Introduction of binary ligand system into binary metal-organic frameworks for enhanced pseudocapactor electrode

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NickelCobalt-Benzenedionicarboxylic (NiCo-BDC) was synthesized through a facile hydrothermal reaction using terephtahlic acid as a organic linker, nickel nitrate and cobalt nitrate as metal precursors. After hydrothermal process, part of BDC ligands combined with metal ions on the surface of NiCo-BDC was exchanged to new ligands, 2-methylimidzole through solvent-assistend ligand exchange (SALE) reaction. The material characterization of NiCo-BDC and NickelCobalt-Benzenedionicarboxylic@Methylimidazole (NiCo-BDC@MI) was analyzed using SEM, EDS, XRD, and XPS. Although ultrathin nanosheet morphology of NiCo-BDC was not transformed during SALE reaction, it can be observed that the amount of nitrogen existed on the surface has increased. The final product NiCo-BDC@MI could be applied to pseudocapacitor electrode, which exhibits better eletrochemical performance (2251.5 F g^{-1} at 1 A g^{-1}) than NiCo-BDC (1046.95 F g^{-1} at 1 A g^{-1}). The improved electrochemical performance is the result of increased diversity of active sites through inserting new ligands into metal-organic frameworks in the SALE reaciton.