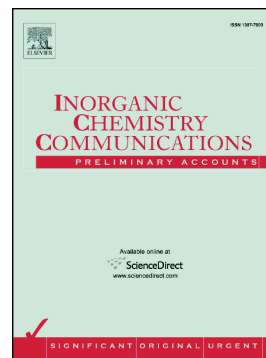


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A naphthalene diimide-based MOF with *mog* net featuring photochromic behaviors and high stability

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ABSTRACT:

A novel photochromic metal-organic framework ($[\text{Zn}(\text{L})_{0.5}(\text{bpy})(\text{H}_2\text{O})]\cdot 3.5\text{H}_2\text{O}$, **FJU-34**) based on Zn(II), carboxylate-based naphthalene diimides derivatives (H_4L) and 4,4'-bipyridine (bpy) has been prepared, which exhibits a unique doubly interpenetrated 3D open framework with a rare *mog* topological net. In addition, the excellent chemical stability and reversible photochromic performances have been observed in this compound.

Keywords: Metal-organic framework; *mog* topology; Photochromism; Chemical stability

Metal-organic frameworks (MOFs, also known as porous coordination polymers or porous coordination networks) are a class of crystalline porous materials that are readily fabricated through the coordination of inorganic metal ions or cluster nodes and organic bridging ligands.[1] Owing to their fascinating structures, designable framework and various potential applications (e.g., gas storage[2] and selective separation,[3] photoluminescence,[4] proton conductors,[5] and so on[6]), MOFs have received much attention in recent years. 1,4,5,8-Naphthalenediimides (NDIs)[7] are planar, chemically robust, redox-active compounds usually with high melting points, which can undergo a one-electron reduction to form stable radical anions as redox-active units for studying photoinduced electron transfer, leading to design and construction of optoelectronically active MOFs.[8] Moreover, recent research has demonstrated the effective synthesis of photochromic coordination polymers via the assembly of nonphotochromic ligands (electronic donors and acceptors, e.g. 4,4'-bipyridine) and a metal center (joint points).[9] Some photochromic MOFs have been reported based on NDI organic ligands with carboxylic acid or pyridine moieties by other groups,[10] but contain both of the carboxylate-based NDI derivatives and 4,4'-bipyridine have not been investigated as potential linkers to construct MOFs to date. In the present study, we synthesize a photochromic zinc-based MOF derived from carboxylate-based NDI (H_4L) and bpy ligands, ($[\text{Zn}(\text{L})_{0.5}(\text{bpy})(\text{H}_2\text{O})]\cdot 3.5\text{H}_2\text{O}$, **FJU-34**) (bpy = 4,4'-bipyridine, H_4L = 5,5'-(1,3,6,8-tetraoxobenzo[*lmn*][3,8]phenanthroline-2-7-diyl)bis-1,3-benzenedicarboxylic acid), which displays a unique three-dimensional doubly interpenetrated open framework with a rare *mog* topology network, accompanied with the extraordinary chemical stability and reversible photochromic properties.

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