Nanohybridization of Ionic Liquids and Cobalt Hydroxide Nanofiber for High Performance of Pseudocapacitor

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Development of nanostructured materials possessing the capabilities of enhanced redox reactions is important for achieving high energy and power densities in the energy storage systems. Here, we demonstrate that the nanohybridization of ionic liquids (ILs) and cobalt hydroxide (Co(OH)2) nanofibers via ionothermal synthesis leads to a rapid and reversible redox reaction by a tailored favorable morphology and surface chemistry. The as-synthesized IL-Co(OH)2 nanohybrid material exhibits improvement of electrochemical characteristics, compared with the bare Co(OH)2, showing a high specific capacitance of 859 F g−1 at 1 A g−1, high-rate capability (~95% retention at 30 A g−1), and excellent cycling performance (~96% retention over 1000 cycles). Our density functional calculations reveal that the IL molecules, consisting of anion and cation groups, enable easier hydrogen desorption/adsorption process.