Supplementary Materials

Green synthesis of ZnO/BC nanohybrid for fast and sensitive detection of bisphenol A in water

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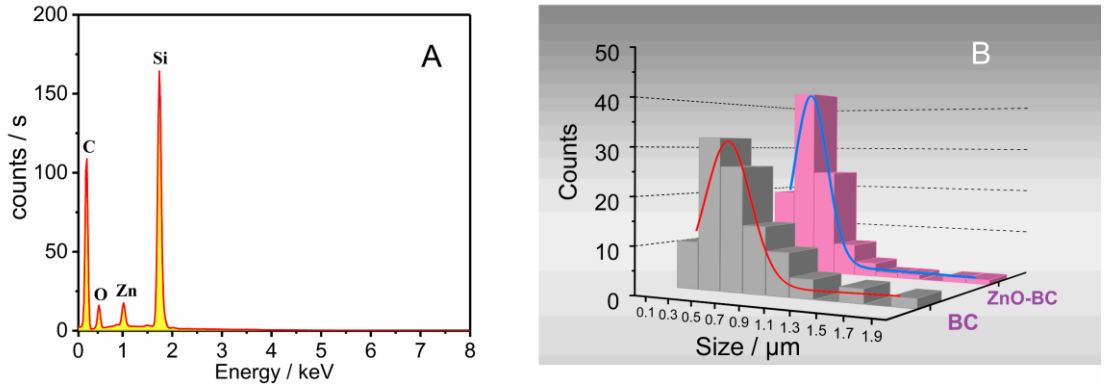

Figure S1. (A) Total elemental distribution spectrum and (B) the particle size distribution histogram of BC and ZnO/BC.

EDS of ZnO/BC nanohybrid. The elements of C, O and Zn (Si is the background) can be found in the EDS. And no other impurity peaks were detected for the sample. This indicates that the synthesised ZnO/BC nanohybrid are pure. The particle size distribution of BC and ZnO/BC in the range of 90 – 2470 nm and 60 – 1580 nm, respectively. And the average particle size is 542 nm and 404 nm (n = 100). ZnO/BC has 40% particle size distribution at 300 nm. As shown as in the SEM and particle size distribution histogram that the ZnO/BC nanohybrid has a smaller particle size, which is beneficial to enhance the conductivity of the material.

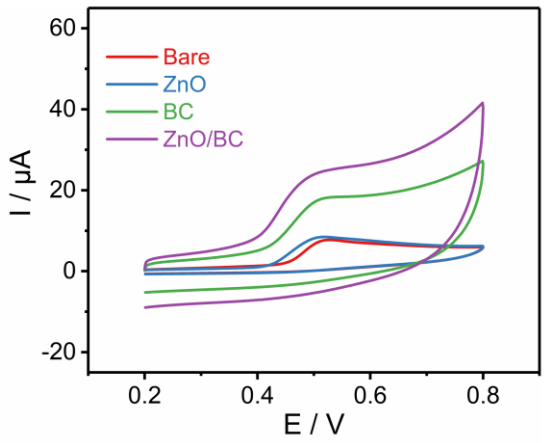

Figure S2. CV responses of modified electrode in PBS solution (50 mM, pH 7.0) containing 100 μM BPA with a scan rate of 100 mV/s.

The electrochemical behavior of unmodified and modified with ZnO/BC were recorded by CV with a scan potential range of 0.2 to 0.8 V (vs. Ag/AgCl). A clear oxidation peak, and no reduction peak in the reverse scan indicates the irreversible nature of the electrode reaction[38]. It shows more clearly that ZnO/BC has a larger oxidation peak, indicating that the nanohybrid has a higher electron transfer rate and

conductivity. Expresses the same essence as EIS and DPV.

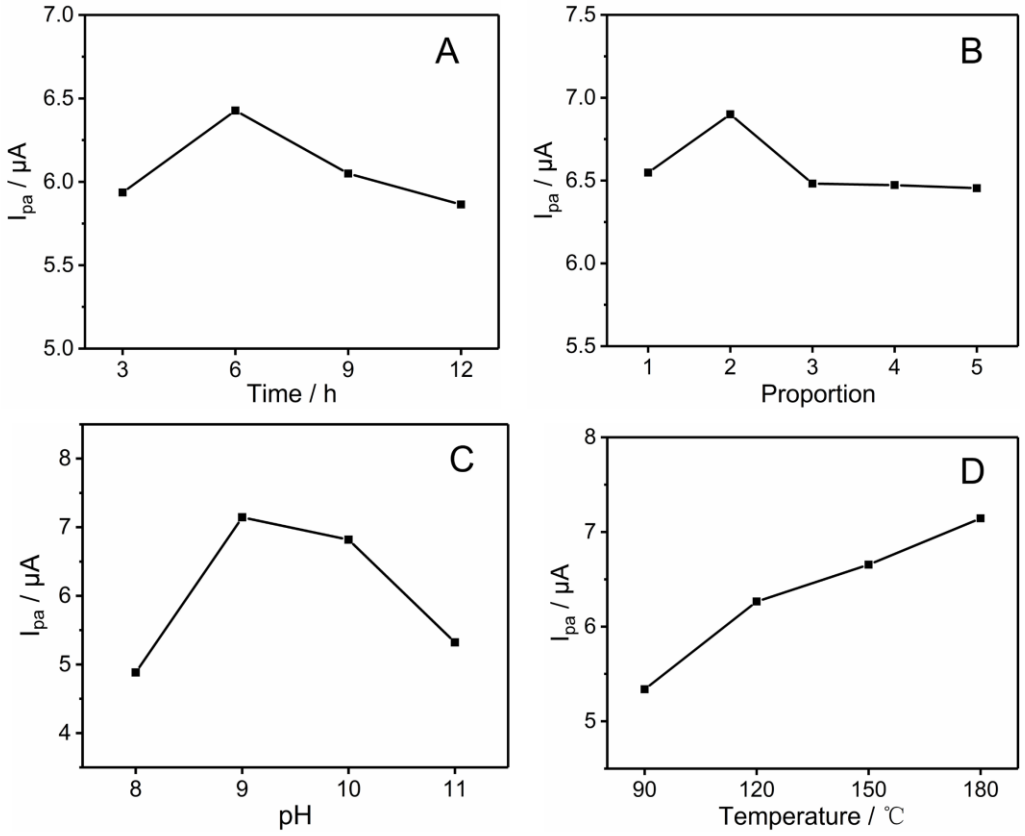

Figure S3. Effect of hydrothermal synthesis of ZnO/BC (A) time, (B) proportion, (C) pH and (D) temperature on the amperometric responses to 100 μM BPA in PBS solution (50 mM, pH 7.0).

Optimized the synthesis conditions of ZnO/BC nanohybrid, as shown in Figure S3, for the synthesis time, ratio, pH and temperature, respectively. The optimal synthesis conditions of the obtained ZnO/BC nanohybrid were 180 °C, 6 h, 1:1 and pH 9.0. We used the optimal results of the synthesized ZnO/BC for subsequent experiments.

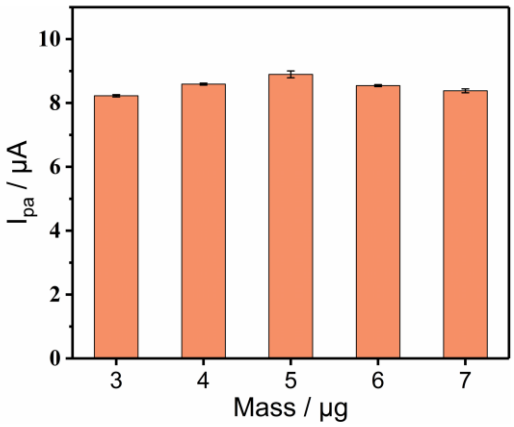

Figure S4. Histogram of the effect of drop mass on the response signal.

Dropwised different masses (3 – 7 μg) of ZnO/BC nanohybrid to compare the effect of response signal. As shown in Fig. S4, the current of the sensor to BPA increases to a maximum at 5 μg. Then the current signal decreases instead at increasing drop addition amount, which is due to the increase in the thickness of the complex on the electrode surface leading to an increase in the electrode surface impedance and a decrease in the electron transfer rate[39]. Therefore 5 μg of ZnO/BC drop addition was used for subsequent experimental analysis.

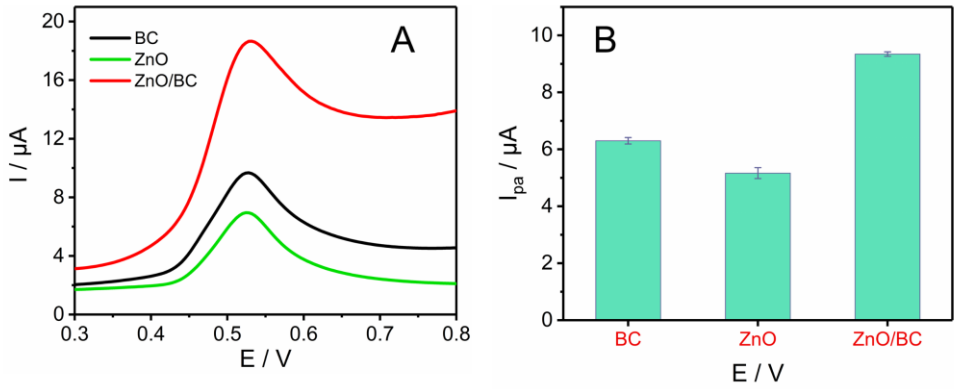

Figure S5. Differential pulse voltammogram for comparison of adsorption performance (A), Histogram of peak current values from the detection of 100μM BPA using different materials (B).

The comparative study of the adsorption and detection performance of ZnO/BC nanohybrid was carried out within the incubation time of 5 min. ZnO/BC has the greatest detection effect of BPA. This also indicated the strong adsorption ability and electrocatalytic properties of the nanohybrid.

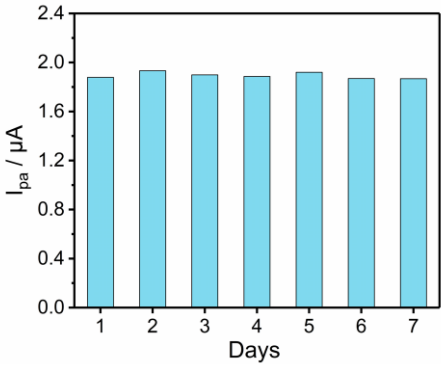

Figure S6. Stability of the ZnO/BC sensor stored at 4°C.

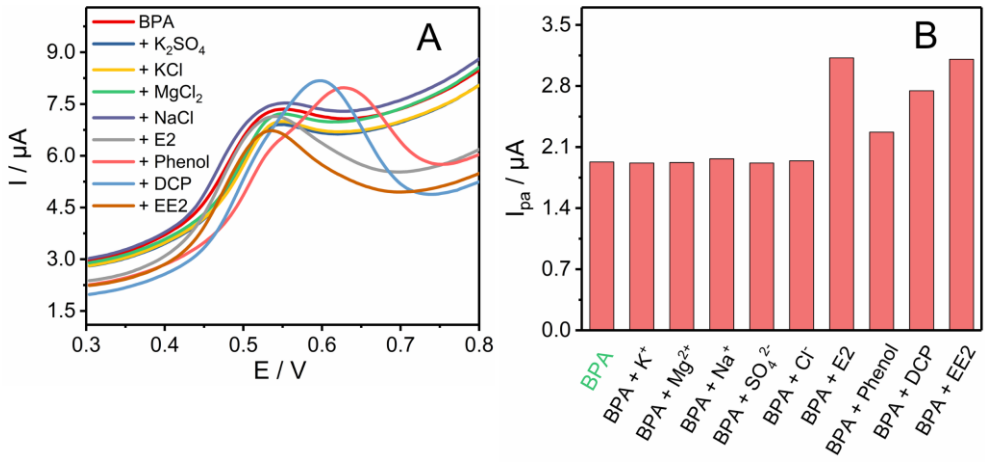

Figure S7. Differential pulse voltammogram at interferer concentrations 5 times higher than BPA (20 μM) (A), corresponding peak-current histogram (B).

As can be seen from Figure S7, anions and cations 100 times higher than BPA (20 μM) had no significant effect on the assay results. 5-fold concentration of the E2, phenol, DCP and EE2 interferents have an effect on the detection of BPA, it changes the peak shape. Although the presence of high concentrations of interferents cannot be used for the quantitative analysis of BPA, qualitative analysis can still be achieved.

References

The bibliographic citation information was in the text reference list.