Synthesis of Cobalt oxide/Ionic liquid hybrids for High Performance of Energy Storage

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Here, we demonstrate that the nanohybridization of ionic liquids (ILs) and cobalt hydroxide ($Co(OH)_2$) nanofibers via ionothermal synthesis leads to a promotion of simultaneous ion and electron transfer by a tailored favorable morphology and surface chemistry, resulting in a high rate capability and long term stability of pseudocapacitors. The construction of the porous network structure of IL-$Co(OH)_2$ nanofibers achieved excellent textile properties with a mesopore size of 4.8 nm and large surface area of 400.4 m^2/g, thus, the inner electrochemical active sites can be fully accessed with electrolyte ions, making ion diffusion length shorter. More importantly, the electron transfer was triggered by means of the facilitated intercalation/de-intercalation process of protons as a consequence of strong interactions with ILs and $Co(OH)_2$. This enhancement of ion and electron transfer of the nanohybrid enabled further improvement of electrochemical characteristics, compared with the bare $Co(OH)_2$, showing a high specific capacitance of 859 F/g at 1 A/g, high rate capability (~95% retention at 30 A/g), and excellent cycling performance (~96% retention over 1000 cycles).