Supplementary materials

TiO_2-Based Bioprobe Enabling Excellent SERS Activity in Detection of Diverse Circulating Tumor Cells

Yanping Xu [1,2,3,4†], Jie Lin[2,3*], Xiaoxia Wu[1,2,3], Xiawei Xu[2,3], Dinghu Zhang[1,2,3], Yujiao Xie[2,3], Ting Pan[1], Yiwei He[1,4], Aiguo Wu[2,3*]& Guoliang Shao[1*]

1 Department of Radiology, The Cancer Hospital of the University of Chinese Academy of Sciences (Zhejiang Cancer Hospital), Institute of Basic Medicine and Cancer (IBMC), Chinese Academy of Sciences, Hangzhou, 310022, China.

2 Cixi Institute of Biomedical Engineering, International Cooperation Base of Biomedical Materials Technology and Application, Chinese Academy of Science (CAS) Key Laboratory of Magnetic Materials and Devices and Zhejiang Engineering Research Center for Biomedical Materials, Ningbo Institute of Materials Technology and Engineering, CAS, Ningbo 315201, P.R. China

3 Advanced Energy Science and Technology Guangdong Laboratory, Huizhou 516000, P.R. China.

4 Second clinical college, Zhejiang Chinese Medical University, Hang Zhou 310053, China.

*Corresponding author: (E-mail: linjie@nimte.ac.cn, aiguo@nimte.ac.cn, shaogl@zjcc.org.cn)

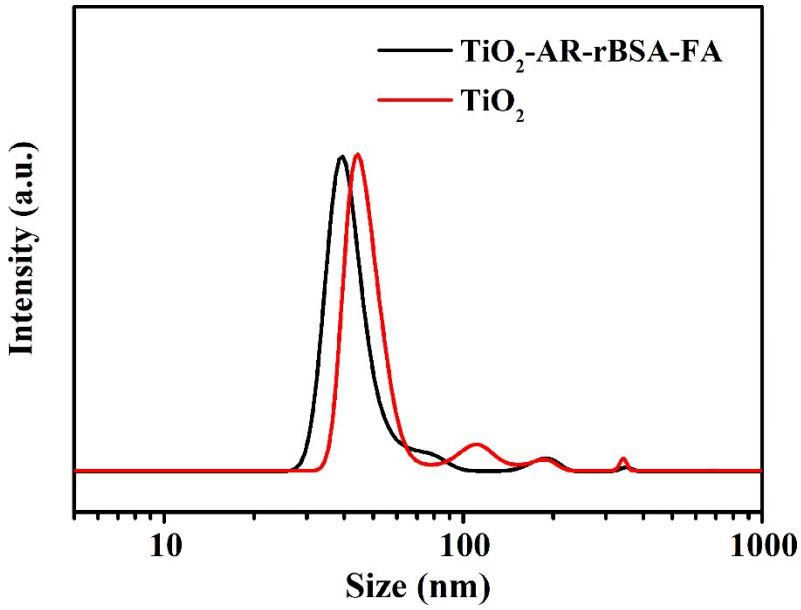

Figure S1. Size distribution of TiO_2-AR-rBSA-FA and TiO_2 NPs.

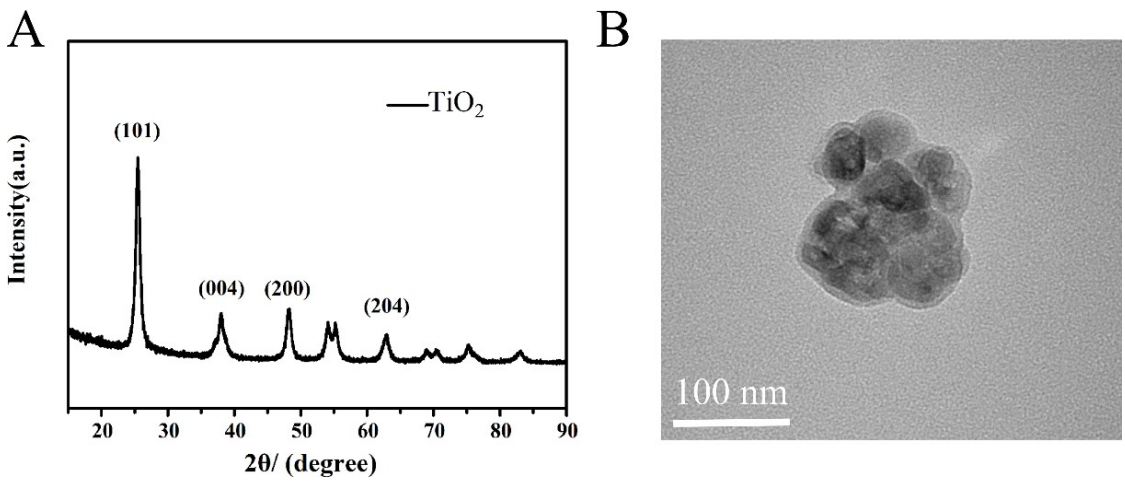

Figure S2. (A) XRD spectrum of TiO_2 NPs and (B) TEM image of TiO_2-AR-rBSA.

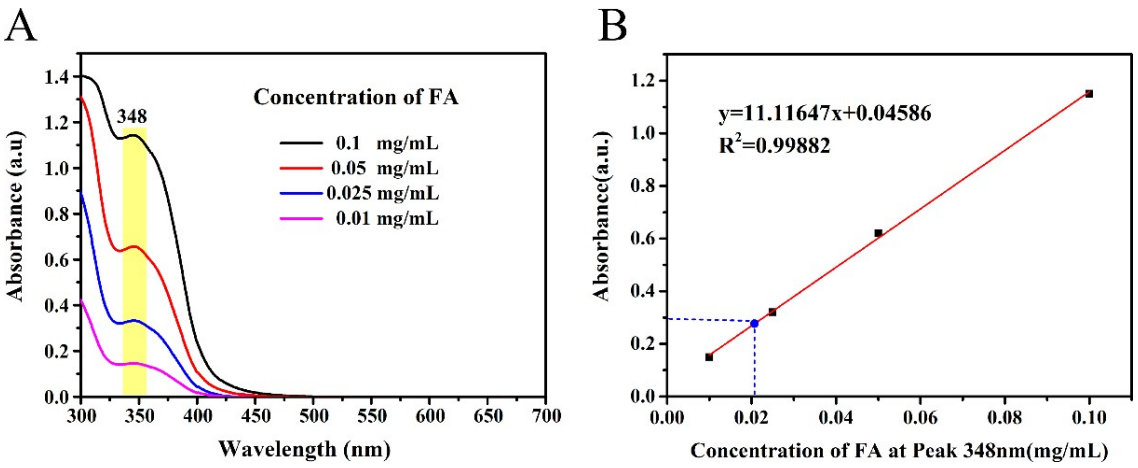

Figure S3.(A) UV-Vis absorption spectra of FA with different concentrations and (B) the relationship between FA concentration and UV-Vis absorbance.

The grafting rate of FA on TiO_2-AR-rBSA-FA can be calculated by mass balance method, as shown in below:

Firstly, the UV-Vis absorbance of activated FA with different concentrations can be measured before binding to the TiO_2-AR-rBSA, as shown in Figure S3A. We can get the relationship between FA concentration and absorbance by standard calibration curve, which is y=11.11647x+0.04586, R^2=0.99882 (Figure S3A).

Secondly, the TiO_2-AR-rBSA-FA can be obtained by centrifugation after activated FA reacted with TiO_2-AR-rBSA for 2 h. Next, the absorption peak at 348 nm of residual FA in supernatant was measured by ultraviolet spectrophotometer, and the content of residual FA was acquired by standard calibration curve.

Finally, the conjugation efficiency (CE%) of FA on TiO_2-AR-rBSA-FA can be calculated according to the following formula:

$$CE\% = \frac{weight\ of\ initial\ FA - weight\ of\ residual\ FA}{weight\ of(\ TiO_2 - AR - rBSA - FA)}$$

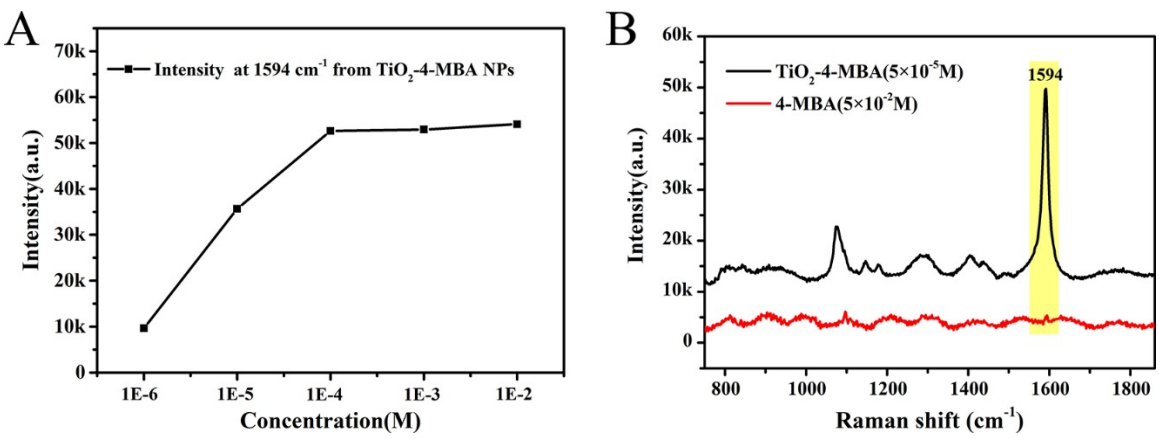

Figure S4. (A) Peak intensity at 1594 cm^{-1} in the TiO_2-4-MBA versus the molecule concentrations of 4-MBA. (B) SERS spectrum of 4-MBA molecule (5×10^{-5} M) adsorbed on TiO_2 NPs and pure SERS signal of 4-MBA molecules (5×10^{-2} M).

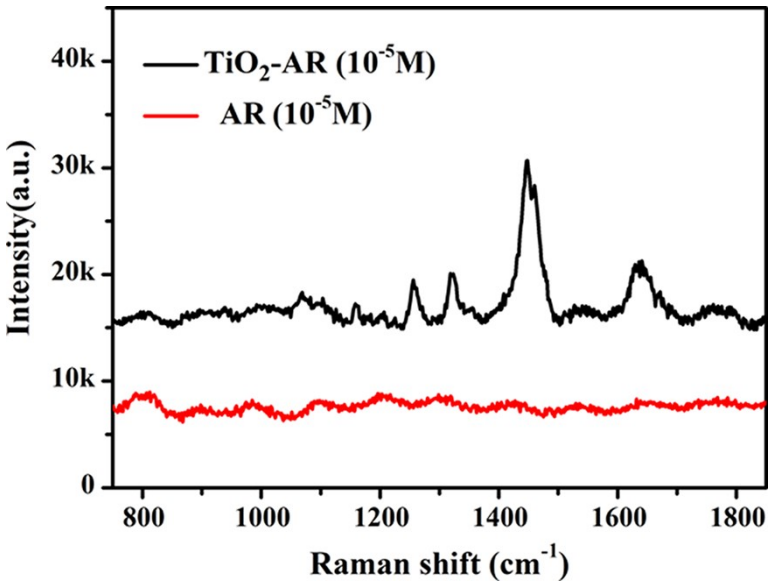

Figure S5. SERS spectra of TiO_2-AR and AR, the concentration of AR is 10^{-5}M.

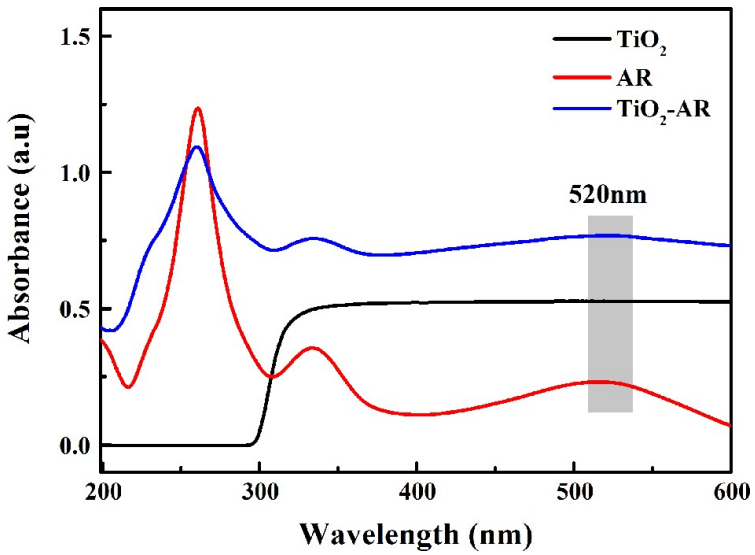

Figure S6. UV-Vis spectroscopy of TiO_2, AR and TiO_2-AR, respectively.

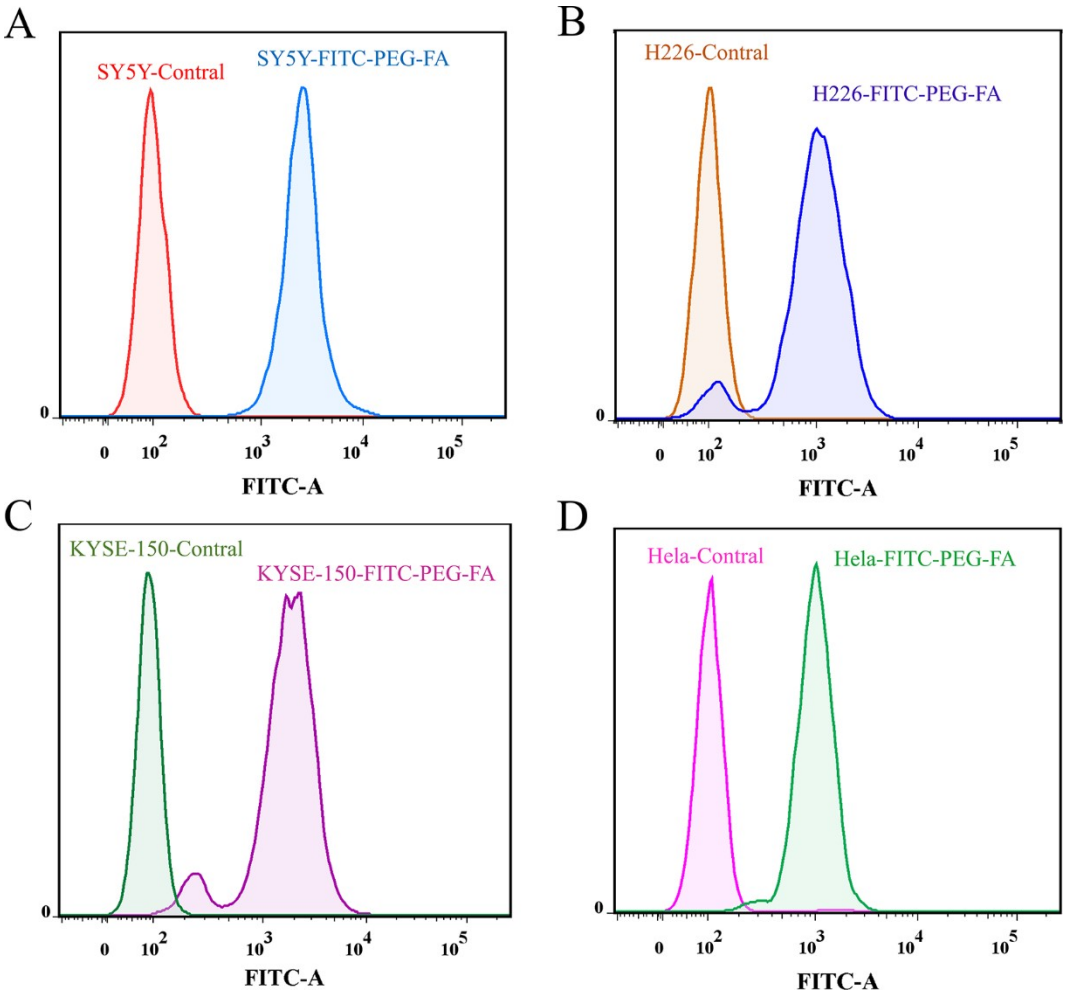

Figure S7. FCS analysis of (A)SY5Y, (B)H226, (C)KYSE-150 and (D)Hela cells incubated with 20 uL FA-PEG-FITC, respectively.