Electronic Supplementary Information (ESI)

Ag-embeded MnO nanorod: Facile synthesis and oxygen reduction

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Fig. S1. TG curve of the sample prepared with Ag⁺/Mn²⁺ molar ratio of 1:200 molar ratio (a), and the corresponding XRD patterns annealed at 200, 400, and 600 °C (b).

Seen from the TG curve and XRD patterns, there was an initial weight loss of desorbed water as temperature was increased up to 200 °C. The first sharp weight loss due to chemical water desorption and PVP residue occurred at ca. 200-250 °C, indicating the sample began to simultaneously decompose and convert into Ag and amorphous MnOₓ. No characteristic XRD peaks due to MnOₓ were observed after the sample was annealed at 200 °C. The second weight loss between 300 and 550 °C was caused by the oxygen release, forming crystalline MnO. The XRD patterns of samples
annealed at 600 °C confirmed the evolution of stable MnO phase. However, to obtain the stable Ag-MnO, we calcined the sample at 800°C.
Fig. S2. Raman spectroscopy of sample prepared at molar ratio of 1:200 before (a) and after calcination (b).

The RSS are plotted to determine the structure of as-prepared sample at molar ratio of 1:200 before and after calcination. As shown in Fig S2(a), the bands at 646, 616, 554 and 385 cm\(^{-1}\) are assigned to hollandite.\(^1\),\(^2\) As to the band at 646 cm\(^{-1}\), which is also close to the reported value of 648 cm\(^{-1}\) for MnO\(_2\). The result of RSS peaks, appeared at 800-350 cm\(^{-1}\), verifies the formation of Mn-O vibration in hollandite. The RSS peaks located at 1586 and 1350 cm\(^{-1}\), which may be assigned to the G band and D band of the carbon owing to the decomposed surfactant, are disappeared after calcination. Sharp peak at 653 cm\(^{-1}\) and a broad peak at 546 cm\(^{-1}\), are confirmed to be MnO phase, consistent with the reported bands for MnO at 654 and 537 cm\(^{-1}\).\(^3\),\(^4\) No Raman peaks due to Ag-O group are observed in Fig. S3b, indicating that Ag\(_{1.8}\)Mn\(_8\)O\(_{16}\) nanoparticles decompose to Ag\(^0\) and MnO after annealed at 800 °C.
Fig. S3. XRD pattern for 1-D Ag/Ag\textsubscript{1.8}Mn\textsubscript{8}O\textsubscript{16} and Ag-MnO nanorods prepared with CH\textsubscript{3}COOA\textsubscript{g} and Mn(CH\textsubscript{3}COO\textsubscript{2} and TEM image of the sample annealed at 800 °C.
References


