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RARE METALS (Monthly)

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Cover Picture
X.-X. Gu et al. Multi-core–shell-structured $LiFePO_4@Na_3V_2(PO_4)_3@C$ composite for enhanced low-temperature performance of lithium-ion batteries

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Cover story

(Xing-Xing Gu*, Shuang Qiao, Xiao-Lei Ren, Xing-Yan Liu, You-Zhou He, Xiao-Teng Liu, Tie-Feng Liu*, pp. 828–836)

Multi-Core-shell structured cathode contributes vehicles cruising at low temperature

In cold climates and high-altitude drones, lithium-ion batteries (LIBs) are required to work at subzero temperature. However, cold temperature causes sluggish diffusion rate and slow reaction kinetics for the electrodes. In this issue, Gu et al. successfully designed a multi-core-shell structured $LiFePO_4@Na_3V_2(PO_4)_3@C$ (LFP@NVP@C) composite to address inferior low temperature performance of $LiFePO_4$ cathode for LIBs. The outer carbon layers could enhance the conductivity of the cathode. The inner NVP interlayer processes an open framework for easy insertion/desertion of Li^+ into/out of the crystal, and the introduction of NVP interlayer also modifies the surface of LFP crystal by offering more diffusion channels of Li^+. As the temperature falls, LFP@NVP@C exhibits an enhanced low-temperature performance by *ca*. 8~33% in comparison with LFP@C, which is attributed to reduced charge-transfer resistance and enhanced Li^+ diffusion. Even at -10°C with 0.5 C, LFP@NVP@C delivers a discharge capacity of *ca*. 96.9 $mAh \cdot g^{-1}$ and discharge voltage of *ca*. 3.3 V.

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