

# Electrostatic self-assembled multilayers of tetrachromated metalloporphyrins/polyoxometalate and its electrocatalytic properties in oxygen reduction

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## Abstract

Multilayer electrostatic assemblies described as  $\{[\text{FeTPyP}(\text{Crphen2Cl})_4]^{8+}/\text{SiW}_{12}\text{O}_{40}^{4-}\}_n$  and  $\{[\text{NiTPyP}(\text{Crphen2Cl})_4]^{8+}/\text{SiW}_{12}\text{O}_{40}^{4-}\}_n$ , where  $\text{TPyP}$  = 5,10,15,20-tetra(4-pyridyl) porphyrin,  $\text{phen}$  = 1,10-phenanthroline,  $\text{SiW}_{12}\text{O}_{40}^{4-}$  = silicotungstate and  $n$  = number of multilayers, were assembled onto different electrodic surfaces. The modified electrodes were constructed using the layer by layer methodology. UV-Vis spectroscopy, scanning electron microscopy (SEM), and cyclic voltammetry were used for the electrodes characterization. The electrocatalytic reduction of oxygen in aqueous solution was driven with these electrodes. In the oxygen reduction, rotating ring-disk and cyclic voltammetry techniques revealed a synergic effect between the cationic porphyrin and  $\text{SiW}_{12}\text{O}_{40}^{4-}$ . The synergism is related to the number of multilayers, the porphyrin complex employed, inner electroactive process across assemblies and the overpotential applied in the electrochemical process.