Supporting Information

Materials Characterization

The as-prepared materials were characterized by means of the following techniques. The BET surface areas were performed on a Quantachrome Nova 2200e Automated Gas Sorption system. All samples were degassed at 200℃in a nitrogen flow prior to N_2 physisorption at −196℃. The pore diameter and pore volume were calculated by BJH method. The crystal structure of $LaMnO_3$ perovskite oxide structure, the mixture of Ce-Sn binary oxides and their composites were determined using powder X-ray Diffraction Patterns (XRD) (APLX-DUO, BRUKER, Germany), and the scanning range was from 10° to 80° with a scanning velocity of 7° min^{-1} with Cu-Kα radiation. Raman spectroscopy was used for the determination of the crystallinity degree of the materials. The analyses were performed in a SENTERRA R200 microscope. The 633 nm line of Ar^+ laser was used for the excitation. The reducibility of the materials was conducted by H_2-TPR experiments, which was performed on Chemisorp TPx 2920 instrument, the materials were firstly degased at 300℃ for 3 h under Ar atmosphere before H_2-TPR test, the reducing gas was 10% H_2/Ar. X-ray photoelectron spectroscopy (XPS) was carried out on a Shimadzu–Kratos system to examine the valance states of elements on the surface of materials, coupled with an ultra DLD spectrometer with Al Kα as the excitation source. C 1s line at 284.6 eV was taken as a reference for the binding energy calibration.