Electronic Supplementary Material (ESI) for Analyst.

Supporting Information for:

Magneto-controlled flow-injection device for electrochemical immunoassay of alpha-fetoprotein on magnetic beads using redox-active ferrocene derivative polymer nanospheres

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S1. Characterization of MB-mAb$_1$

To investigate whether mAb$_1$ antibodies were covalently conjugated onto magnetic beads, we first used UV-vis absorption spectroscopy to monitor magnetic beads before and after modification with the antibody. The UV-vis absorption spectrum of the dispersion of the present magnetic beads is shown in Fig. S1A-a. The absorption spectra of magnetic beads were complicated, and increased with the wavelength decreased in the range from 600 nm to 200 nm. However, a strong absorption characteristic peak at 278 nm was observed after the functionalized magnetic beads reacted with the antibody (Fig. S1A-b). The peak at 278 nm derived from the conjugated antibody.[1] Further, we also FTIR to study the bionanocomposites. As is well known, the shapes of the infrared absorption bands of amide I groups at 1610-1690 cm^{-1} corresponding to the C=O stretching vibration of peptide linkages and amide II groups around 1500-1600 cm^{-1} from a combination of N-H bending and C-N stretching can provide detailed information on the secondary structure of proteins.[2] After interaction of mAb$_1$ with magnetic bead, the FTIR spectra of the functionalized magnetic beads displayed two absorption peaks at 1673 and 1561 cm^{-1} (Fig. S1B-b), which corresponded to the amide I and II groups of the antibodies. The weak bands occurred in the region of 1200-1400 cm^{-1} were assigned to the wagging and twisting vibrations of the -CH_2 group in these proteins and were commonly referred to as the progression bands.[3] These results also revealed that mAb$_1$ antibody was covalently conjugated onto magnetic beads.

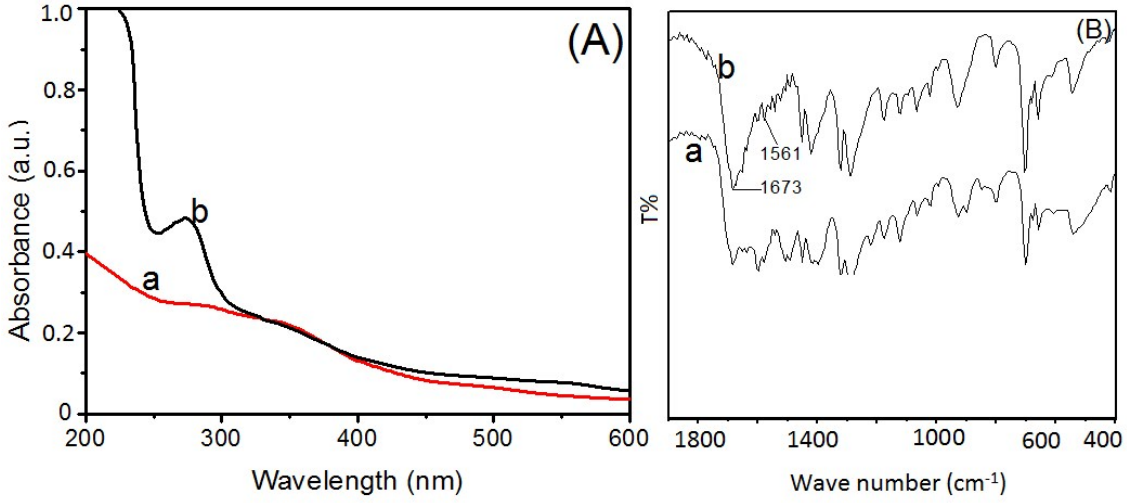

Fig. S1 (A) UV-vis absorption spectra and (B) FTIR spectra of magnetic beads (a) before and (b) after reaction with mAb$_1$ antibody.

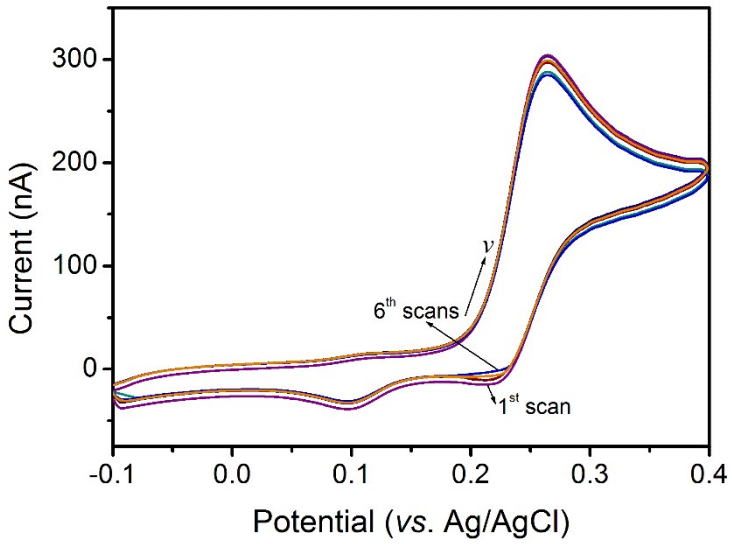

Fig. S2 Cyclic voltammograms of FDNP-mAb$_2$/AFP/MB-mAb$_1$/ITO during the continuous scans in PBS (10 mM, pH 7.0) at 50 mV s^{-1}.

References

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2. M. Jackson, L. Choo and P. Watson, *Biochim. Biophys. Acta*, 1995, **1270**, 1-6.
3. C. Feng, Y. Xu and L. Song, *Sens. Actuators B*, 2000, **66**, 190-192.