Facile Preparation of Novel Au-Polydopamine Nanoparticles
Modified by 4-Mercaptophenylboronic acid for Glucose Sensor

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Experimental

Materials
Dopamine Hydrochloride, poloxamer (F108), gold (III) chloride trihydrate, 4-Mercaptophenylboronic acid (MPBA), Tris(hydroxymethyl)aminomethane (Tris), D-glucose and other reagents were supplied by Aladdin Reagent Co., Ltd without any purification. Milli-Q water was utilized through the whole experiment.

Synthesis of PDA microspheres
Tris (10mM, pH=8.5), F108 (750mg, 1.25mg/m) were completely dissolved in 600mL distilled H$_2$O with mechanical agitation. Then dopamine hydrochloride (480mg, 0.8mg/mL) was added into the mixture and its color changed from red to black for about 10 minutes. After reaction for about 20h, PDA microspheres was obtained by centrifugation and freeze-drying. The precipitates were washed with deionized water and ethanol for three times.

Preparation of Au-PDA microspheres
Gold (III) chloride trihydrate solution (30mL, 0.1 mg/mL) and PDA microspheres were mixed and agitated mechanically for about 12h while light avoided. The final Au-PDA spheres were collected by centrifugation and freeze-drying. The precipitates were washed with deionized water and ethanol for three times.

Preparation of MPBA-Au-PDA nanocomposites
MPBA (24.0mg) and Au-PDA microspheres (100mg) were added into 30mL distilled H$_2$O, agitated mechanically for about 6h. The resultants were obtained by centrifugation and freeze-drying. The precipitates were washed with deionized water and ethanol for three times.

Characterization
Dynamic light scattering (DLS) measurements were performed in aqueous solution using a HORIBA Zetasizer LB-550V apparatus at 25°C. The morphologies were investigated by ULTRA-55 field-emission scanning electron microscopy (FE-SEM) and JSM-2100
transmission electron microscopy (TEM) equipped with an energy dispersive X-ray spectrum (EDS, Inca Energy-200) at an accelerating voltage of 200kV. Fourier transform infrared (FT-IR) spectra were recorded on a Nicolet 5700 spectrophotometer using an ATR cell or KBr pellets for samples. Thermogravimetric analysis (TGA) was performed on a Pyris Diamond 1 instrument (America) at a heating rate of 20 °C/min from 10°C to 800°C in a flow of nitrogen. A CHI 660D electrochemical workstation was employed to accomplish the electrochemical experiments with platinum electrode as an auxiliary electrode, a saturated calomel electrode (SCE) as the reference electrode and a glassy carbon electrode as the working electrode. Microstructures of the as-prepared samples were analyzed with a SIEMENS Diffraktometer D5000 X-ray diffractometer using Cu Kα radiation source at 35kV, with a scan rate of 0.02°s⁻¹ in the 2θ range of 10-80°.

**Calculation of the size of Au NPs:**

The size of Au NPs on the PDA particles were calculated as following [1]:

\[
d = \frac{K \lambda}{w \cos \theta}
\]

where \(d\) is the particle size, \(\lambda\) is the wavelength of the radiation, \(\theta\) is the angle of the considered Bragg reflection, \(w\) is the width on a 2θ scale, and \(K\) is a constant close to unity.

Specific figures were as follows:

\(K=0.89, \lambda=1.54056, w=1.44, \theta=19°, d=9.63\text{nm}\).

**Calculation of LOD:**

The limit of detection (LOD) were calculated using the following equations:

\[
\text{LOD} = 3 \frac{\sigma}{R}
\]

where \(\sigma\) is the standard deviation of the peak current of the lowest concentration of the linearity ran, \(R\) is slope of the fitted curve.

Specific figures were as follows:

\(\sigma=1.6588 \times 10^{-8}, R=0.9953, \text{LOD}=5.0 \times 10^{-8}\text{M}\).
Fig. S1 The SEM image of PDA particles.

Fig. S2 The DLS curves of PDA particles.

Fig. S3 TEM image of Au-PDA particles.
References:
