Synthesis, Crystal Structure and Electrochemical Properties of a New Adduct of Benzo-15-crown-5 and $\text{H}_3\text{PMo}_{12}\text{O}_{40}$

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A new crown ether-POM (POM = polyoxometalate) adduct with the molecular formula [(C$_{14}$H$_{20}$O$_5$)$_4$(H$_3$O)$_3$]PMo$_{12}$O$_{40}$·0.5CH$_3$CN (I) was isolated from the mixed solvent of acetonitrile and methanol. The adduct is constructed from Keggin [PMo$_{12}$O$_{40}$]$^{3-}$ anions and [(C$_{14}$H$_{20}$O$_5$)-(H$_3$O$^+$)] and [(C$_{14}$H$_{20}$O$_5$)$_2$(H$_3$O$^+$)] cations via electrostatic and hydrogen bonding interactions. The supramolecular interactions combine the crown ether with oxonium ions. In the [(C$_{14}$H$_{20}$O$_5$)-(H$_3$O$^+$)] moieties, the oxonium ions reside out of the planes defined by the oxygen atoms of the crown ether. The [(C$_{14}$H$_{20}$O$_5$)$_2$(H$_3$O$^+$)] moieties exhibit a sandwich structure. There exist hydrogen bonds between the oxonium ions of the [(C$_{14}$H$_{20}$O$_5$)(H$_3$O)]$^+$ cations and the acetonitrile molecules and the terminal and bridging oxygen atoms of the [PMo$_{12}$O$_{40}$]$^{3-}$ anions. The adduct has been used as a bulk-modifier to fabricate a chemically modified carbon paste electrode (MCPE), which displays well-defined cyclic voltammograms with three reversible two-electron redox couples in acidic aqueous solution, and electrocatalytic activities towards the reduction of $\text{H}_2\text{O}_2$ and $\text{NO}_2^-$. 

**Key words:** Polyoxometalate, Benzo-15-crown-5, Adduct, Carbon Paste Electrode