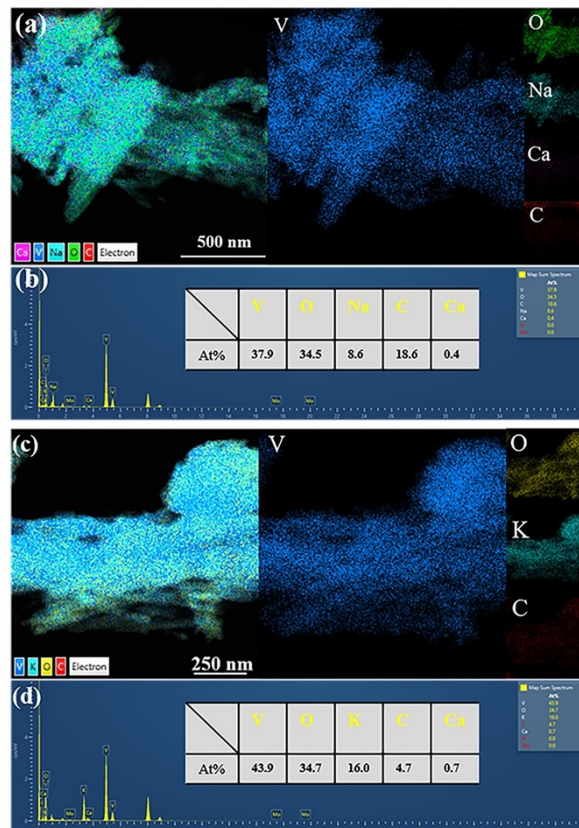


Fig. S3 (a) TEM elemental maps of NVO. (b) EDS of NVO taken from TEM test. (c) TEM elemental maps of KVO. (d) EDS of KVO taken from TEM test.

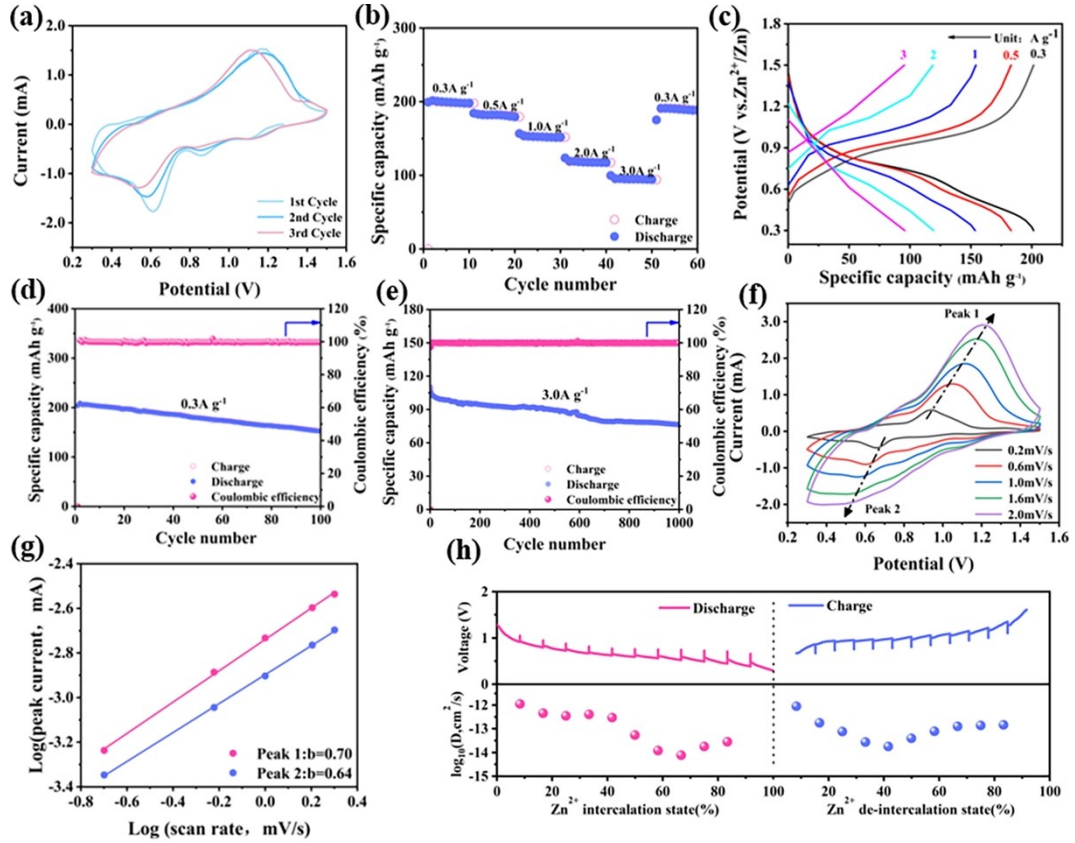


Fig. S4 Electrochemical characterization of the NaV₃O₈ cathode in the 0.3-1.5V voltage range. (a) The CV curve at 0.2mV s⁻¹. (b) Rate performance at different current densities. (c) The corresponding discharge/charge curves at different current densities. (d) Cycling performance at 0.3 A/g. (e) Cycling performance at 3.0 A/g. (f) CV curves at different scan rates (0.2-2.0mV s⁻¹). (g) log(*i*) and log(*v*) curves at specific peak currents extracted from the CV scans of NaV₃O₈. (h) The GITT curve at 1A/g and the corresponding diffusivity coefficients of Zn²⁺.

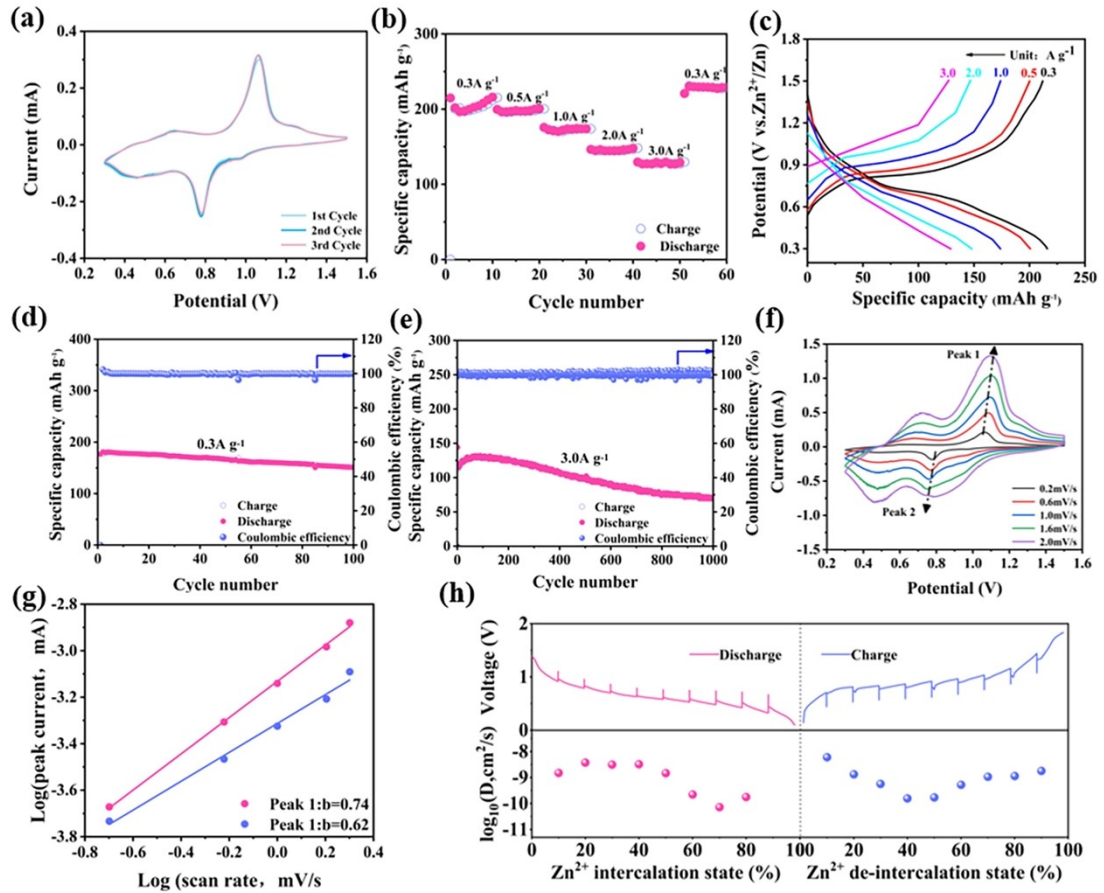


Fig. S5 Electrochemical characterization of the KV_3O_8 cathode in the 0.3-1.5V voltage range. (a) The CV curve at 0.2 mV s^{-1} . (b) Rate performance at different current densities. (c) The corresponding discharge/charge curves at different current densities. (d) Cycling performance at 0.3 A/g . (e) Cycling performance at 3.0 A/g . (f) CV curves at different scan rates ($0.2\text{-}2.0 \text{ mV s}^{-1}$). (g) $\log(i)$ and $\log(v)$ curves at specific peak currents extracted from the CV scans of KV_3O_8 . (h) The GITT curve at 1 A/g and the corresponding diffusivity coefficients of Zn^{2+} .

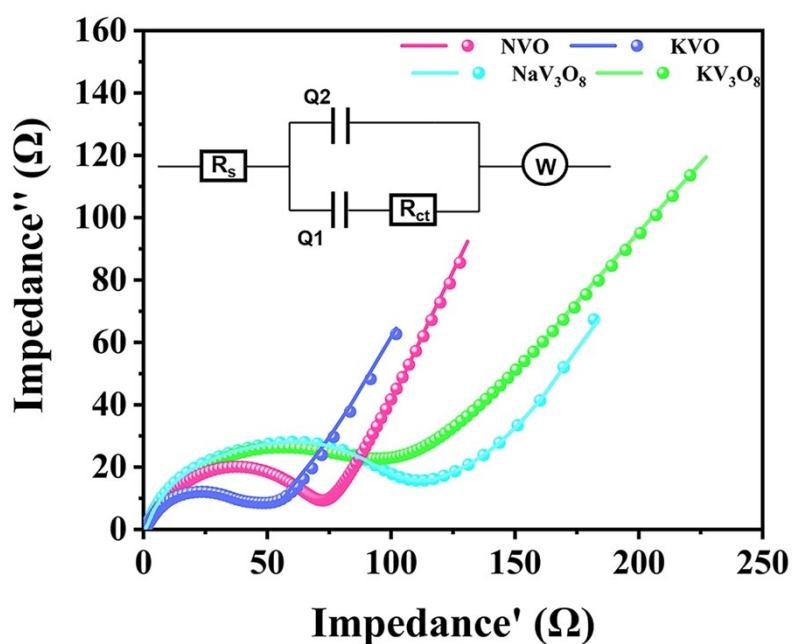


Fig. S6 The EIS of the NVO, KVO, NaV₃O₈, and KV₃O₈ electrodes.

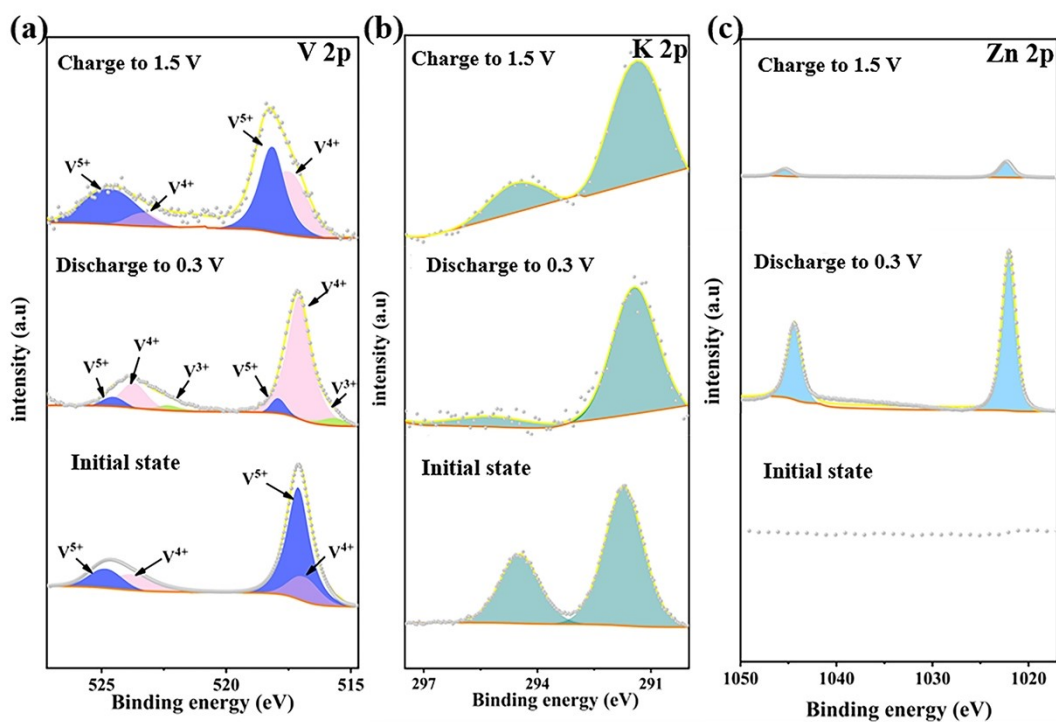


Fig. S7 High-resolution ex-situ XPS spectrum of (a) V 2p, (b) K 2p and (c) Zn 2p for KVO. In (a), (b), and (c) the spectrum from the bottom up corresponds to the initial state, discharge to 0.3 V, and charge to 1.5 V.