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Hierarchical Construction of Versatile Diamondoid Porous Organic Salts (d-POS)

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Porous materials using organic molecules have attracted much attention due to their potential application such as gas absorption and so on. However, it is still difficult to construct porous structures from only simple organic molecules. Thus, we proposed a novel hierarchical method to construct porous structures. In this method, the first step is to build up molecular assemblies. These assemblies act to sustain porous structures with larger inclusion spaces. Then, the assemblies are accumulated by intermolecular interactions between assemblies to achieve both robustness and dynamics of the porous structures. We have previously reported organic salts composed of triphenylmethylamine (TPMA) and various sulfonic acid derivatives constructed unique molecular assemblies "supramolecular clusters" through cubic hydrogen-bonding networks. Here we demonstrate that TPMA and sulfonic acids having polyaromatic moieties give a new class of porous structures consisting of diamond networks, named as diamondoid porous organic salts (d-POSs). The supramolecular clusters are hierarchically accumulated by π−π interactions between the polyaromatic moieties to yield the d-POSs through formation of the diamond networks. Large steric hindrance of the clusters prevents the diamond networks from constructing highly interpenetrated structures, giving continuous open channels. It should be noted that the interpenetration degree of the diamond networks is controlled by tuning the bulkiness of the cluster with alteration of sulfonic acids.

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