Investigating the Use of an Amine-based Cadmium MOF for Precious Metal Remediation

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Due to the continuous growth rate of the electronic industry, tech companies depend on mining and extracting precious metals (PM) to meet the public demand thereby generating an alarming amount of electronic waste (e-waste) [1-5]. Ironically, e-wastes such as printed circuit boards contain more precious metals than mined ores. Despite the fact, four-fifths of the waste still ends up in landfills due to non-selective and inefficient recovery procedures [3]. Porous coordination polymers (PCPs) or metal organic frameworks (MOFs) are a promising alternative to address the aforementioned issues due to their inherent porosity and crystallinity. The organic component of these class of materials is highly tuneable and easy to functionalize. Moreover, it has been reported that nitrogen bearing adsorbents are able to showcase the required high-uptake capacities for PM recovery from e-wastes [2]. This work investigates the use of a synthesized homopiperazine-derived Cd-framework, poly-$[Cd(H_2L)]\cdot 8H_2O$, which forms a two-fold interpenetrated 3D coordination polymer for recovering precious metals such as Au and Pt from e-waste. The cyclic amine core group is designed to provide for an enhanced stability due to its pore accessibility for metal chelation. Preliminary studies indicate that the Cd-MOF is selectively adsorbing Au over the other metals tested. Metal selectivity, and desorption will also be explored.

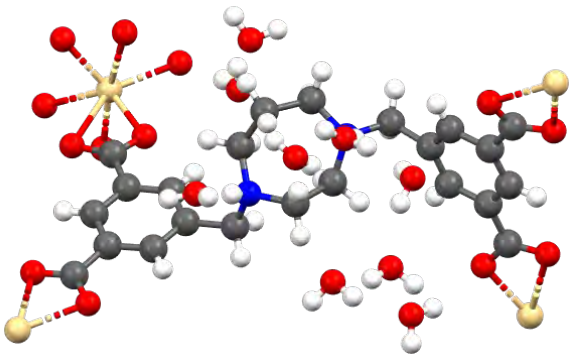

Figure 1. Magnified view of the asymmetrical unit surrounded by water molecules.

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