Journal Name

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Supporting Information

Composite of K-doped $(NH_4)_2V_3O_8$/Graphene as an Anode Material for Sodium-ion Batteries

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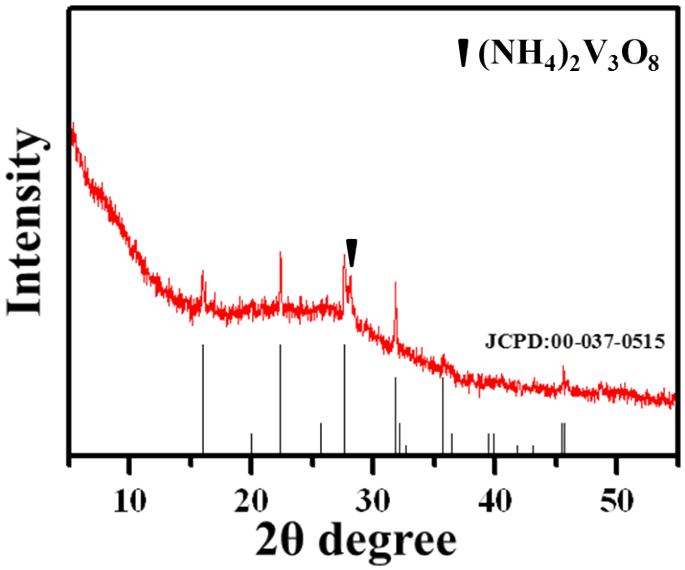

Fig. S1 XRD pattern of $(NH_4)_{1.92}V_3O_8$/graphene.

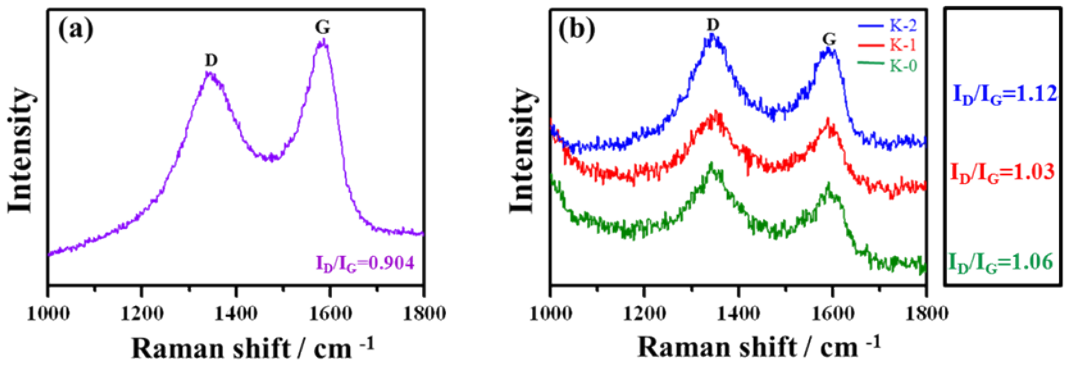

Fig. S2 Raman spectrum of (a) pristine graphene and (b) K-doped $(NH_4)_2V_3O_8$/graphene materials.

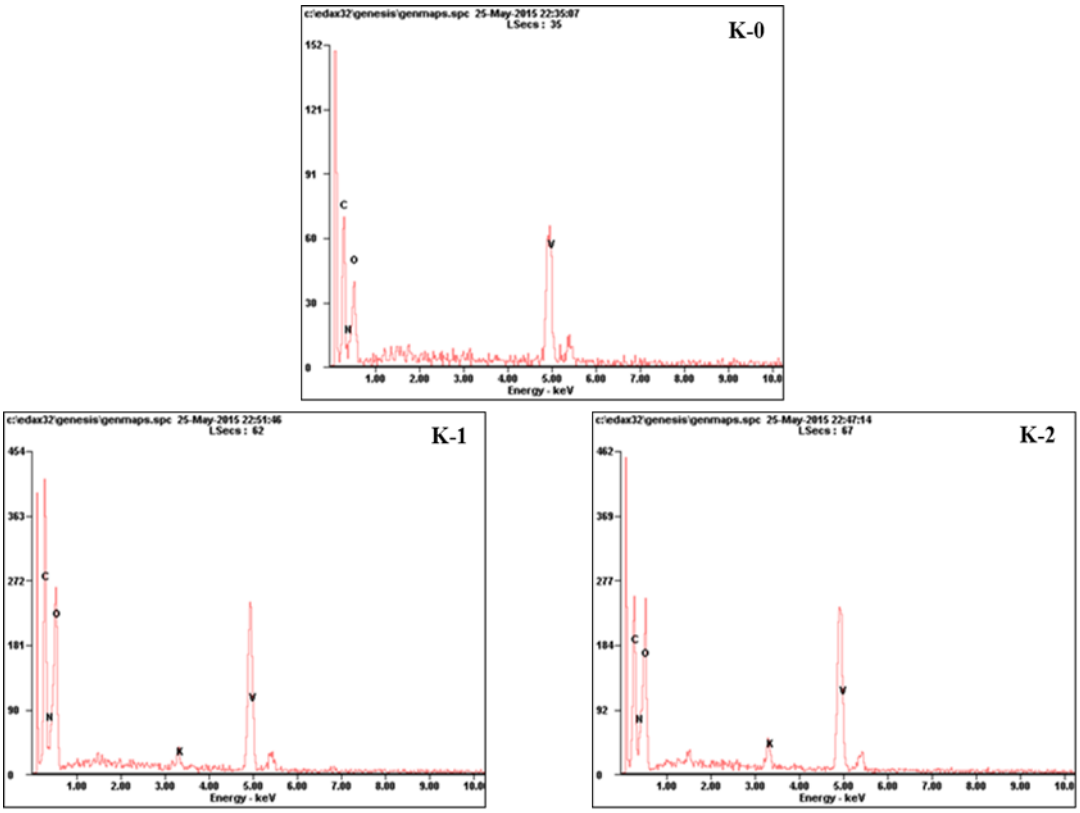

Fig. S3 EDX spectrum of K-doped $(NH_4)_2V_3O_8$/graphene materials.

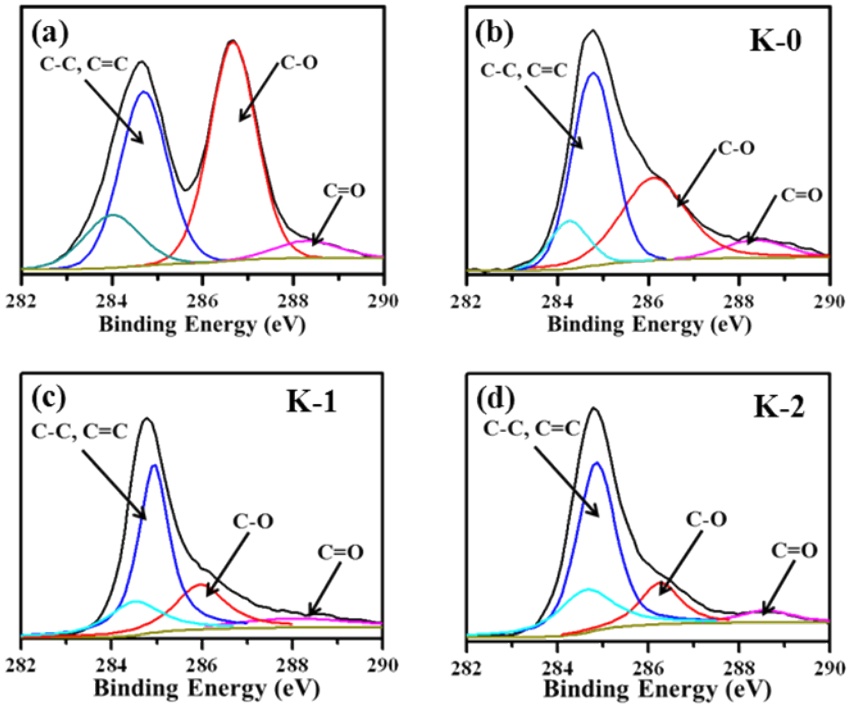

Fig. S4 C(1s) X-ray photoelectron spectrum (XPS) of (a) pristine graphene and (b-d) K-doped $(NH_4)_2V_3O_8$/graphene materials, respectively.

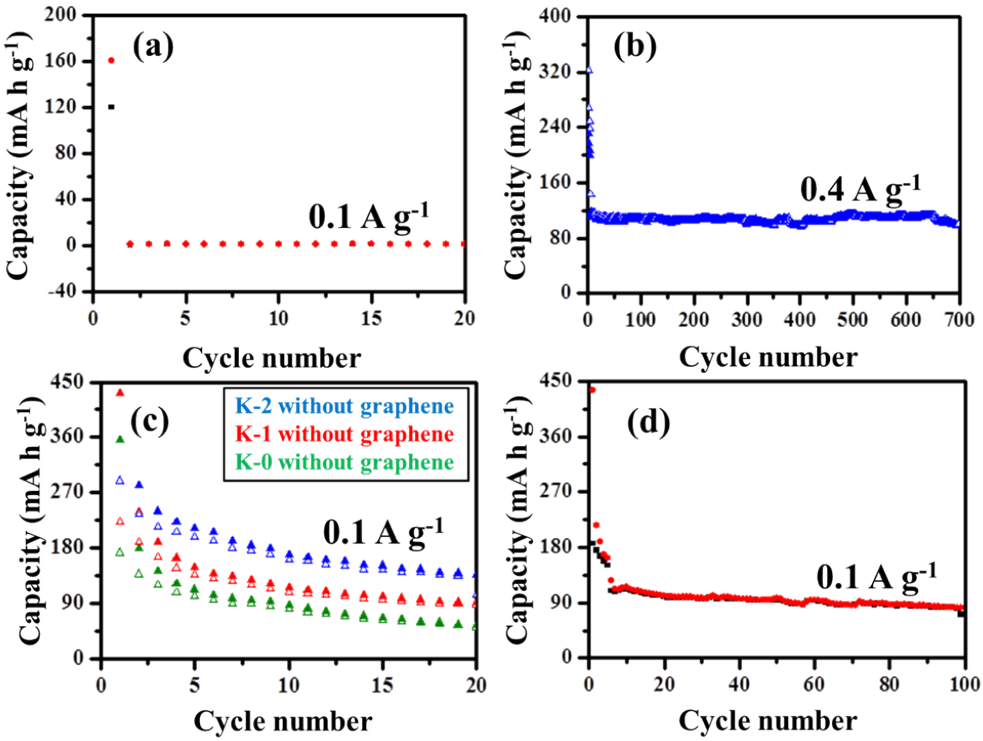

Fig. S5 (a) cycling capacities of the pure reduced graphene at the current density of 0.1 A g^{-1}; (b) cycling performance of K-2 at the current rate of 0.4 A g^{-1};(c) cycling performance of K-doped $(NH_4)_2V_3O_8$ materials without graphene at the current density of 100 mA g^{-1}; (d) cycling performance of $(NH_4)_{1.92}V_3O_8$/graphene at the current density of 0.1 A g^{-1}.

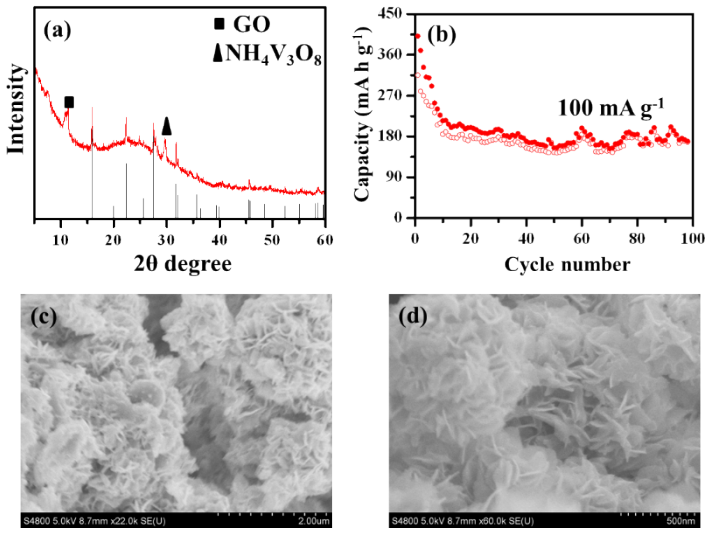

Fig. S6 (a) XRD pattern of K-doped $(NH_4)_2V_3O_8$ (molar ratio K: V=7.5%); (b) cycling performance of K-doped $(NH_4)_2V_3O_8$ (molar ratio K: V=7.5%) at the current density of 100 mA g^{-1}; (c-d) SEM images of K-doped $(NH_4)_2V_3O_8$ (molar ratio K: V= 7.5%).

The composition at the molar ratio of K:V=7.5% was investigated in Fig. S6. It can be found that all the diffractions can be indexed with the JCPD: 00-51-1733(Fig. S6a). Meanwhile, the capacity of 193 mA h g^{-1} was exhibited at the current density of 100 mA g^{-1} after 100 cycles (Fig. S6 b). SEM images showed that the nanosheets are in the ranges of 200 − 500 nm in width (Fig. S6c, d).

Table S1 The comparison of different vanadium oxides' electrochemical performances.

V- based materials	Capacity (mA h g^{-1})	Current density (mA g^{-1})	Reference
K-doped $(NH_4)_2V_3O_8$/graphene	**235.4 (after 100 cycles)**	**100**	**Present work**
$Na_6(V_{10}O_{28}).16H_2O$	220 (after 27 cycles)	50	4
V_2O_5 nano-spheres	177 (after 100 cycles)	100	5
$VO_2 \cdot 1.65H_2O$/graphene	303.1 (after 20 cycles)	10	6

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[6] H.L. Fei, Z.W. Li, W.J. Feng, X. Liu, *Dalton Trans.*, 2015, **44**, 146-150.

