Supplementary information

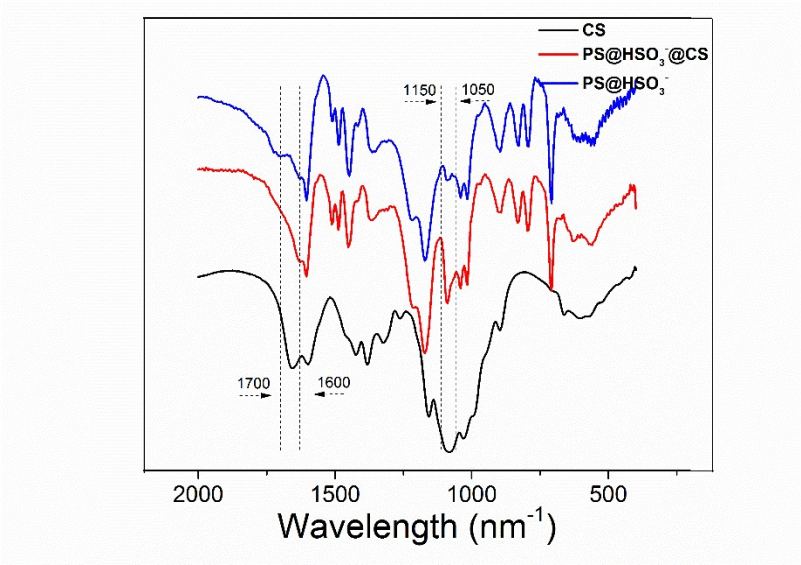

Figure.s1 The FT-IR spectra of sulfonated SPS, SPS@CS and CS.

FT-IR is used to characterize the coating of CS and the result is shown in Figure.s1. The infrared spectra of SPS@CS shows the characteristic of primary amino groups at 1700-1600cm^{-1} and hydroxyl groups at 1150-1050cm^{-1} on the CS which proves that CS has successfully loaded on the surface of the microbeads.

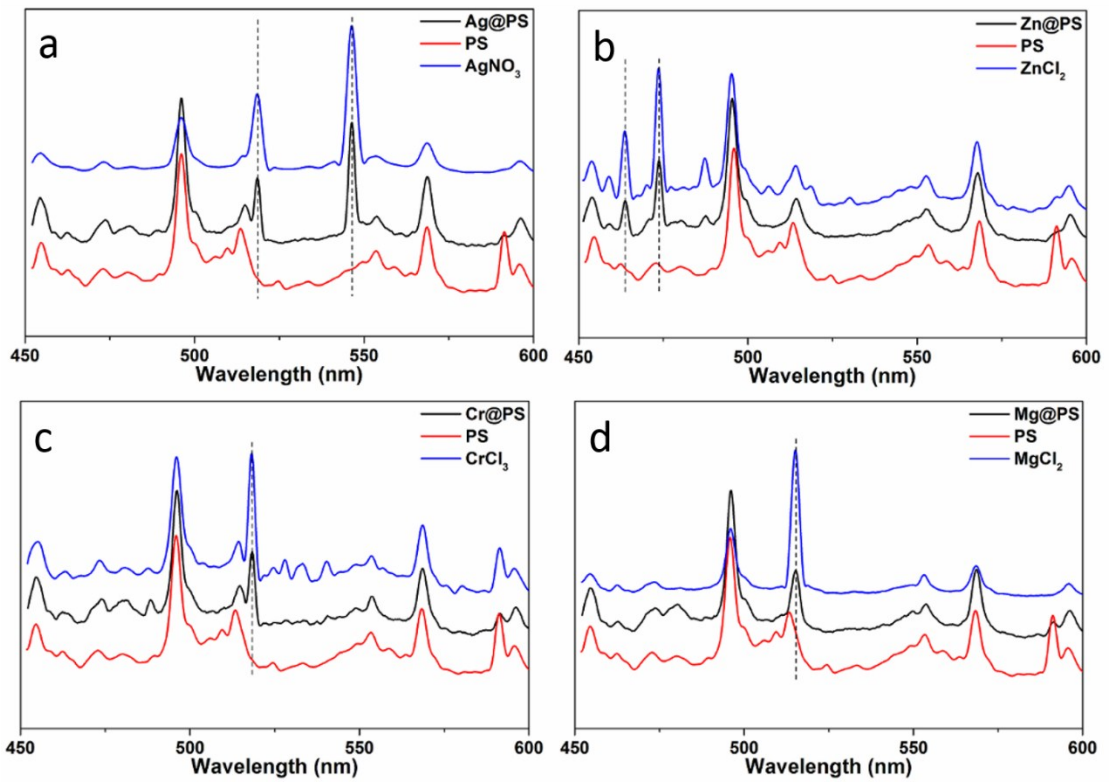

Figure.s2 LIBs of bare microbeads, pure metal ion compounds and ions encoded microbeads.

In Figure.s2, the blue solid lines represent the LIBs from pure metal ion compounds, the red solid lines represent the LIBs from bare microbeads and the black solid lines represent the LIBs from ions encoded microbeads. Obviously, the bare microbeads show no characteristic peaks of metal

ions. And through compare with pure metal ion compounds, it can easily come to the conclusion that by taking advantages of chelation function, metal ions can successfully assembled on the surface of microbeads to show characteristic peaks of metal ions.

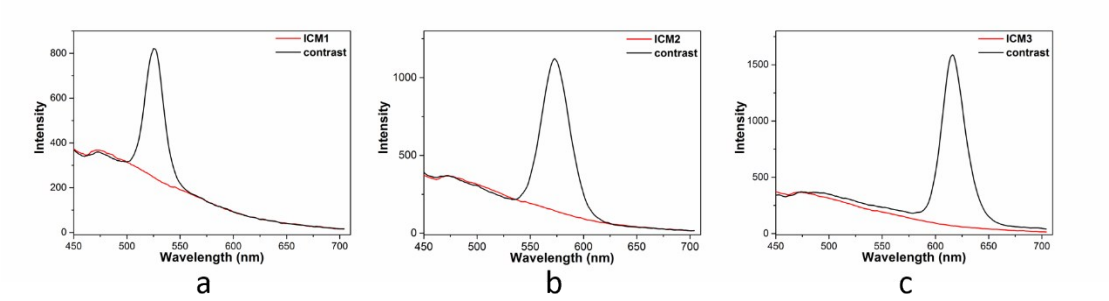

Figure.s3 Fluorescence spectra of three initial ICMs and ICMs after binding with QDs-labeled molecules.

As shown in Figure.s3, the red lines represent initial fluorescence spectra of three ICMs and black lines represent fluorescence signals of ICMs after binding with QDs-labeled molecules. The original microbeads have relatively high background noise in the range of 450-500 nm, but the noise signal is weak and has no obvious peak value compared with the fluorescence report signal, so it will not interfere with the detection results. Besides, with the enhancement of report fluorescence, the influence of background noise becomes weaker. So it is reasonable to claim that our ICMs have no fluorescence emissions which will improve the multiplexing performance of our ICMs.