

Electronic Supplementary Information for

**Aptamer aided plasmonic nano-urchin for reporter free surface-enhanced Raman spectroscopy analysis of cortisol**

Chengyu Li,<sup>a</sup> Jing Hu,<sup>b</sup> Nan Hu,<sup>a</sup> Jianjun Zhao,<sup>a</sup> Qianwen Li,<sup>a</sup> Yanhui Han,<sup>a</sup> Yanxiong Liu,<sup>a</sup> Xufang Hu, <sup>\*a</sup> Liyan Zheng,<sup>\*a</sup> Qiue Cao,<sup>\*a</sup>

<sup>a</sup> School of Chemical Science and Technology, National Demonstration Center for Experimental Chemistry and Chemical Engineering Education, Yunnan University, Kunming, Yunnan 650091, P. R. China

<sup>b</sup> Clinical Psychology Department, Zhongshan Third People's Hospital, Zhongshan, Guangdong 528451, P. R. China

**\*Corresponding Authors.**

E-mail addresses: huxufang@ynu.edu.cn (Xufang Hu), zhengliyan@ynu.edu.cn (Liyan Zheng), qecao@ynu.edu.cn, (Qiue Cao)

## **1. Supplementary experimental and ethical approval**

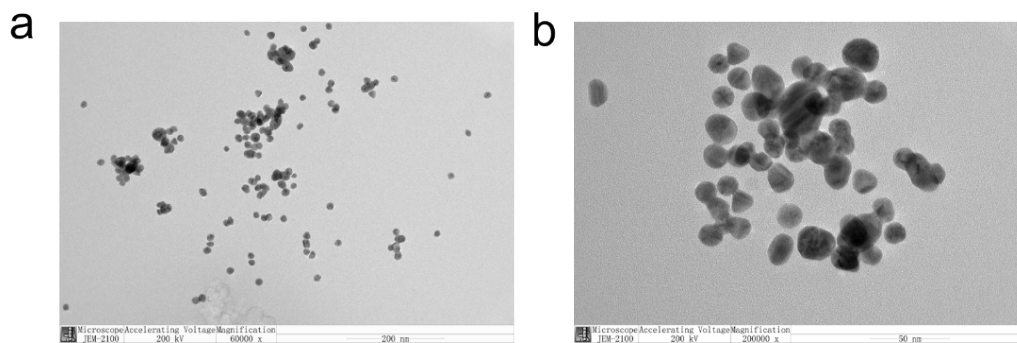
### **1.1. Characterization methods**

Transmission electron microscopy (TEM) imaging was performed on a JEM 2100 (JOEL, Japan). Fourier transform infrared (FT-IR) spectra were generated on a Nicolet iS 10 Fourier spectrophotometer (USA). Zeta potential was measured by a Nano ZS90 Zeta analyzer. Ultraviolet–visible (UV–vis) absorption spectra were tested with a UV-2700 UV-Vis spectrophotometer (Shimadzu, Japan).

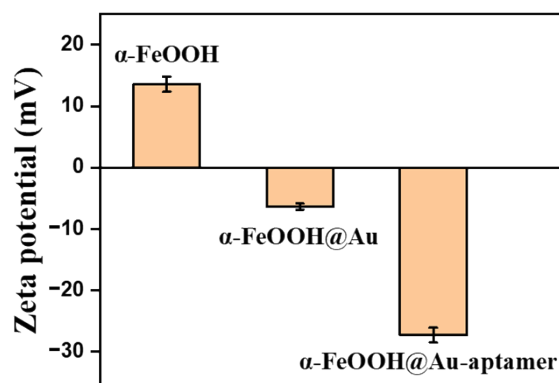
### **1.2. Ethical approval**

Bio-fluids of serum and urine samples were donated by healthy volunteers in Zhongshan Third People's Hospital. All the experimental protocols involved in this work were approved by the committees on human subject research and ethics of the Zhongshan Third People's Hospital and Yunnan University. In accordance with the Helsinki Declaration, written informed consents were offered by all participants to ascertain their participation in the study and approve the utilization of their biological samples for analysis.

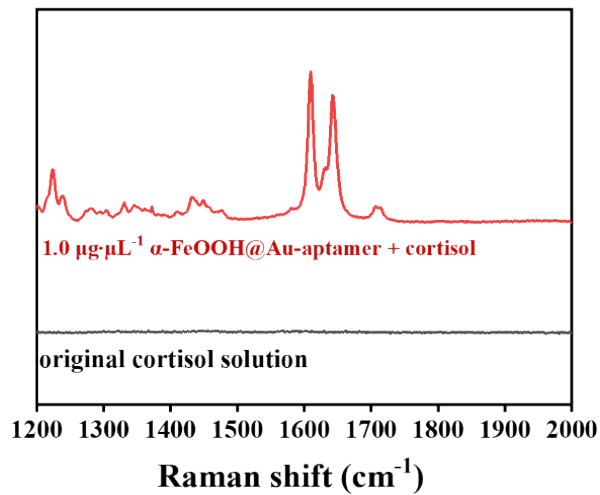
## 2. Supplementary Figures



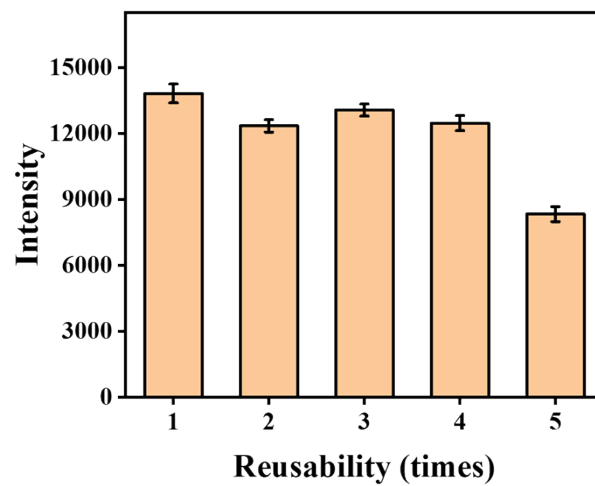
**Fig. S1.** TEM images of the Au plasma.



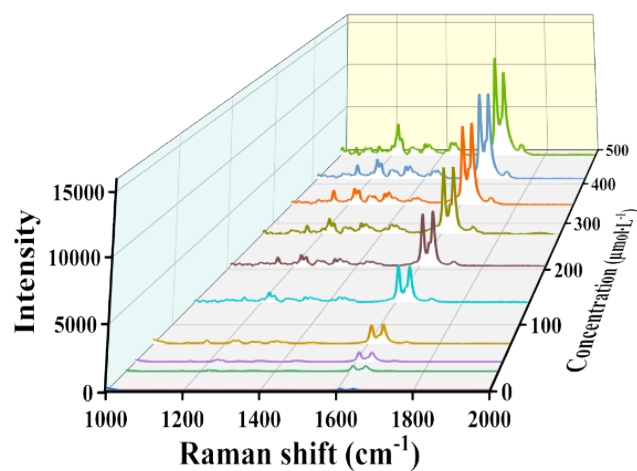
**Fig. S2** Zeta potentials of  $\alpha$ -FeOOH,  $\alpha$ -FeOOH@Au and  $\alpha$ -FeOOH@Au-aptamer. The error bars were calculated as the relative standard deviation of three measurements.



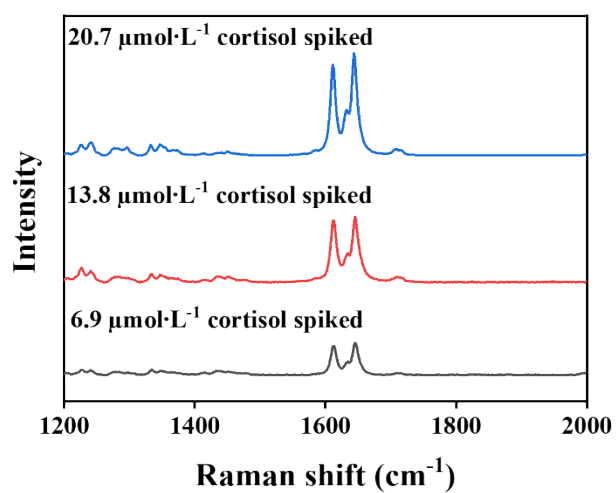
**Fig. S3** Raman spectra of cortisol solution ( $276.0 \mu\text{mol}\cdot\text{L}^{-1}$ ) being directly dropped onto a silicon wafer for Raman analysis and treating with the  $\alpha\text{-FeOOH@Au-aptamer}$  based SERS protocol.



**Fig. S4** SERS spectral intensities of cortisol analyzed by the same  $\alpha\text{-FeOOH@Au-aptamer}$  nanomaterials under different circles. (The peak at  $1645 \text{ cm}^{-1}$  was taken as representative.)



**Fig. S5** Raman spectra of cortisol standard solutions with various concentrations analyzed by  $\alpha$ -FeOOH@Au-aptamer.



**Fig. S6** Raman spectra of cortisol captured and analyzed by  $\alpha$ -FeOOH@Au-aptamer from different cortisol spiked urine.