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Highly bioactive porous 3D Cu-MOFs against MRSA

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Metal-Organic Frameworks (MOFs) are a group of highly porous crystalline materials consisting of metal clusters interconnected with organic linkers. Owing to their high porous and regular structure properties, MOFs has been expanded in biology and medicine as well as gas storage, purification and catalysis. Transition metal ions and metal nanoparticle containing Cu, Zn, Co and Ag have gained prominence as substitutes for new antibacterial agent to effect on bacteria. However, it is known excessive metal ions leached from metal nanoparticle would be harmful to the normal tissue as well as to bacteria. To solve these leakage problems, many researchers tried to trap the metal ion in MOF through coordination of bio active metal ion to organic ligands. New antimicrobial material composed of robust and porous Cu-MOFs are designed in consideration of the inherent characteristics of the metal and organic ligand such as oxidation number, counter ion, the coordination mode, the size and bridging property of the ligand. Bioactive porous three-dimensional Cu-MOFs representing high selective gas sorption were synthesized by hydrothermal reaction. Cu-MOFs containing Cu_2 di-nuclear units connected by flexible glutarate and bipyridyl ligands are formulated as $[Cu_2(Glu)_2(\mu\text{-}L)]\bullet x(H_2O)$ (Glu=glutarate, L: bpy=1,2-bis(4-pyridyl) (1), bpa = 1,2-bis(4-pyridyl)ethane (2), bpe = 1,2-bis(4-pyridyl)ethene (3), bpp = 1,2-bis(4-pyridyl)propane (4)). The single crystal X-ray study showed that Cu-MOFs contain paddle-wheel Cu_2 di-nuclear units connected by glutarates to form two-dimensional (2D) sheets and these sheets were bridged by bipyridyl ligand to form three-dimensional (3D) frameworks. The number of solvent water molecules in MOF was calculated from elemental analysis and TGA. The solvent-free MOFs 1, 2, 3 and 4 indicated 18.9%, 26.5%, 27.7% and 30.8% of void volumes, respectively, based on the PLATON analysis and contain well-defined 1D channel. Porous 3D Cu-MOF exhibited high selective sorption of quadrupolar CO_2 over N_2 and H_2. Antibacterial activities of Cu-MOFs against MRSA will be discussed.

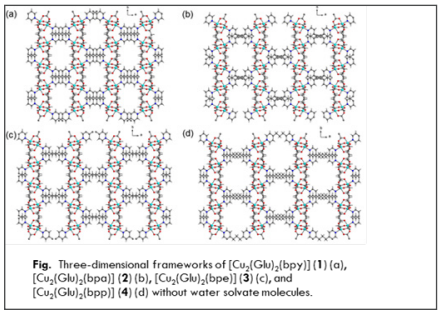

Fig. Three-dimensional frameworks of $[Cu_2(Glu)_2(bpy)]$ (**1**) (a), $[Cu_2(Glu)_2(bpa)]$ (**2**) (b), $[Cu_2(Glu)_2(bpe)]$ (**3**) (c), and $[Cu_2(Glu)_2(bpp)]$ (**4**) (d) without water solvate molecules.

Biography

Do Nam Lee has received her BS and MS from Yonsei University in Chemistry. She has earned her PhD from Yonsei University (1992) under the supervision of Prof. Chang Hwan Kim and completed Postdoctoral study as a member of the groups of Prof. Robert West at University of Wisconsin-Madison. She has worked as visiting scholar at Peking University. She is currently an associate professor at Kwangwoon University, Republic of Korea and mostly focusing on researches of synthesis and application of coordination comlpexes, functional metal organic frameworks and polymers.

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