Water

1- Evolution of water structures in metal-organic frameworks for improved atmospheric water harvesting

By:
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Abstract:
Although the positions of water guests in porous crystals can be identified, determination of their filling sequence remains challenging. We deciphered the water-filling mechanism for the state-of-the-art waterharvesting metal-organic framework MOF-303 by performing an extensive series of single-crystal x-ray diffraction measurements and density functional theory calculations. The first water molecules strongly bind to the polar organic linkers; they are followed by additional water molecules forming isolated clusters, then chains of clusters, and finally a water network. This evolution of water structures led us to modify the pores by the multivariate approach, thereby precisely modulating the binding strength of the first water molecules and deliberately shaping the water uptake behavior. This resulted in higher water productivity, as well as tunability of regeneration temperature and enthalpy, without compromising capacity and stability.

2- Adsorption-based atmospheric water harvesting

By:
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Abstract:
Atmospheric water harvesting (AWH) is a promising solution to the world's water shortage. Meanwhile, adsorption-based atmospheric water harvesting (ABAWH) has shown a higher ability to supply water in arid areas using clean and cheap energy. Numerous modern adsorbents for this application have been introduced so far, and many prototypes have been provided. However, there is still a long way to go for

widespread and practical use of this technology. Dedicated designs, operating strategies, environmental compatibility, and energy supply are issues that still need further consideration. This article has tried to summarize what has been achieved so far in ABAWH, analyze the challenges ahead, and provide solutions to continue the path.

3- Applications of water-stable metal-organic frameworks in the removal of water pollutants: A review

By:
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Abstract:
Because the pollutants produced by human activities have destroyed the ecological balance of natural water environment, and caused severe impact on human life safety and environmental security. Hence the task of water environment restoration is imminent. Metal-organic frameworks (MOFs), structured from organic ligands and inorganic metal ions, are notable for their outstanding crystallinity, diverse structures, large surface areas, adsorption performance, and excellent component tunability. The water stability of MOFs is a key requisite for their possible actual applications in separation, catalysis, adsorption, and other water environment remediation areas because it is necessary to safeguard the integrity of the material structure during utilization. In this article, we comprehensively review state-of-the-art research progress on the promising potential of MOFs as excellent nanomaterials to remove contaminants from the water environment. Firstly, the fundamental characteristics and preparation methods of several typical water-stable MOFs include UiO, MIL, and ZIF are introduced. Then, the removal property and mechanism of heavy metal ions, radionuclide contaminants, drugs, and organic dyes by different MOFs were compared. Finally, the application prospect of MOFs in pollutant remediation prospected. In this review, the synthesis methods and application in water pollutant removal are explored, which provide ways toward the effective use of water-stable MOFs in materials design and environmental remediation.

3- Design and Applications of Water-Soluble Coordination Cages

By:
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Abstract:
Compartmentalization of the aqueous space within a cell is necessary for life. In similar fashion to the nanometer-scale compartments in living systems, synthetic water-soluble coordination cages (WSCCs) can isolate guest molecules and host chemical transformations. Such cages thus show promise in biological, medical, environmental, and industrial domains. This review highlights examples of threedimensional synthetic WSCCs, offering perspectives so as to enhance their design and applications. Strategies are presented that address key challenges for the preparation of coordination cages that are soluble and stable in water. The peculiarities of guest binding in aqueous media are examined, highlighting amplified binding in water, changing guest properties, and the recognition of specific molecular targets. The properties of WSCC hosts associated with biomedical applications, and their use as vessels to carry out chemical reactions in water, are also presented. These examples sketch a blueprint for the preparation of new metal-organic containers for use in aqueous solution, as well as guidelines for the engineering of new applications in water.

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5- Current scenario and challenges in adsorption for water treatment

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Abstract:
In this opinion paper, the current scenario and the main challenges in adsorption for water treatment are presented shortly. It is expected that this discussion paper will serve as a fast literature directive to support new ideas and novel investigations in the field. A general background about the topic is first presented. Subsequently, some important aspects that are well developed in literature are discussed, including adsorbent materials, adsorption operation mode, modeling, regeneration, and process operation with real samples. In the last section, it has been pointed out what should likely be the next steps required to advance in this knowledge.