Polyoxometalate as a biomimetic bifunctional catalyst for Lithium-oxygen batteries

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Rechargeable energy storage device with high power and energy densities is a key technique for sustainable distribution and use of renewable energy. Lithium-oxygen battery is considered a next-generation energy storage device because of its lightweight and their high energy density (2-3 times higher than Li-ion battery). However, there are some drawback such as poor rate capability and cycle stability originating from the sluggish kinetics for the formation and decomposition of lithium oxide products and large overpotentials for the oxygen evolution and reduction reactions (OER and ORR, respectively). For enhancing kinetics of lithium-oxygen batteries, we introduce a biomimetic molecular catalyst, cobalt-based polyoxometalates (Co-POMs) with an oxo-bridged tetracobalt active site. We found that Co-POMs can act as a OER /ORR bifunctional catalyst, resulting in a significant decrease of overpotentials with an increased capacity and cyclability. Our approach may provide insights for the development of high-performance lithium-oxygen batteries.