

ABSTRACT

In the quest for advancing energy storage technology, there is a growing consensus that an integrated approach holds great promise. This approach aims to leverage the advantageous qualities of battery and supercapacitor, specifically their large specific capacity and large power density. Therefore, the rise of fusion supercapacitor has garnered significant attention, as they present an opportunity to combine the corresponding features of these dual tools within a distinct device, thus exceeding the restrictions inherent in traditional energy storing structures. In this perspective, MOFs, which consist of metal ion center and organic linker, have developed as greatly sought-after constituents for energy storing due to remarkable porous structure. We examine the luminescence and electro-chemical characteristics of Zn derived MOFs MS-15 and MS-52. The MOF MS-15 was synthesized by using $Zn(NO_3)_2 \cdot 6H_2O$, 5-Sulfoisophthalic acid monosodium salt and co-ligand 5-Nitroisophthalic acid by using hydrothermal method at $120\text{ }^\circ\text{C}$ for 72 hours. The MOF, MS-52 was synthesized by using $Zn(NO_3)_2 \cdot 6H_2O$, 5-Sulfoisophthalic acid monosodium salt and co-ligand 2-Methyl imidazole by sonication for 15 minutes. The MOF, MS-15 was characterized by using FT-IR, Photoluminescence spectroscopy, Cyclic Voltametry (CV), Electro-chemical Impedance Spectroscopy (EIS) and Galvanostatic charge/discharge(GCD) investigation. FT-IR spectroscopy revealed the shift of particular peaks related with carboxylate-metal bonding towards lower frequency convincing the complex formation. Photoluminescence spectroscopy confirms that our MOFs MS-15 and MS-52 displays luminescent behavior. The CV, GCD and EIS data provided a comprehensive showcase of the materials' capabilities in terms of charge storage and transport properties, offering valuable insights into their potential utilization and suitability for energy storage and conversion devices.