

# Mussel-Inspired Molecularly Imprinted Polymer Coating Superparamagnetic Nanoparticles for Protein Recognition

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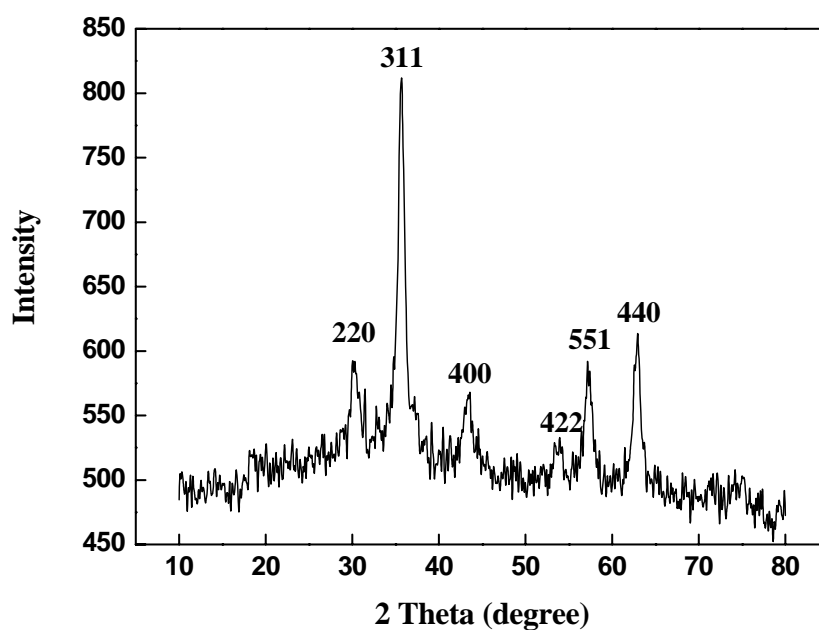
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## XRD characterization of the Fe<sub>3</sub>O<sub>4</sub> nanoparticles

Fe<sub>3</sub>O<sub>4</sub> nanoparticles were prepared through a solvothermal reaction<sup>S1</sup> and the formation of Fe<sub>3</sub>O<sub>4</sub> crystal was confirmed by X-ray diffraction (XRD) analysis. From the wide-angle XRD pattern, it was found that all the peaks could be readily identified as the pure cubic phase of Fe<sub>3</sub>O<sub>4</sub>. No impurity peak was observed, indicating that the high purity of Fe<sub>3</sub>O<sub>4</sub> crystalline was successfully synthesized.



**Figure S1** The wide-angle XRD pattern of synthesized Fe<sub>3</sub>O<sub>4</sub> nanoparticles

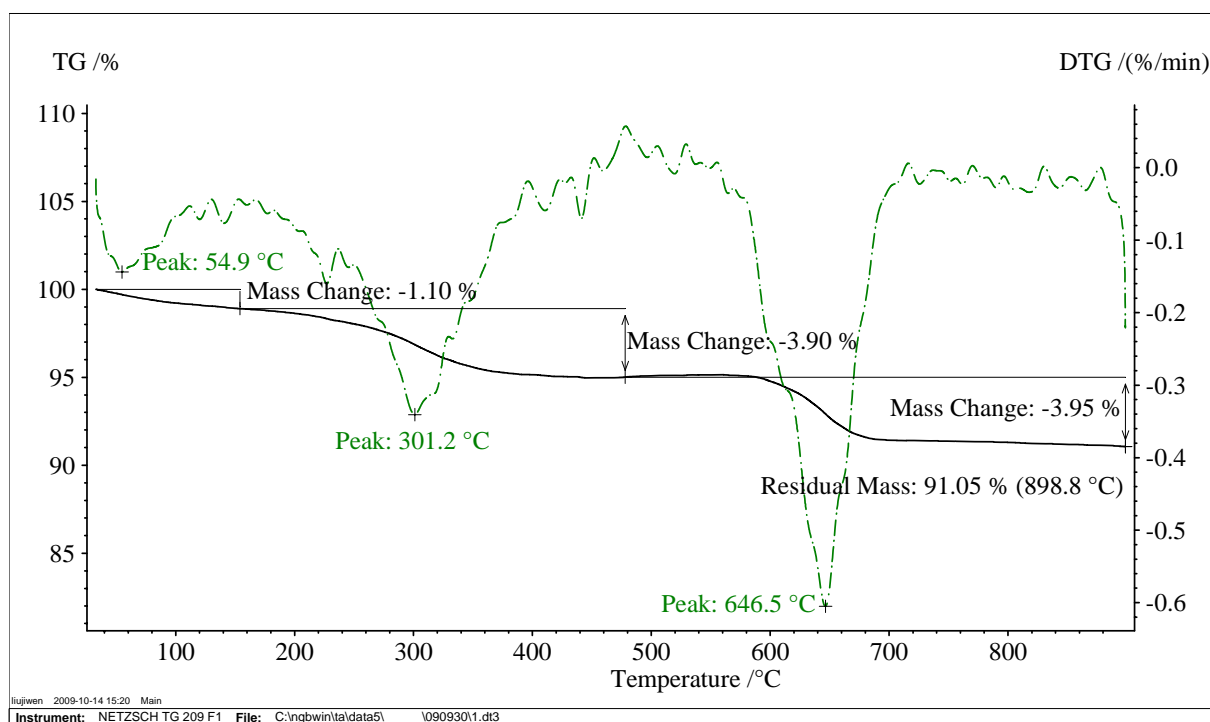
**Table S1** Element analysis results of the imprinted Fe<sub>3</sub>O<sub>4</sub>@PDA particles.

	<b>N</b> ( W% )	<b>C</b> ( W% )	<b>H</b> (W%)
Fe <sub>3</sub> O <sub>4</sub> @PDA	0.48	4.99	0.54

Elemental analysis was performed on a Vario MICRO series CHNOS Elemental Analyzer. Elemental analysis of the Fe<sub>3</sub>O<sub>4</sub>@PDA detected the carbon content of about 5 wt %. Thus, we can presume that polymers are distributed throughout the Fe<sub>3</sub>O<sub>4</sub> particles surface.

## TGA characterization results for the Fe<sub>3</sub>O<sub>4</sub>@PDA.

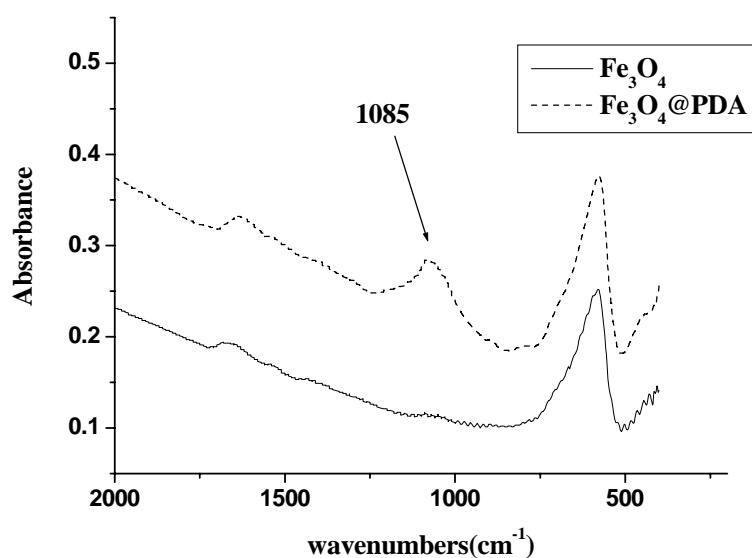
For the thermogravimetric analysis (TGA) a Netsch TG209 F1 in a N<sub>2</sub> atmosphere was used with a heating rate of 10 K/min between 30 and 900 °C. The TGA curve (Fig. S3) shows that there are three stages of mass change from room temperature to 900°C. The first stage, in which the decrease in weight was 1.10 %, occurred at ~ 30–167 °C. In the second stage, from ~ 167 to 479 °C, there was a decrease in weight to 95.00%. Then the TGA curve suddenly leveled off in the third stage from ~ 479 to 900 °C. In this stage, the decrease of weight was 3.95 %, so the total decrease of weight was 8.98 %. Therefore, the average polydopamine content was 8.95%.



**Figure S2** TGA results for the imprinted Fe<sub>3</sub>O<sub>4</sub>@PDA.

## FT-IR spectra characterization of the $\text{Fe}_3\text{O}_4$ and $\text{Fe}_3\text{O}_4@\text{PDA}$

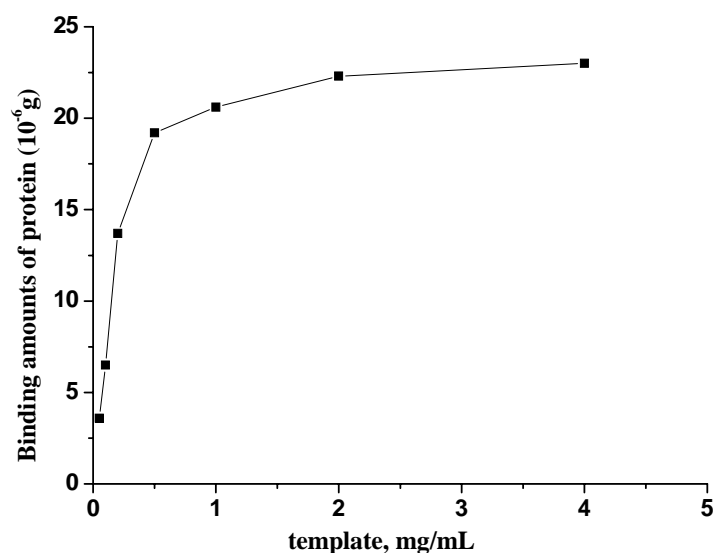
FT-IR spectra also confirmed the formation of polydopamine films on  $\text{Fe}_3\text{O}_4$  particles. As shown in Fig. S4, there is a characteristic peak appear in the spectrum of the  $\text{Fe}_3\text{O}_4@\text{PDA}$  particles. The strong peak at  $1085\text{ cm}^{-1}$  may attribute to the vibration of C–O bond of PDA, because it did not appear for pure  $\text{Fe}_3\text{O}_4$  particles, which provides an evidence for the formation of PDA films on  $\text{Fe}_3\text{O}_4$ .



**Figure S3** FT-IR spectra of the imprinted  $\text{Fe}_3\text{O}_4@\text{PDA}$  and blank  $\text{Fe}_3\text{O}_4$  particles.

### Effect of template concentration on binding amount of target protein

The influence of the template concentration on the ability of imprinted  $\text{Fe}_3\text{O}_4@\text{PDA}$  NPs to rebind the template was investigated. The imprinted  $\text{Fe}_3\text{O}_4@\text{PDA}$  NPs were prepared in the presence of different amounts of hemoglobin (ranging from 0.05 to 2 mg/mL protein). The readsorption was performed in Tris buffer containing 0.01% SDS (pH 7.5). Change in absorbance was measured at 406 nm. The polymer's ability to rebind the template protein increases steeply for imprinted  $\text{Fe}_3\text{O}_4@\text{PDA}$  prepared within 0.05-1 mg/mL template protein, while it rests unchanged for imprinted  $\text{Fe}_3\text{O}_4@\text{PDA}$  prepared in the presence of a template protein concentration above 1 mg/mL. So an optimized protein concentration of 1 mg/mL was selected.



**Figure S4** Effect of template concentration on binding amount of target protein.

## References

- S1. H. Deng, X. L. Li, Q. Peng, X. Wang, J. P. Chen and Y. D. Li, *Angew. Chem. Int. Ed.* 2005, **44**, 2782.
- S2. F. Bonini, S. Piletsky, A. P. F. Turner, A. Speghini and A. Bossi, *Biosensors and Bioelectronics*, 2007, **22**, 2322.