Electronic Supplementary Information (ESI)

Mild and cost-effective synthesis of iron fluoride/graphene nanocomposites for high-rate Li-ion battery cathodes

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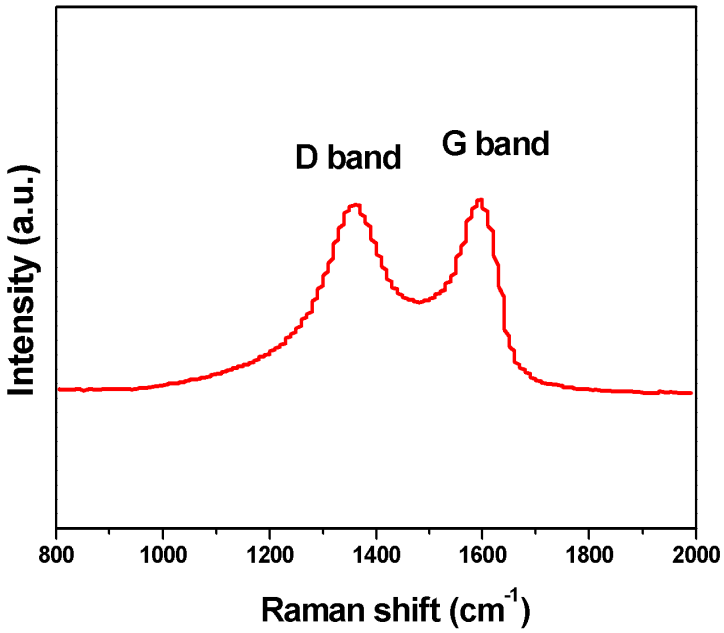

Fig. S1 Raman spectrum of the FeF_3/graphene nanocomposites.

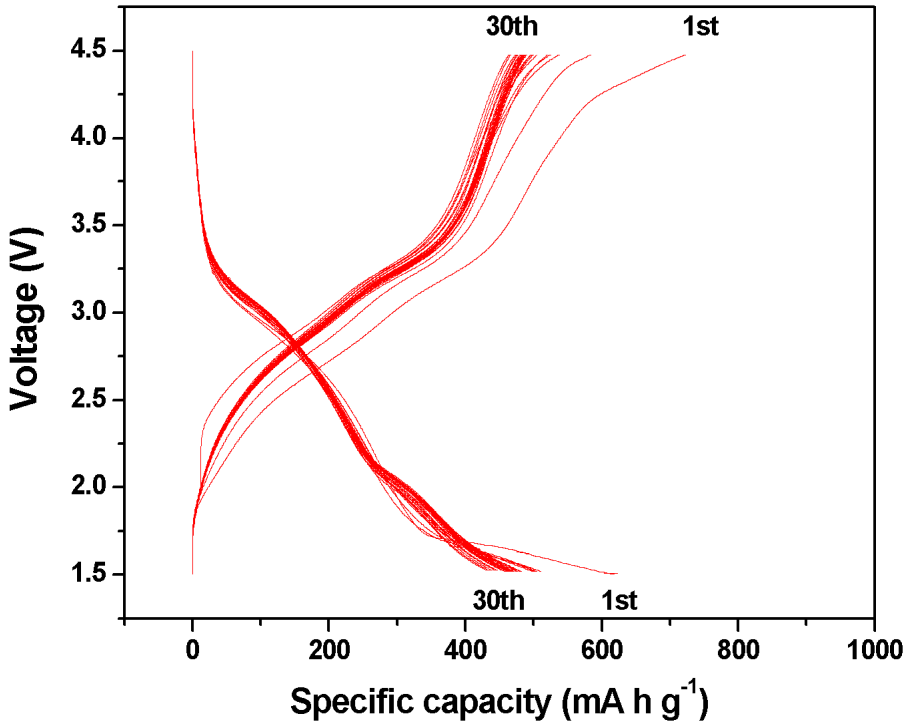

Fig. S2 Voltage-capacity curves of FeF_3/graphene nanocomposite cathode materials between 1.5 V and 4.5 V at a 0.1C rate (the first 30 discharge/charge cycles).

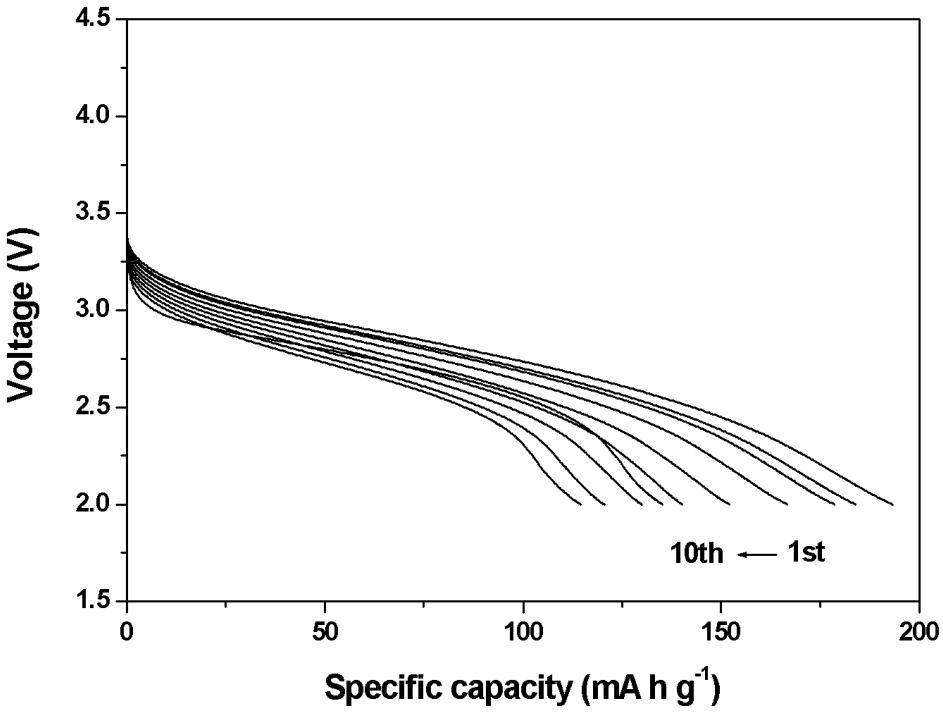

Fig. S3 voltage–discharge capacity curves of bare FeF_3 cathode materials between 2.0 V and 4.5 V at a 0.2C rate (the first 10 discharge/charge cycles).

The size and morphology of the final FeF_3 products can be reasonable controlled via changing the parameters of the current reaction. For example, when the reaction temperature and time were increased to 120 ºC and 24 h, respectively, only the aggregated $FeF_3{\cdot}3H_2O$ nanoparticles on graphene sheets were obtained. It may be caused by the fast and non-uniform nucleation of $FeF_3{\cdot}3H_2O$ at relatively high temperature (120 ºC) and the subsequently big growth of these nanoparticles in the following long reaction time (24 h). As shown in Fig. S4a and b, the $FeF_3{\cdot}3H_2O$ particles were not uniformly distributed on the conductive 2D graphene sheets and showed severely aggregated. Some aggregated particles were randomly covered on the surface of graphene sheets (Fig. S4b). The presence of 2D graphene sheets also has an important effect on the morphology and uniformity of $FeF_3{\cdot}3H_2O$ particles during the solution-deposition process. When the chemical-reduced graphene sheets were absent in the reaction system, only hierarchical $FeF_3{\cdot}3H_2O$ nanospheres composed of numerous small nanoparticles were achieved. Fig. S4c and d exhibit the morphology of these hierarchical nanospheres particle precursors. From these SEM images, it can be seen that all these $FeF_3{\cdot}3H_2O$ precursor nanoparticles self-assembled and grew into big nanospheres with diameter of 250–500 nm due to the absence of graphene sheet to anchor $FeF_3{\cdot}3H_2O$ nanoparticles during their growth.

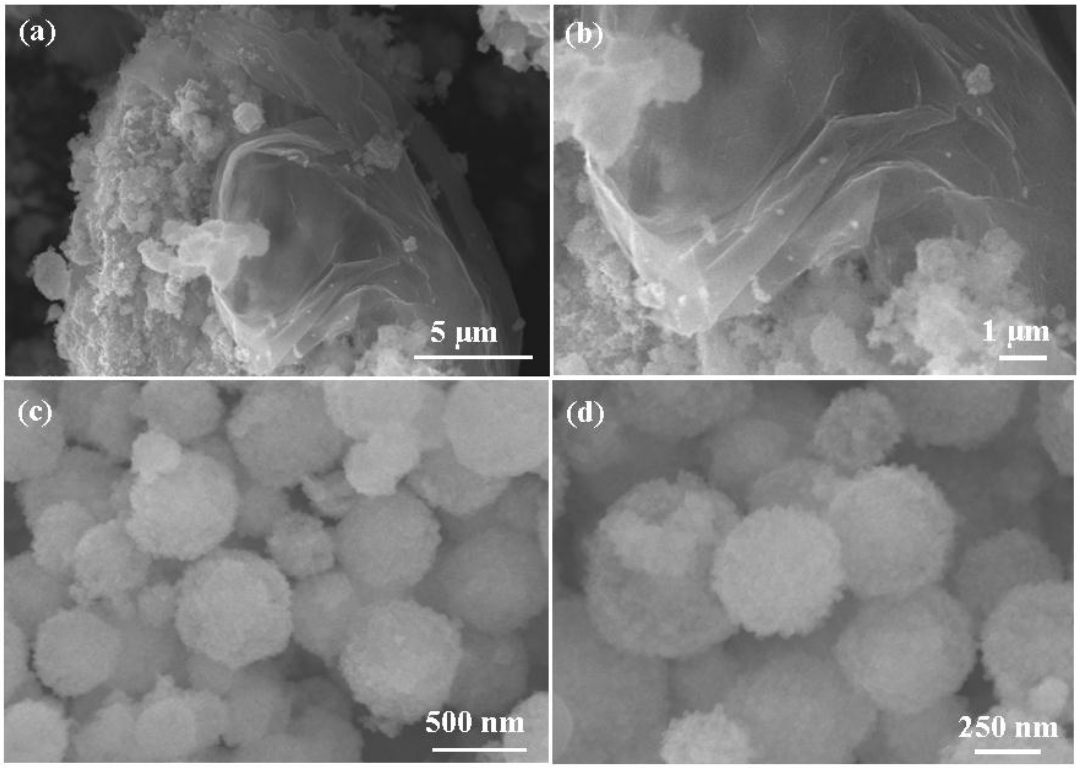

Fig. S4 (a, b) SEM images of $FeF_3 \cdot 3H_2O$/graphene nanocomposites obtained with high reaction temperature (120 ºC) and long reaction time (24 h); (c, d) SEM image of $FeF_3 \cdot 3H_2O$ hierarchical nanospheres (composed of numerous small nanoparticles) obtained with in the absence of 2D graphene sheets due to the absence of graphene sheet to anchor $FeF_3 \cdot 3H_2O$ small nanoparticles during their growth.