Supplementary materials

New Bi_2MoO_6 Nano-Tremellas for Promising Electrochemical Immunoassay of Carcinoembryonic Antigen

Zhongmin Wang[a], Xinli Tian [a], Dong Sun[b], Penghui Cao [a], Mengkui Ding[a], Yuhao Li[a], Ning Guo[a], Ruizhuo Ouyang[a,*], Yuqing Miao[a]

[a]*Institute of Bismuth Science, University of Shanghai for Science and Technology, Shanghai 200093, China*

[b]*School of Chemistry and Chemical Engineering, Henan Normal University, Xinxiang 453007, China*

S1. XRD pattern of Bi_2MoO_6

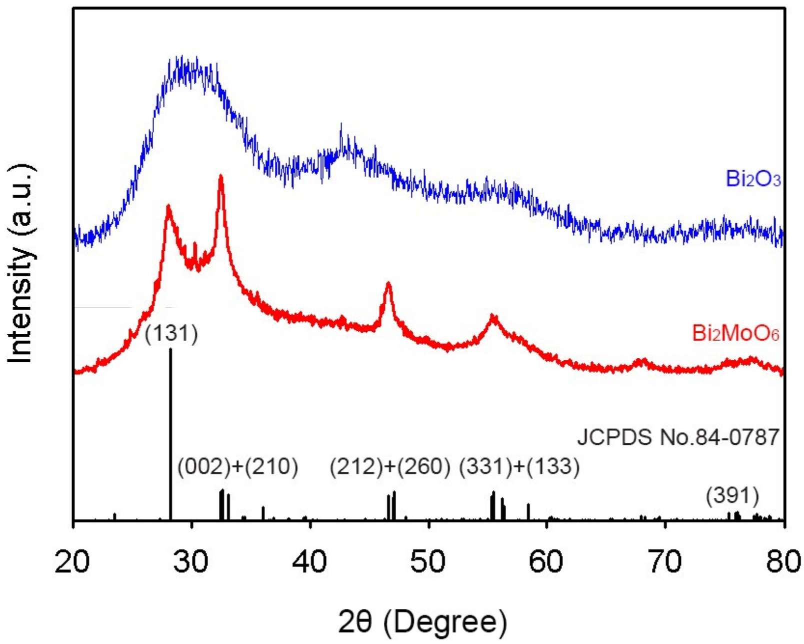

Fig. S1. XRD patterns of the as-fabricated samples Bi_2MoO_6 and pure Bi_2O_3.

S2. Optimization of experimental condition

In order to get preferable sensitivity and specificity of immunosensor, four factors

*Corresponding authors: ouyangrz@usst.edu.cn;

affecting the performance of the Au@Bi_2MoO_6 NTs based immunosensor toward 1 ng /mL^{-1} CEA were optimized with DPV, which included the concentration of Au@Bi_2MoO_6 NTs, pH values of PBS, the concentration of anti-CEA as well as the affinity reaction time between antibody andantigen.

Au@Bi_2MoO_6 NTs play an important role in the response of the prepared immunosensor to CEA. As seen in Fig. S2A, at the low concentration of Au@Bi_2MoO_6 NTs modified, the response signal is small, and the increasing concentration continuously increased the current till the concentration reached 2.0 mg /mL^{-1}. However, when the concentration of Au@Bi_2MoO_6 NTs was higher than 2.0 mg /mL^{-1}, the electron transfer rate of the immunosensor began decreasing. The current increase in the beginning could be attributed to the good conductivity and large surface area of Au@Bi_2MoO_6 NTs beneficial to the electron transfer and bimolecular modification. However, the reduced current was caused by the thickness of the material blocking the electron transfer. Therefore, the concentration of Au@Bi_2MoO_6 NTs was set as 2.0 mg/ mL^{-1}.

Therefore, we can know that when the pH was 6.5, the environment for the anti-CEA was the best and the maximum sensitivity of the antigen-antibody can be stimulated. The medium pH for CEA detection plays an essential role in the electrochemical performance of the designed Au@Bi_2MoO_6 NTs-based immunosensor. Five pH values (5.5, 6.0, 6.5, 7.0, and 7.5) were selected to examine the response of the immunosensor to CEA. As shown in Fig. S2B, as the pH value increased, the current went up and reached the highest value at 6.5. when the pH was higher than 6.5, the detection performance of the immunosensor was apparently influenced due to the pH-sensitive binding between Ab and CEA. Therefore, the optimal pH value was set as 6.5 for CEA detection.

Five different concentrations of anti-CEA (25, 50, 75, 100 and 125 μg /mL^{-1}) were individually incubated with Au@Bi_2MoO_6 NTs modified electrode to achieve the favorable detection performance of the immunosensor toward 1.0 ng /mL^{-1} CEA (Fig. S2C). It was found that the peak current greatly increased when more anti-CEA were immobilized on the electrode surface and the immunosensor exhibited the highest response to CEA at the concentration of anti-CEA increasing to 75 µng /mL^{-1}.

The incubation time of the antibody-antigen was established and the incubation time was selected to be 20, 40, 60, 80,100 min, respectively. As can be seen from the Fig. S2D, the antigen-antibody reaction reached maximum at 60 min, and kept stable afterwards. So 60 min was chosen as the optimal incubation time between anti-CEA and CEA.

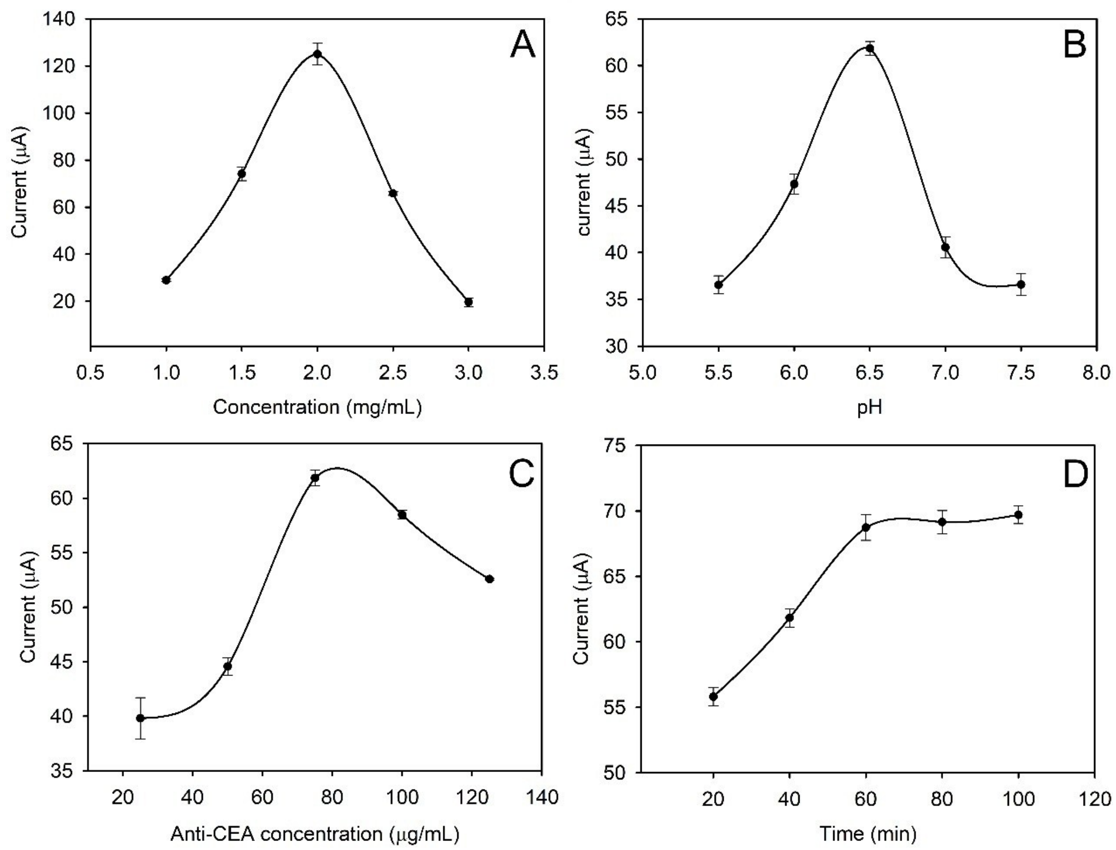

Fig. S2. Effects of (A) concentration of Au@Bi_2MoO_6 NTs, (B) pH of PBS, (C) concentration of anti-CEA and (D) antibody-antigen reaction time on reduction current responses of the immunosensor.