

Controlled Synthesis of Double-Shelled CeO₂ Hollow Spheres and Enzyme-free Electrochemical Bio-Sensing Properties for Uric Acid

Lijun Han,[†] Rongji Liu,^{†,||} Chunshan Li,[†] Honghua Li,[†] Cuixia Li,^{†,||} Guangjin Zhang,^{*,†} and Jiannian Yao[‡]

[†]Beijing Key Laboratory of Ionic Liquids Clean Process, State Key Laboratory of Multiphase Complex System, Key Laboratory of Green Process and Engineering, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, PR China

[‡]Beijing National Laboratory for Molecular Science, Key Laboratory of Photochemistry, Institute of Chemistry, Chinese Academy of Science, 100190, Beijing, China

^{||}Graduate University of Chinese Academy of Sciences, 100190 Beijing, China

Supporting Information

1. Fig. S1 TG curve of as-obtained double-shelled CeO₂ HSs.

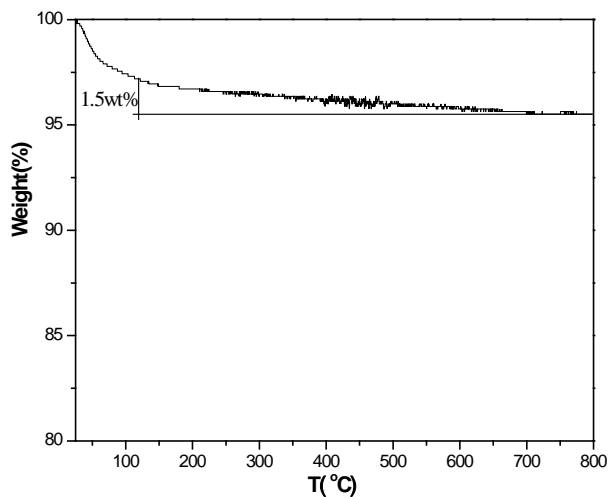


Fig. S1 TG curve of as-obtained double-shelled CeO₂ HSs

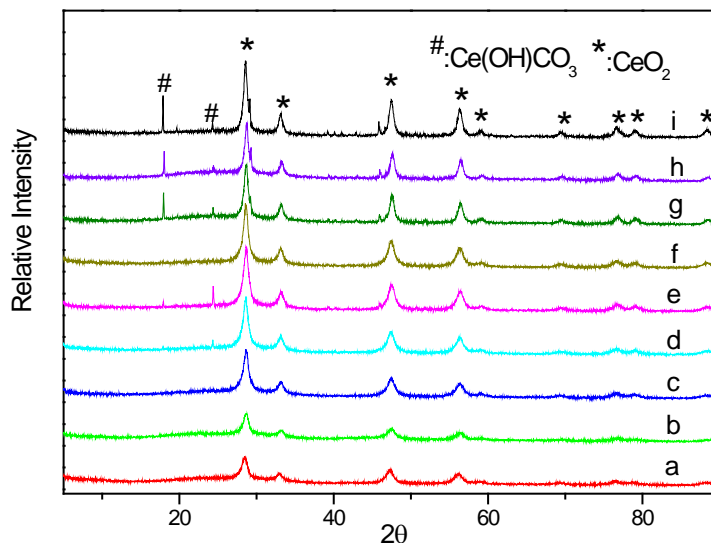


Fig. S2 XRD patterns of the intermediates at different time after the solvothermal process.
a) 50min, b) 1h, c) 2h, d) 3h, e) 4h, f) 5h, g) 10h, h) 15h, i) 20h.

XRD analysis was performed to check the composition of these products at different solvothermal stages and the results were shown in Fig. S2. All the products were mainly composed of cubic phase CeO_2 . Some trace amount of $\text{Ce(CO}_3\text{)OH}$ can be found in the samples when reaction time was prolonged to more than 3h. During the solvothermal process, trace CO_2 was formed by oxidation of PEG after prolonged reaction time. Due to the appearance of H_2O in the reaction, trace Ce^{3+} existed in the form of $[\text{Ce(H}_2\text{O)}_n]^{3+}$, and then changed into $[\text{Ce(OH)(H}_2\text{O)}_{n-1}]^{2+}$, which reacted with CO_3^{2-} in the solution to form $\text{Ce(CO}_3\text{)OH}$, finally. Since the oxidation of PEG to form CO_2 is a relative slow process, the formation of ceria hydroxy carbonate phase can only be observed at prolonged reaction time. It should be noted that all these trace impurities can be entirely removed by following heat treatment and the final product is a pure CeO_2 phase.