Supplementary Material (ESI) for *Journal of Materials Chemistry*


Electronic Supplementary Information (ESI) for
Journal of Materials Chemistry


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

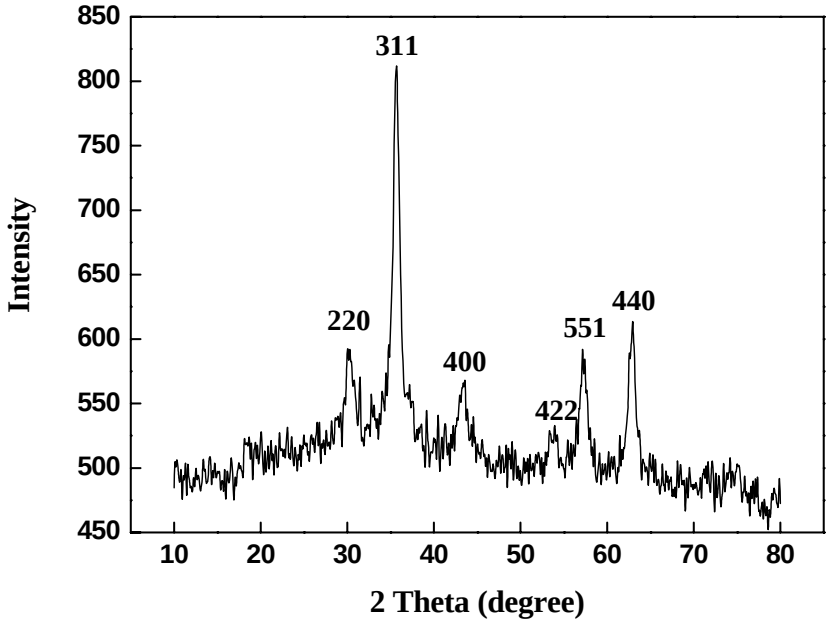
Wen-Hui Zhou[a,c], Chun-Hua Lu[b], Xiu-Chun Guo[a,c], Fa-Rong Chen[c], Huang-Hao Yang[*,b,c] and Xiao-Ru Wang[*,a,c]

[a] College of Chemistry and Chemical Engineering, Ocean University of China, Qingdao, P.R. China
[b] The Key Lab of Analysis and Detection Technology for Food Safety of the MOE, College of Chemistry and Chemical Engineering, Fuzhou University, Fuzhou, P.R. China
[c] The First Institute of Oceanography, SOA, Qingdao, P.R. China
*Corresponding author: hhyang@fio.org.cn

Contents:

## XRD characterization of the $Fe_3O_4$ nanoparticles

$Fe_3O_4$ nanoparticles were prepared through a solvothermal reaction[S1] and the formation of $Fe_3O_4$ 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 $Fe_3O_4$. No impurity peak was observed, indicating that the high purity of $Fe_3O_4$ crystalline was successfully synthesized.




**Figture S1** The wide-angle XRD pattern of synthesized $Fe_3O_4$ nanoparticles

**Table S1** Element analysis results of the imprinted $Fe_3O_4$@PDA particles.

| | **N (W%)** | **C (W%)** | **H (W%)** |
|---|---|---|---|
| $Fe_3O_4$@PDA | 0.48 | 4.99 | 0.54 |

Elemental analysis was performed on a Vario MICRO series CHNOS Elemental Analyzer. Elemental analysis of the $Fe_3O_4$@PDA detected the carbon content of about 5 wt %. Thus, we can presume that polymers are distributed throughout the $Fe_3O_4$ particles surface.

## TGA characterization results for the $Fe_3O_4$@PDA.

For the thermogravimetric analysis (TGA) a Netsch TG209 F1 in a $N_2$ 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%.

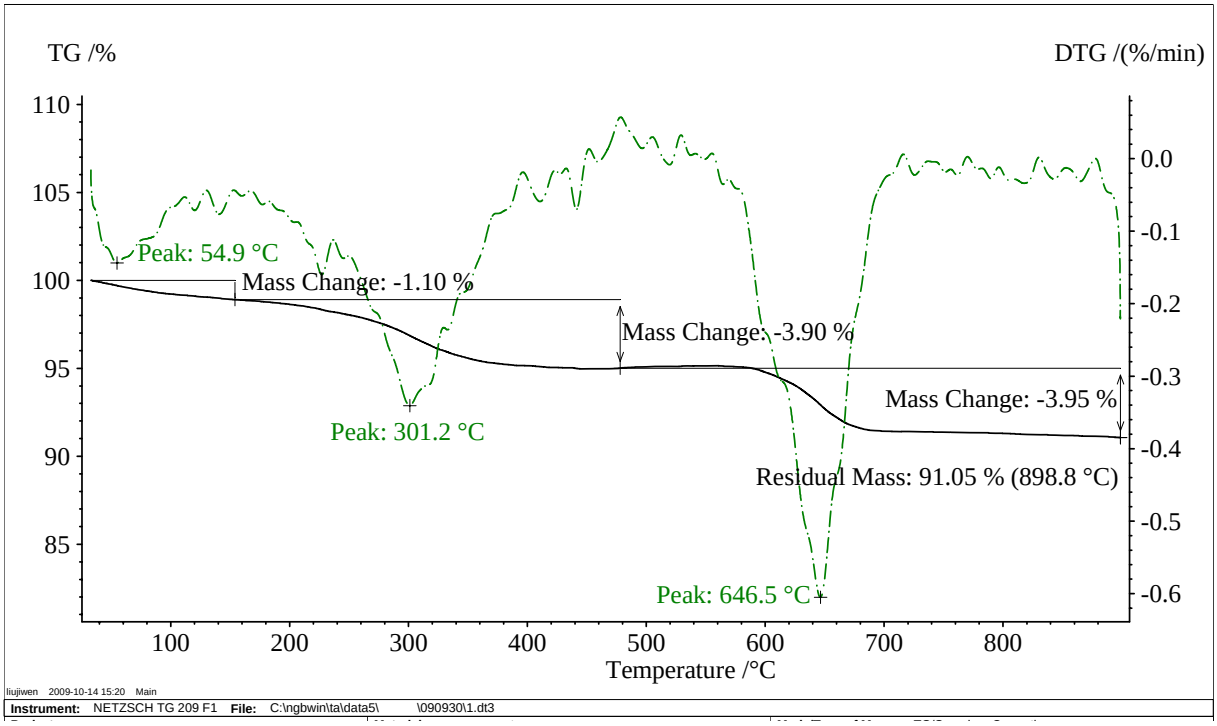



**Figure S2** TGA results for the imprinted $Fe_3O_4$@PDA.

# FT-IR spectra characterization of the $Fe_3O_4$ and $Fe_3O_4$@PDA

FT-IR spectra also confirmed the formation of polydopamine films on $Fe_3O_4$ particles. As shown in Fig. S4, there is a characteristic peak appear in the spectrum of the $Fe_3O_4$@PDA particles. The strong peak at 1085 $cm^{-1}$ may attribute to the vibration of C–O bond of PDA, because it did not appear for pure $Fe_3O_4$ particles, which provides an evidence for the formation of PDA films on $Fe_3O_4$.

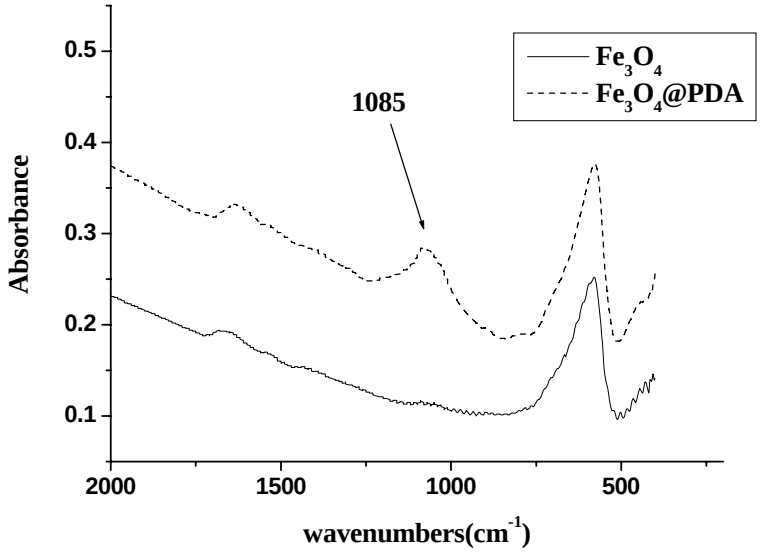



**Figure S3** FT-IR spectra of the imprinted $Fe_3O_4$@PDA and blank $Fe_3O_4$ particles.

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

The influence of the template concentration on the ability of imprinted $Fe_3O_4$@PDA NPs to rebind the template was investigated. The imprinted $Fe_3O_4$@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 $Fe_3O_4$@PDA prepared within 0.05-1 mg/mL template protein, while it rests unchanged for imprinted $Fe_3O_4$@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.

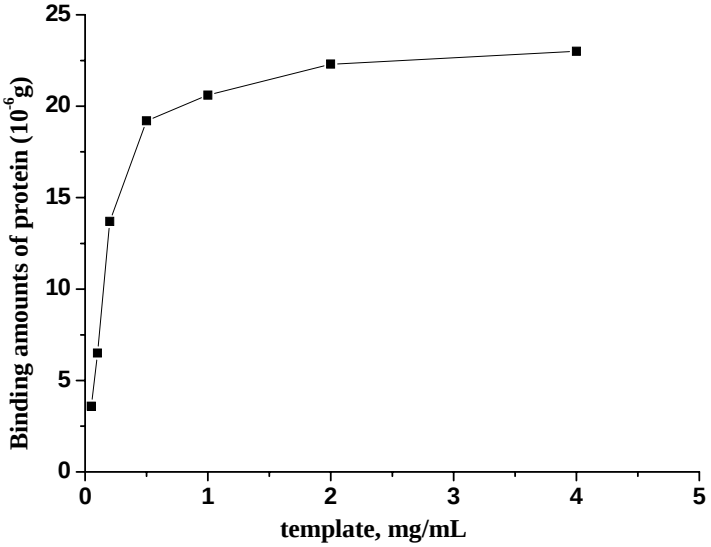



**Figure S4** Effect of template concentration on binding amount of target protein.

# 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.