A Polyoxometalate-templated Inorganic-Organic Hybrid Compound Containing a Crown-like Metallamacroyclic Cation \([\text{Ag}_6(1,2,4\text{-triazole})_6]^6+\)

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A new polyoxometalate(POM)-templated inorganic-organic hybrid compound, \([\text{Ag}_6(\text{trz})_6][\text{PMo}_{12}\text{O}_{40}]_2 \cdot 6\text{H}_2\text{O}\) (1) (trz = 1,2,4-triazole) has been prepared under hydrothermal conditions and characterized by single-crystal X-ray diffraction, elemental analyses, IR spectroscopy, thermogravimetric analysis and cyclic voltammetry. In compound 1, six Ag\(^{+}\) ions are linked by six trz molecules to give a hexanuclear \([\text{Ag}_6(\text{trz})_6]^6+\) cycle. The six trz molecules are not co-planar, but adopt a crown-like shape. Cavities, with sizes of about 7.706 × 7.706 Å\(^2\), are found with the hexanuclear cycles packed along the c axis. The Keggin anions, as templates, are inserted in the 3D supramolecular framework. The electrochemical and electrocatalytic behavior of 1 has been studied in detail. The results exhibit that the redox ability of the Keggin anions can be maintained in the hybrid solid which has good electrocatalytic activity toward the reduction of bromate, hydrogen peroxide and nitrite.

Key words: Keggin Anion, Metallamacrocycle, POM-templated Hybrid, Electrochemistry