Supporting Information

Carbon Nanotube-Encapsulated FeF_2 Nanorods for High-Performance Lithium-Ion Cathode Materials

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Supporting Data:

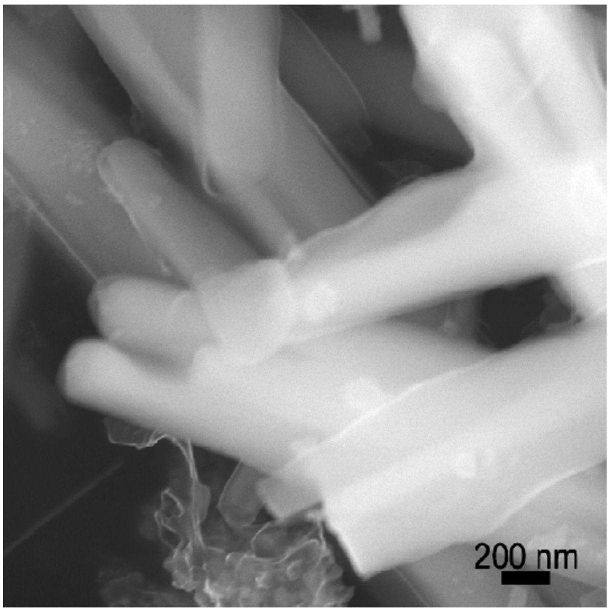

Figure S1. SEM image of FeF_2@CNT obtained at 500 ^{o}C for 3 h.

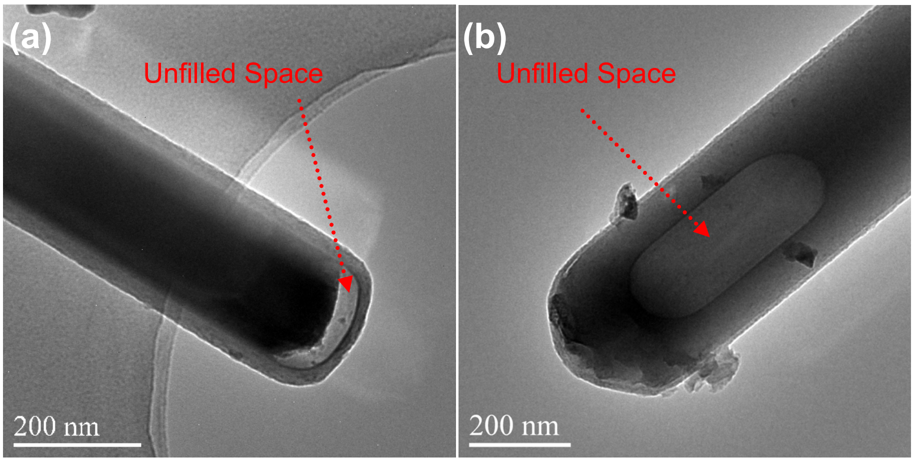

Figure S2. TEM images of FeF_2@CNT with (a) unfilled space and (b) hollow interior obtained at 500 °C for 3 h.

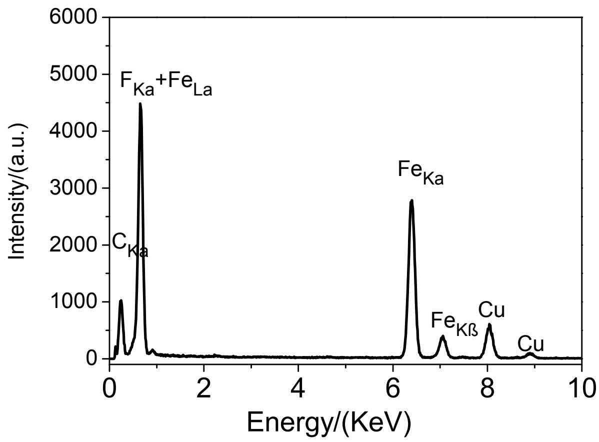

Figure S3 EDS spectrum of FeF_2@CNT nanorods obtained at 500 °C for 3 h.

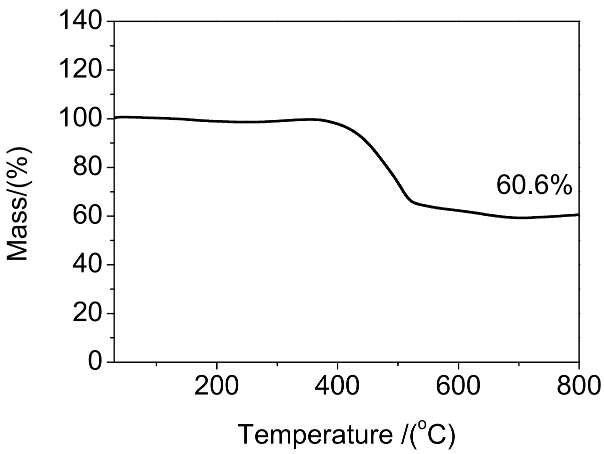

Figure S4 TG curve obtained by heating FeF_2@CNT from room temperature to 800 °C in air atmosphere. (Note: It means that the content of FeF_2 in the composite is ca. 71.22 wt%.)

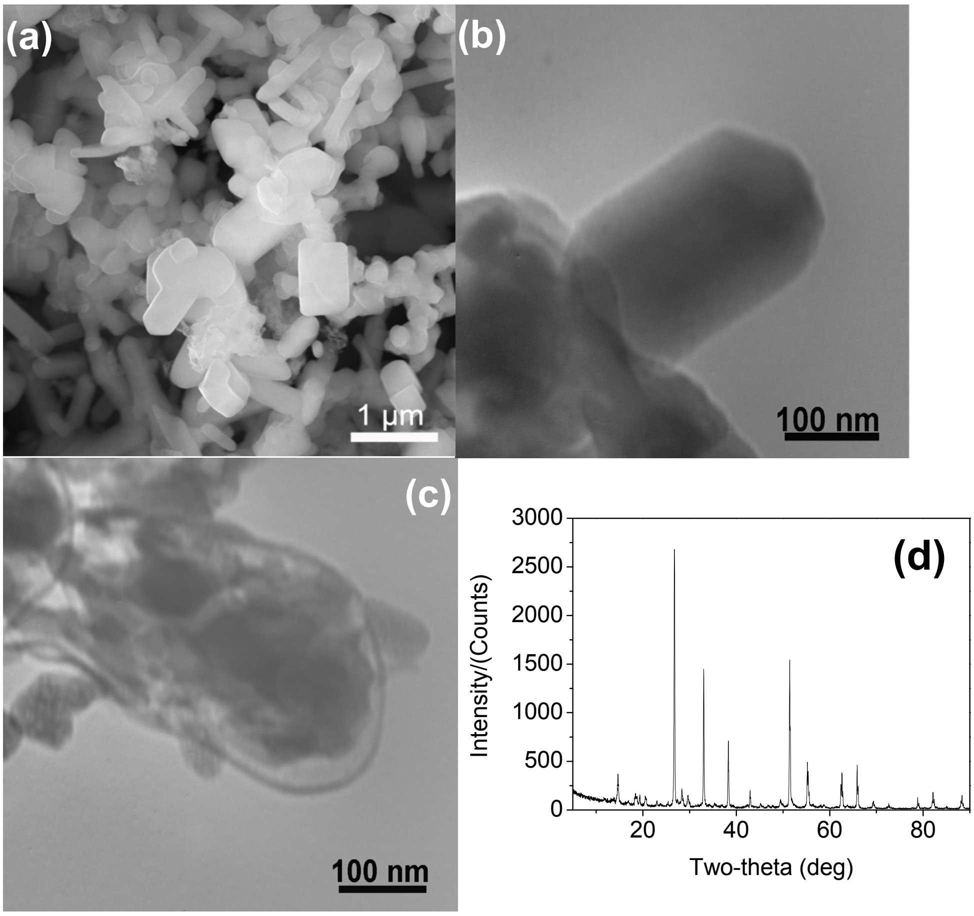

Figure S5 (a) SEM, (b,c) TEM images and (d) XRD pattern of the sample obtained by co-pyrolysis of ferrocene and NH4F at 450 ^{o}C for 3 h, (b) TEM image of a FeF_2 nanoparticle without carbon shell, (c) TEM image of a FeF_2 nanoparticle with thin carbon shell.

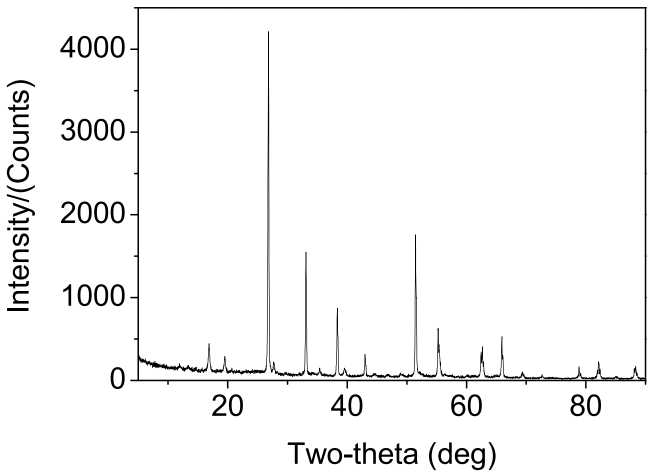

Figure S6. XRD pattern of the sample obtained by co-pyrolysis of ferrocene and NH^4F at 700 ^{o}C for 10 min, which shows that the obtained sample is mainly composed of FeF_2.

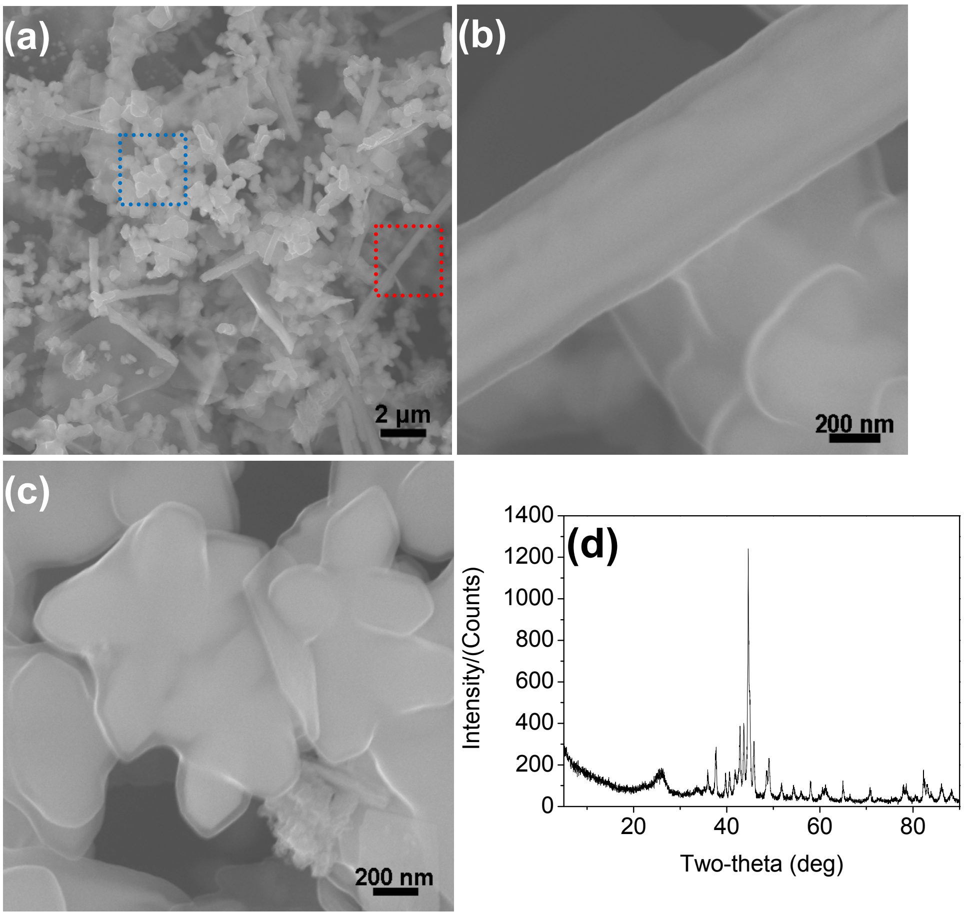

Figure S7 (a-c) SEM images and (d) XRD pattern of the sample obtained by co-pyrolysis of ferrocene and NH4F at 700 °C for 30 min, (b) magnified SEM image of a nanowire in red box in the image (a), and (c) magnified SEM image of aggregated nanoparticles in blue box in the image (a)

Fig. S7(a) exhibits that the sample obtained at 700 °C for 3 h is composed of mainly aggregated nanoparticles and less nanorods/nanowires. And, both nanoparticles (Fig. S7(c)) and nanorods/nanowires (Fig. S7(b)) are coated by carbon shells. XRD pattern shows that Fe element in the sample exist in the form of Fe_3C and α-Fe, and no any FeF_2 is found, indicating that FeF_2 is decomposed and reacted with carbon by long-period annealing at high temperature.

Table S1. Comparison of the electrochemical performance of FeF_2@CNT nanorods synthesized in this work with those of iron fluoride reported in the literatures

Samples		voltage range /(V)	Current density	Initial capacity /($mAhg^{-1}$)	Cycle number	Capacity after cycling/(mAhg-1)	Ref
FeF_3	FeF_3:C(50:50 wt%)	2.5-4.5	7.58 mAg^{-1}	ca. 250	30	210	1
	FeF_3•0.33H_2O	1.6-4.5	14 mAg^{-1}	154	30	130	5
			71 mAg^{-1}	126	30	105	
	FeF_3•0.33H_2O with mesoporous structure	1.6-4.5	0.1 C	150	50	115	6
			0.25 C	ca. 140	--	--	
			0.5 C	ca. 130	--	--	
			1 C	120	--	--	
	FeF_3 nanoflowers on CNT	2.0-4.5	20 mAg^{-1}	210	30	ca. 210	7
			100 mAg^{-1}	180	70	ca. 150	
			500 mAg^{-1}	150	--	--	
			1000 mAg^{-1}	ca. 125	--	--	
	FeF_3/ordered mesoporous carbon	2.0-4.5	0.1C	178	30	150	8
			0.25C	156	--	--	
			0.5C	143	--	--	
			1C, 1C=237mA g^{-1}	131	--	--	
			2C	117	--	--	
			5C	90	--	--	
			10C	69	--	--	
	FeF_3/graphene	1.0-4.5	20 mAg^{-1}	587	10	300	9
			100 mAg^{-1}	ca.580	80	200	
			200mAg^{-1}	ca.200	--	--	
			1000 mAg^{-1}	ca.80	--	--	
	FeF_3/graphene	1.7-4.5	50 mAg^{-1}	190	--	--	10
			500 mAg^{-1}	150	50	134	
			1000mAg^{-1}	146	50	123	
	FeF_3 nanowires	1.5-4.5	50 mAg^{-1}	543	50	223	34
			200 mAg^{-1}	ca.470	50	147	
C/iron lithium fluoride nanocomposite (C/FeF_3/FeF_2/Fe_3C/LiF)		0.5-4.3	20.83 mAg^{-1}	324	200	275	12
			105 mAg^{-1}	175	30	ca.175	
			1050 mAg^{-1}	120	30	ca.120	
			2100 mAg^{-1}	ca.100	30	ca.100	
FeF_2	FeF_2-C nanocomposites	1.5-4.5	4 mAg^{-1}	ca.480 (24 °C)	5	ca.480	4
			50 mAg^{-1}	ca.480 (60 °C)	5	ca.420	
	C(FeF_2)0.55	1.3-4.3	22.7 mAg^{-1}	538 (25 °C)	25	171	11
			22.7 mAg^{-1}	603(25 °C)	25	235	
	C(FeF_2)0.55 after ball milling		22.7 mAg^{-1}	576(25 °C)	25	327	
			22.7 mAg^{-1}	637(25 °C)	25	425	
	FeF_2@C core/shell structures	1.3-4.2	30 mAg^{-1}	314	50	217	23
			100 mAg^{-1}	ca.200	--	--	
			200 mAg^{-1}	ca.160	--	--	
			500 mAg^{-1}	ca.100	--	--	
			1000 mAg^{-1}	ca.50	--	--	
			2000 mAg^{-1}	ca.25	--	--	
	FeF_2@CNT	1.0-4.2	50 mAg^{-1}	263	50	263	this work
			100 mAg^{-1}	221	50	181	
			500 mAg^{-1}	153	50	124	
			1000 mAg^{-1}	133	50	92	

Note: "--" means that the measurements were not carried out in the corresponding references.

Reference:

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