Isoreticulation of Zwitterionic Metal-Organic Frameworks for Electrochromic Applications

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Metal-organic frameworks (MOFs) are crystalline porous materials composed of metal ions or clusters connected by functionality-tunable polytopic organic linkers producing three-dimensional porous structures affording high surface area to mass ratios and large pore volumes rendering MOFs as the perfect platform for diverse host-guest chemistry. This work entails the design, synthesis, and characterization of a series of linear pyridinium and carboxylate based zwitterionic ligands with particular attention to the identities of the terminal coordinating functional groups, maintaining identical charges, built-in functional groups, and the location of the N+ atom of the pyridinium ring. Using these ligands, a series of isoreticular zwitterionic MOFs were synthesized through varying the identity of the metal salts and co-ligands used. Modern solid state analytical techniques were employed to obtain important structure-property relationship information of these MOFs with focus on their electrochromic and/or photochromic properties for smart window technologies, and selective gas adsorption properties for carbon capture.