A hybrid material of vanadium nitride and nitrogen-doped graphene for lithium storage

Kejun Zhang\textsuperscript{a,+}, Haibo Wang\textsuperscript{a,+}, Xiaoqing He\textsuperscript{b,+}, Zhihong Liu\textsuperscript{a}, Li Wang\textsuperscript{a, c}, Lin Gu\textsuperscript{b, *}, Hongxia Xu\textsuperscript{a}, Pengxian Han\textsuperscript{a}, Shanmu Dong\textsuperscript{a}, Chuanjian Zhang\textsuperscript{a}, Jianhua Yao\textsuperscript{a}, Guanglei Cui\textsuperscript{a,∗}

\textsuperscript{a} Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, Qingdao 266101, P.R. China

\textsuperscript{b} Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China.

\textsuperscript{c} Ocean University of China, Qingdao 266003, P.R. China

\textsuperscript{+} These authors contributed to the work equally.

\textsuperscript{∗} Corresponding author. Tel.: +86 532 80662746; fax: +86 532 80662744.

E-mail address: cuigl@qibebt.ac.cn (G.L. Cui), l.gu@iphy.ac.cn (L. Gu).
Fig. S1 Tapping-mode AFM images and corresponding height profiles of G derived from (a) and (c) VN-G-30% after a long time of sonication, (b) and (d) VN-G-30% after a short time of sonication. The thickness of the G is around 3.2 nm.
Fig. S2 XRD pattern and rate performance of bulk VN prepared from commercial V$_2$O$_5$ cycled in EC/DMC solution containing 1 M LiPF$_6$.

Fig. S3 Cycling and rate performance of VN-G-30% hybrid electrode cycled in EC/DMC solution containing 1 M LiPF$_6$. 
Fig. S4 Cyclic performance and coulombic efficiency of the VN-G-30% hybrid electrode cycled in EC/DMC solution containing 1 M LiPF₆ after rate performance.

Fig. S5 Rate performances of VN-G-30% hybrid material, and a simple mixture of VN and G (7:3) electrodes cycled in EC/DMC solution containing 1 M LiPF₆.