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Special Issue Reprint

Research on Polyoxometalate Materials

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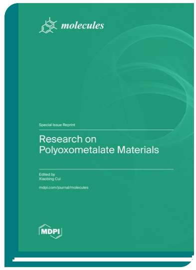

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Polyoxometalates (POMs) are a large and rapidly growing class of early-transition-metal oxide clusters. POMs are formed via acid-involved condensation reactions from monomeric oxometalate units, thus holding a special position (intermediate state) between monomeric oxometalate units and infinite metal oxide frameworks. POMs continue to show remarkable advances and unexpected surprises in both their fundamentals and applications. The chemical compositions (addenda atoms) of POMs are mainly Mo, W, V, Nb, and Ta, and the heteroatoms of POMs are more variable, including P, As, B, Al, Si, Ge, S, and so on. The wide range of chemical composition variability and the large amount of unusual structural types enable POMs to exhibit a large number of different properties, such as rich solution equilibria, significant chemical and thermal stability, strong acidity, and the ability to act as proton–electron sinks due to their fast and reversible proton-coupled redox processes. Based on their intrinsic multifunctional nature, POMs have significant applications in catalysis, medicine, and materials science, etc. POMs not only can be used widely in different disciplines but can also be combined with polymers, oxides, ionic liquids, or carbonaceous supports to construct new and advanced composite (hybrid) materials, which have important, extensive applications in catalysis, electrode materials, electrocatalysis, photocatalysis, and so on.