Transition metal-substituted polyoxometalate based material for oxygen reduction electrocatalysis

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The development of low-cost electrocatalysts with highly efficient catalytic activity and strong stability toward oxygen reduction reaction (ORR) is crucial for clean energy conversion and storage devices such as fuel cells, metal-air batteries, electrochemical reactions and so on. In this work, transition metal-substituted polyoxometalate embedded in heteroatom-doped carbon material((TM-POM@X-C) is prepared via the continuous hydrothermal method followed by pre-reduction and heteroatom doping treatment. Attributed to synergistic effects between the TM-POM nanoparticles and X-C support, larger specific surface area, the doping of X and better electrical conductivity, the TM-POM@X-C catalysts exhibit preferable performance toward E_{on} = 0.81 V vs. RHE and $E_{1/2}$ = 0.77 V vs. RHE compared to precious metal-based electrocatalysts. This work indicates that the polyoxometalate is a promising candidate for oxygen electrocatalyst in future applications.