Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supplementary materials

A novel mechanical device provided by Fe_3O_4-PDMS composite membrane based on magneto-stress coupling effect for HSA detection

The hysteresis loop of the Fe_3O_4-PDMS composite membrane was tested by PPMS. The results were shown in Fig. S1. The hysteresis loop was narrow and long, which indicated that the Fe_3O_4-PDMS composite membrane exhibited ferromagnetic behaviors.

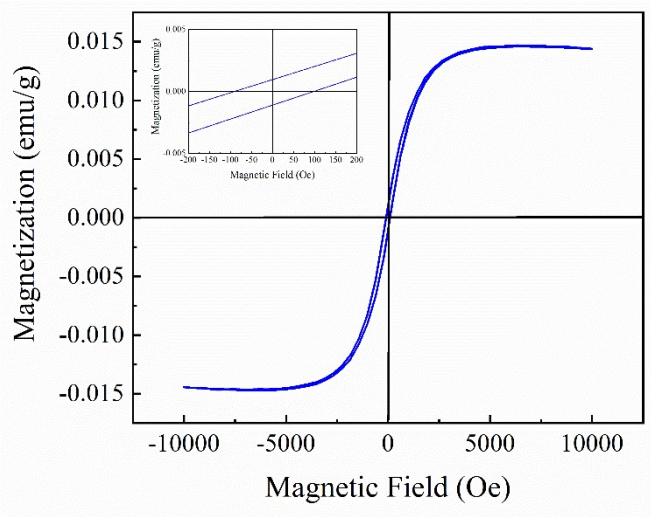

Fig. S1. (a) Variation of magnetization with applied magnetic field for Fe_3O_4-PDMS composite membrane at the environment temperature

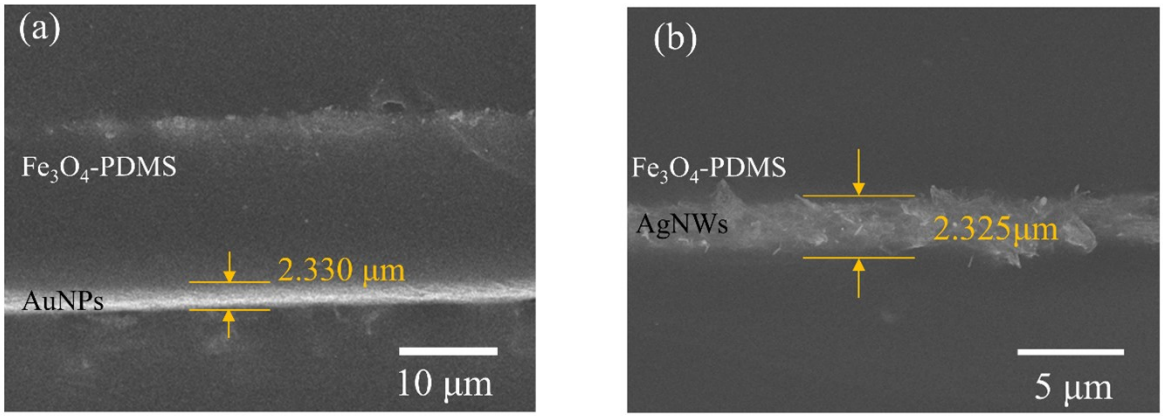

Fig. S2 (a) The SEM cross section of the interface between AuNPs layer and Fe_3O_4-PDMS composite film. (b) SEM cross section of the interface between AgNWs and Fe_3O_4-PDMS composite film.

To illustrate the surface modification, the EDS of the MSMD surface was measured, as shown in Fig. S3. The Fig. S3 showed the presence of the C, O, Fe and Au element in the MSMD without the modification. The presence of S element demonstrated that the formation of the CYS self-assembled monolayer. And the enrichment of the C, O and N element proved that the anti-HSA molecules were assembled on the MSMDs.

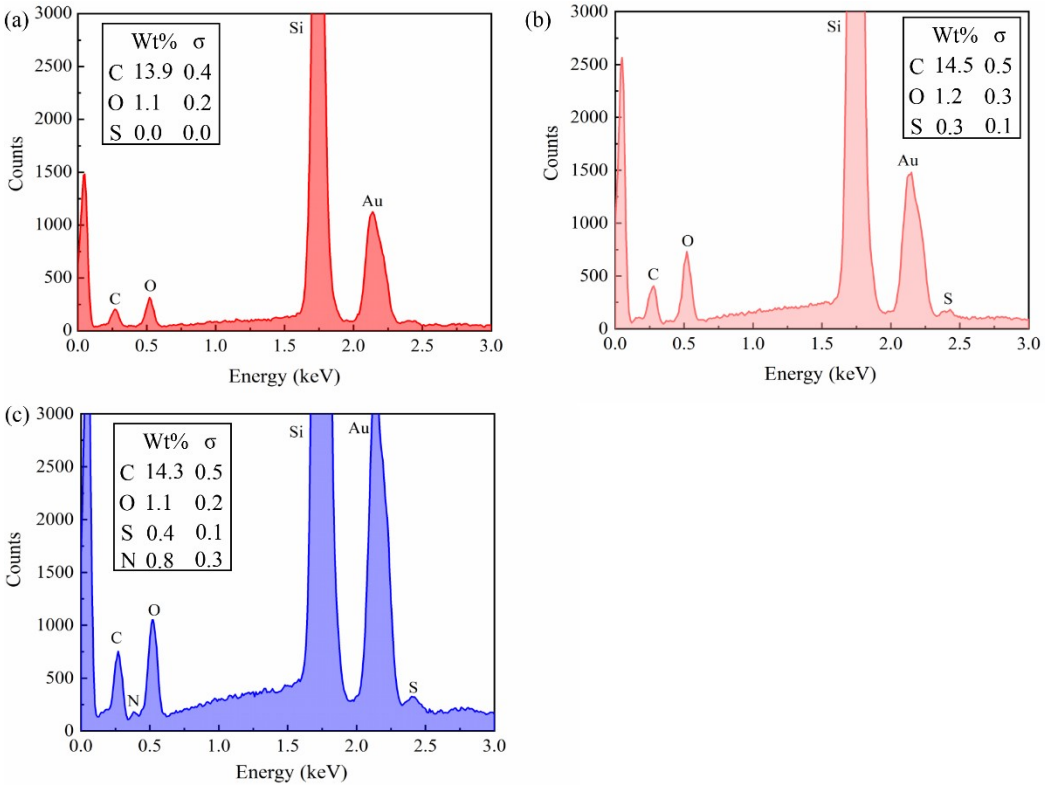

Fig. S3. (a) EDS of the MSMDs without modification; (b) EDS of the MSMDs with CYS self-assembled mono-layers; (c) EDS of the MSMDs with the anti-HSA.

The 20 μL HSA solution of different concentrations was dropped onto the MSEC-MMBs. After 20 min, the drop was removed using the pipette gun. The resistance responses of the MSEC-MMBs on the HSA in the range of 0-50 μg/mL with and without magnetic field application were shown in Fig. S4. In the absence of a magnetic field, the resistance responses of the MSEC-MMBs on HSA were smaller than that of the MSEC-MMBs with a magnetic field applied. Due to the absence of magnetic field application, the initial resistance of the the MSEC-MMBs was significantly smaller than that of the applied magnetic field. In addition, applying different magnetic fields also resulted in different initial resistances of the MSEC-MMBs.

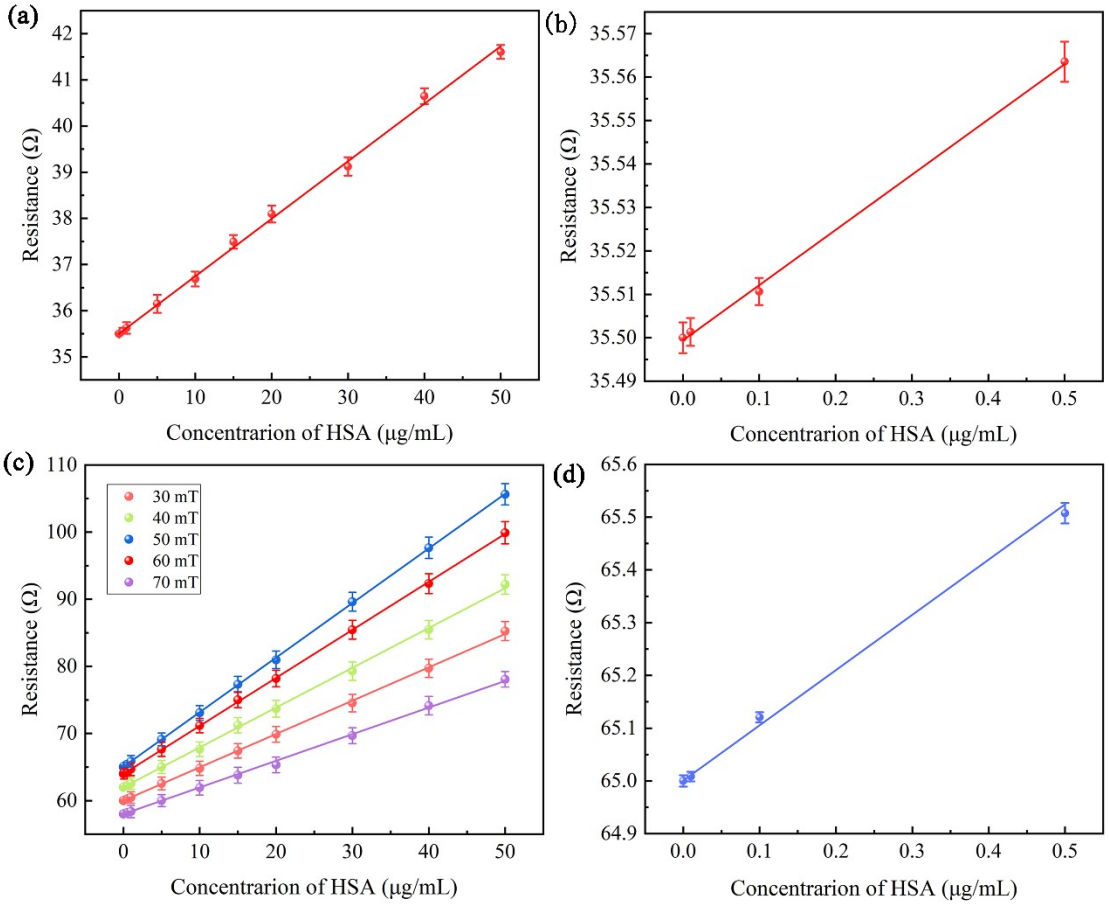

Fig. S4. (a) The resistance response of the MSEC-MMBs on the HSA in the range of 0-50 μg/mL without magnetic field application; (b) Enlargement of curve within the

range of 0-0.5mol/L in Fig. S4 (a); (c) The resistance responses of the MSEC-MMBs on the HSA in the range of 0-50 μg/mL with application of different magnetic fields; (d) Enlargement of curve within the range of 0-0.5mol/L with the magnetic field of 50 mT in Fig. S4 (c). The experiments were parallelly carried out 5 times.