Supporting Information

Potassium ferrous ferricyanide nanoparticles as high capacity and ultralong life cathode material for nonaqueous potassium-ion batteries

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Table S1 Element contents of KFFCN.

ICP-AES (wt %)		Element analysis (wt %)		
K	Fe	C	N	H
12.05	31.48	17.66	20.85	1.72

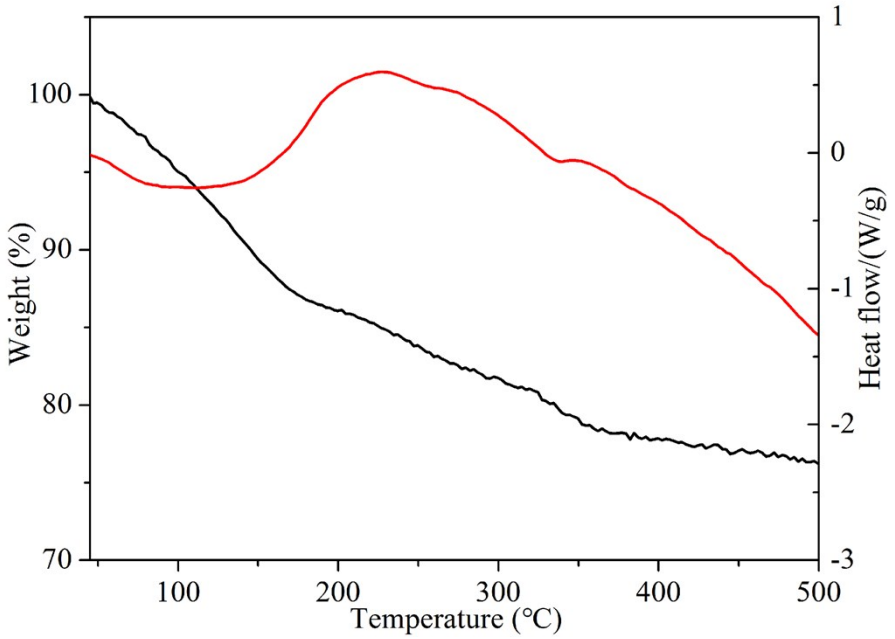

Fig. S1 TG and DSC curves of KFFCN measured at a heating rate of 10 ˚C min^{-1} in nitrogen.

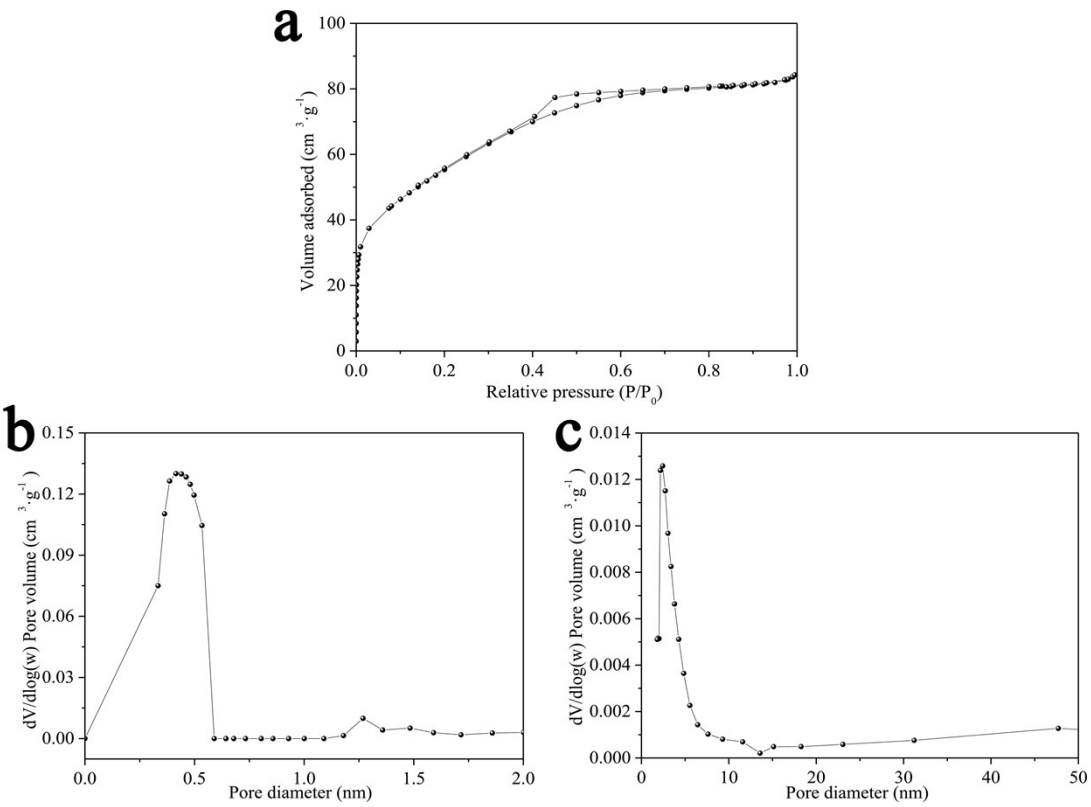

Fig. S2 a) Nitrogen adsorption-desorption isotherm of KFFCN; b) micropore size distribution; c) mesoporous size distribution.

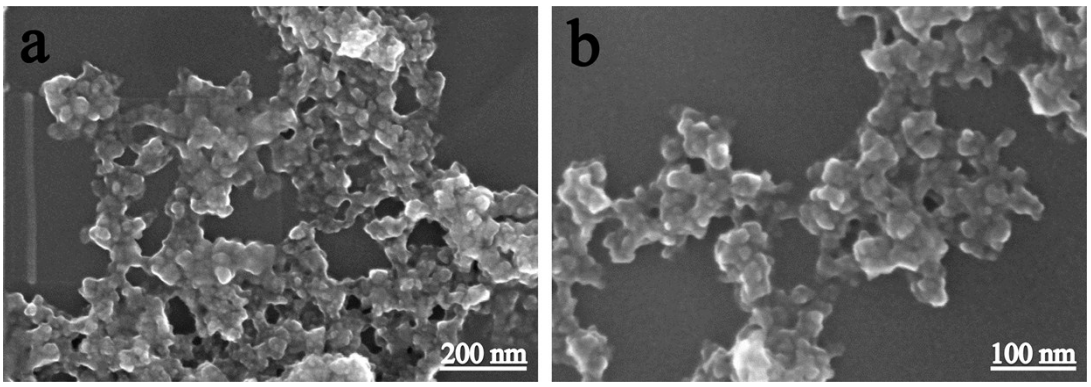

Fig. S3 SEM images of KFFCN at different magnification.

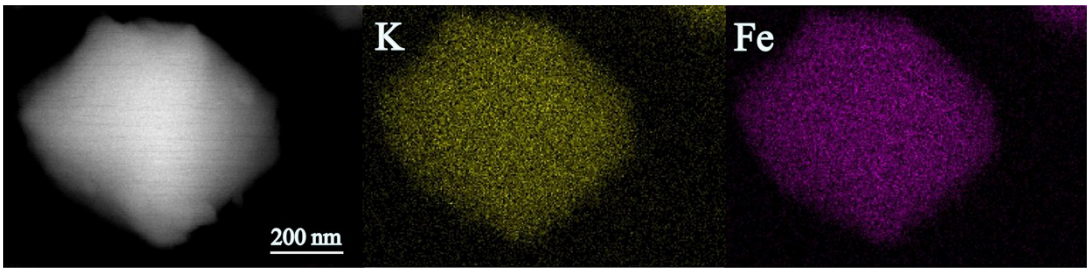

Fig. S4 EDS mapping images of KFFCN.

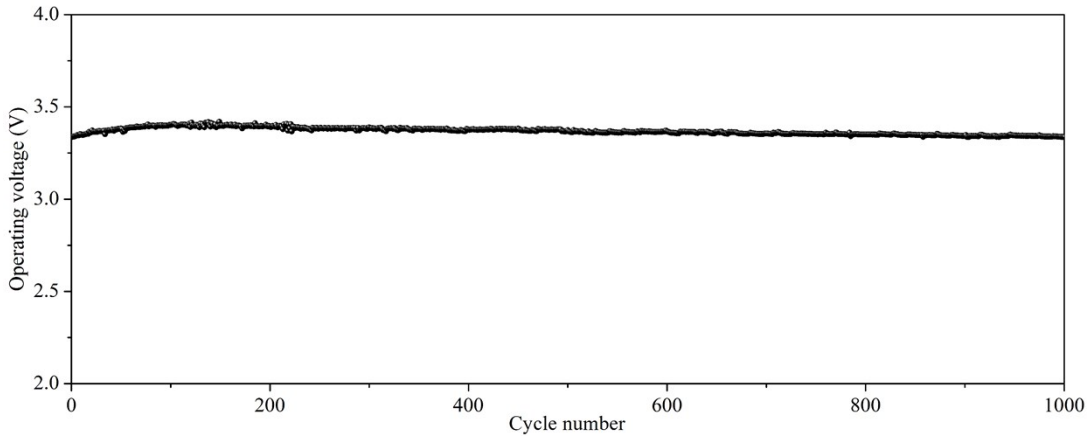

Fig. S5 Discharge operating voltage curve of KFFCN at 100 mA·g^{-1} upon cycling.

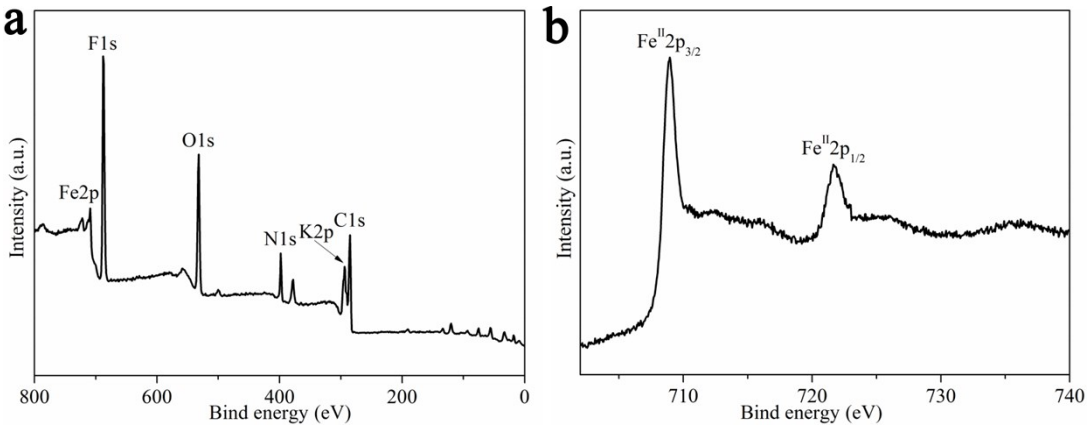

Fig. S6 Ex situ a) XPS survey spectrum; b) Fe 2p spectrum after the first cycle.

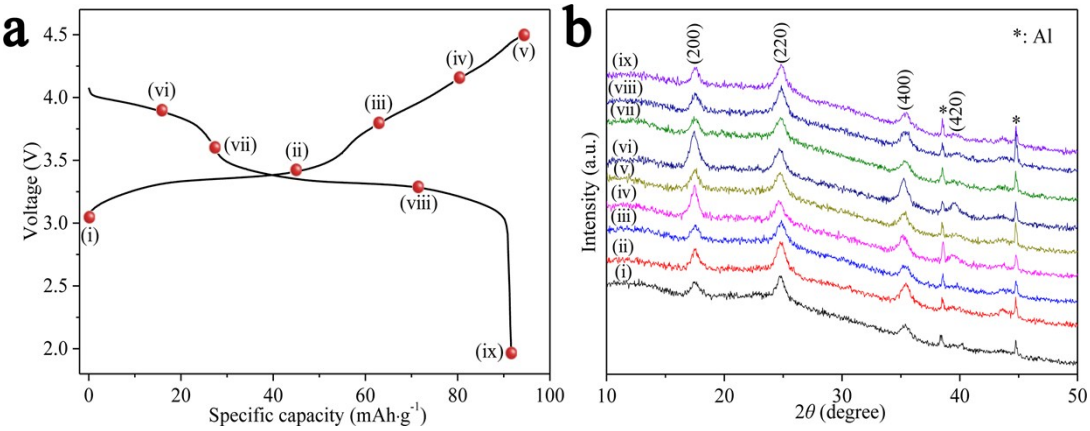

Fig. S7 a) the second charge/discharge profile at 100 mA·g^{-1}; b) ex situ XRD patterns at different states during the second cycle.

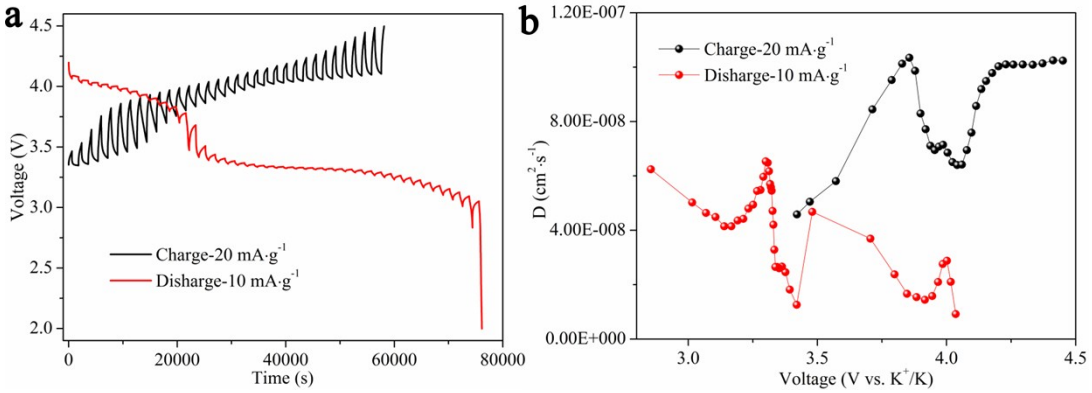

Fig. S8 a) GITT curves of the first cycle and corresponding b) K-ions diffusion coefficient (D_{K^+}) between 2.0 and 4.5 V.

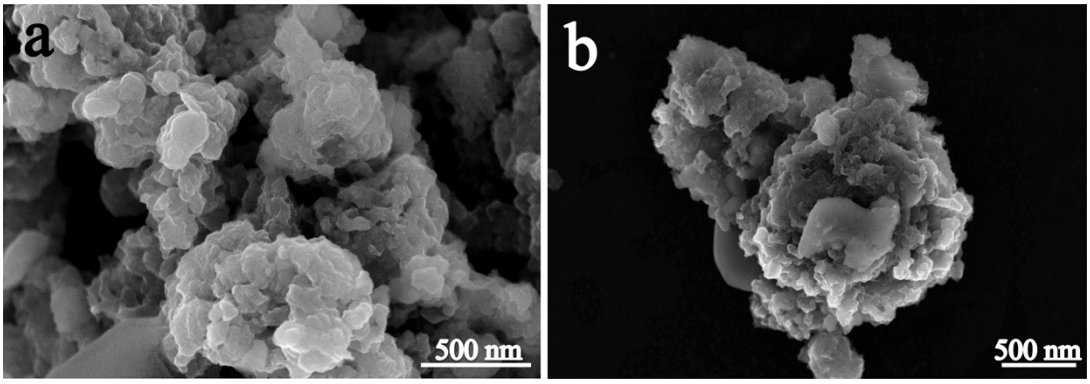

Fig. S9 Ex situ SEM image of KFFCN after a) 100 cycles and b) 1000 cycles.

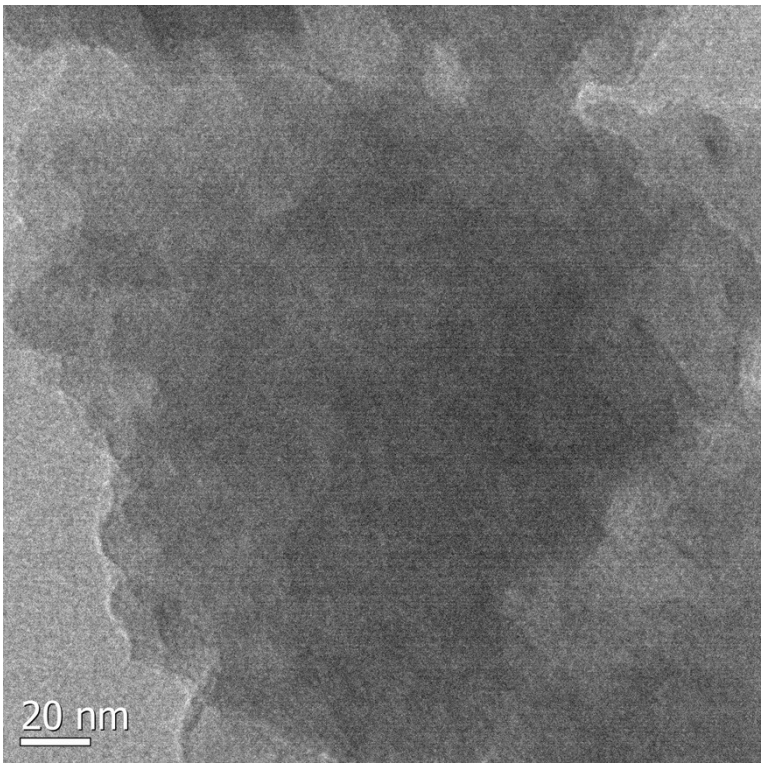

Fig. S10 Ex situ TEM image of KFFCN after 1000 cycles.

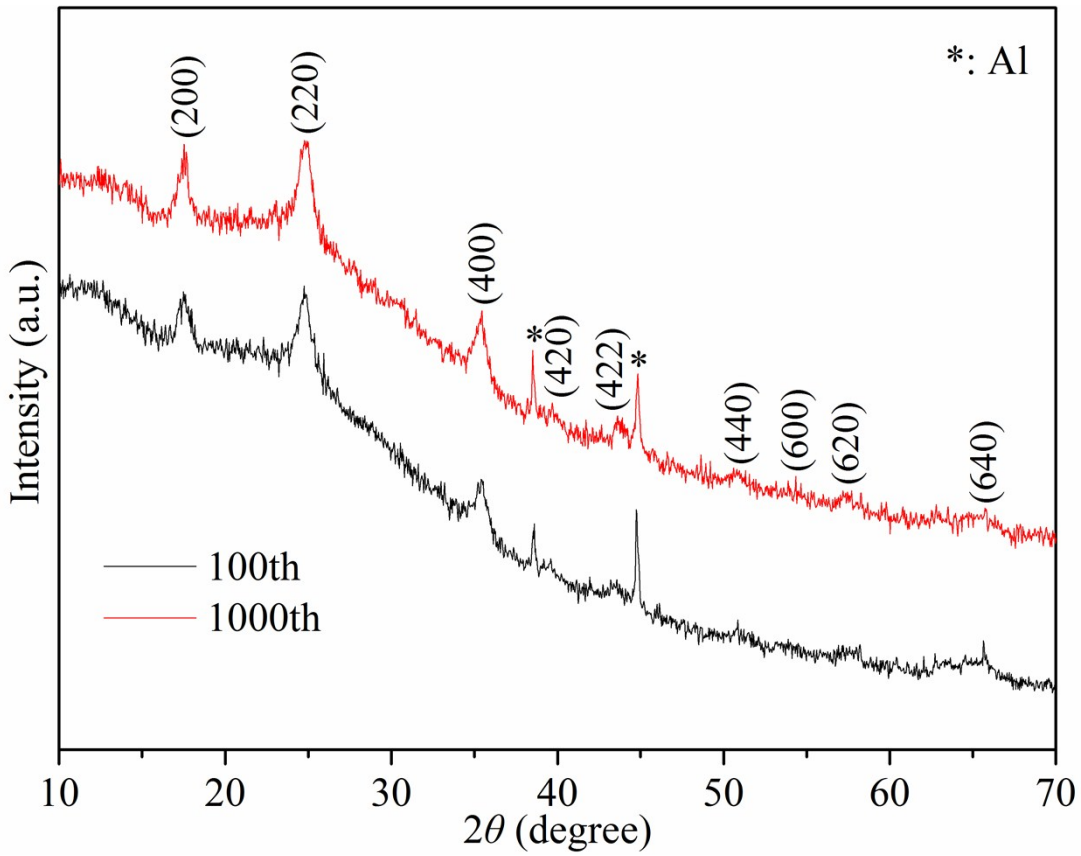

Fig. S11 Ex situ XRD patterns after 100 and 1000 for KFFCN.

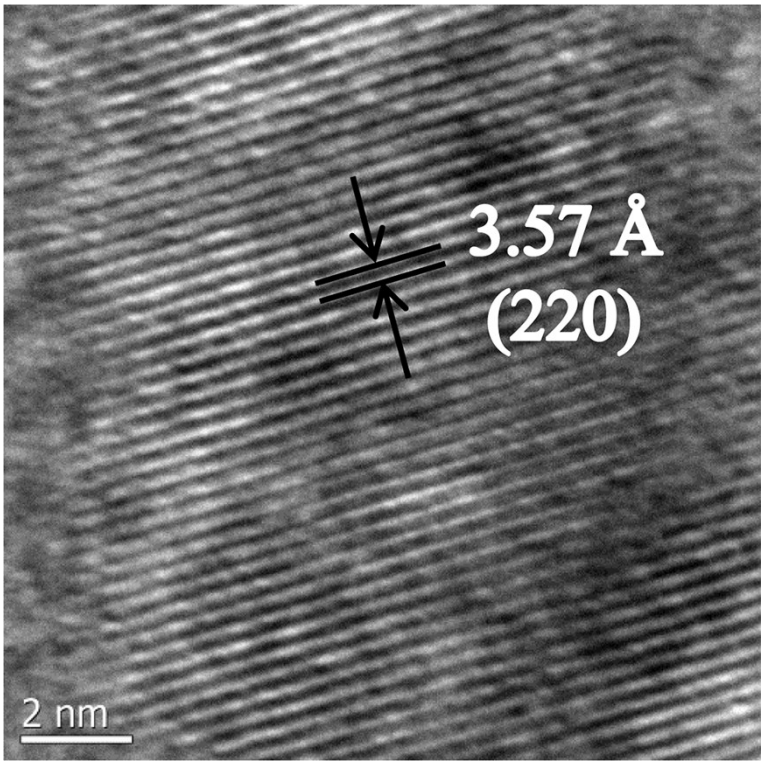

Fig. S12 Ex situ HRTEM image of single nano-particle for 100 cycled KFFCN.

Table S2 Comparison of the cycle life of some cathode materials for the nonaqueous potassium ion batteries.

Materials	Current density ($mA \cdot g^{-1}$)	Initial capacity ($mAh \cdot g^{-1}$)	Cycle numbers	Capacity retention (%)
$KFe[Fe(CN)_6]_{0.82} \cdot 2.87H_2O$	10	118.7	100	93.73
(This work)	100	90.7	1000	80.49
$K_{0.220}Fe[Fe(CN)_6]_{0.805} \cdot 4.01H_2O$[1]	50	76.7	50	95.44
	200	60.6	150	86.50
	300	51.7	150	86.50
$K_{1.7}Fe[Fe(CN)_6]_{0.9}$[2]	100	120.0	300	65.00
$K_{1.89}Mn[Fe(CN)_6]_{0.92} \cdot 0.75H_2O$[3]	1C	57.8 (1st)	100	147.23
		108.7 (20th)		78.29
$K_{1.75}Mn[Fe(CN)_6]_{0.93} \cdot 0.16H_2O$[4]	30	116.6 (1st)	100	110.63
		137.0 (5th)		94.16
$K_{0.7}Fe_{0.5}Mn_{0.5}O_2$[5]	20	178.0	45	70.00
	100	114.0	60	89.00
	200	94.0	45	96.00
	500	77.1	200	85.00
$K_{0.6}CoO_2$[6]	100	48.0	120	60.00%
$K_{0.5}MnO_2$[7]	5	140	20	33.6
3,4,9,10 perylene–tetracarboxylicacid–dianhydride[8]	10	130.0	200	69.23%
perylene anhydride[9]	10	131.8	300	47.80

References:

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