Supporting Information

Plasmonic Nanograting Enhanced Fluorescence for Protein Microarray Analysis of Carcinoembryonic antigen (CEA)

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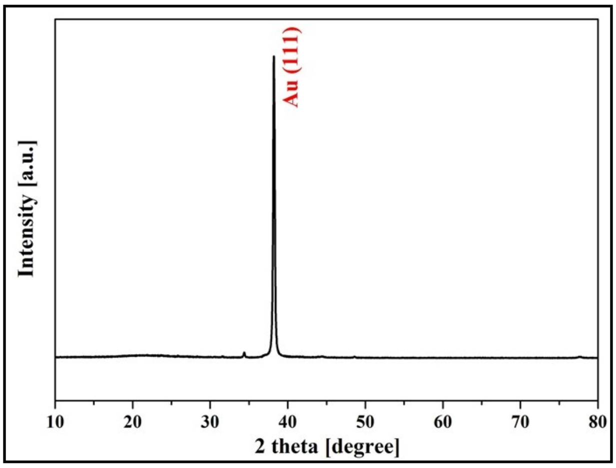

Figure S1 The XRD pattern of the SiO_2 gratings after coating with multilayer films.

Characterization of Cr and SiO_2 thin layer

We can obtain the Cr thickness by controlling the sputtering parameters evaluate it by using the Kretschmann configuration based prism coupled-SPR measurement.

Surface plasmon resonance is the resonant oscillation of conduction electrons at the interface between negative and positive permittivity material stimulated by incident light. SPR is the basis of many standard tools for measuring adsorption of material onto planar metal surfaces or onto the surface of metal nanoparticles. We have prepared another layer system and demonstrated the existence of Cr and SiO_2 through the prism coupled-SPR measurement before coating with metal layers on the quartz grating. The SPR data could demonstrate the existence of Cr and SiO_2. Then we used the same experimental condition to construct the plasmonic Au nanograting.

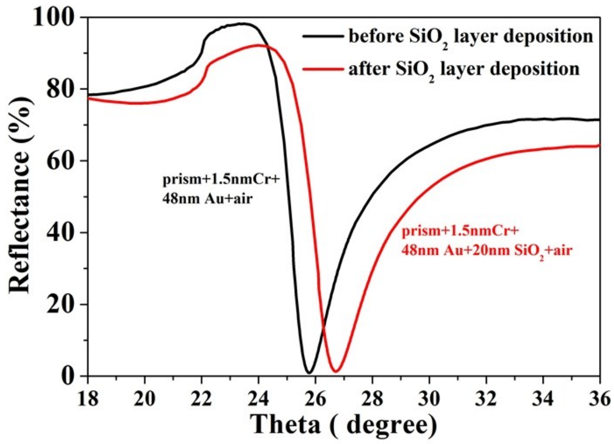

Figure S2 The prism coupled-SPR curves characterize of the existence of Cr and SiO_2.

layer system (prism+1.5nm Cr+48nm Au+air)			
L-Nr	Thick/[nm]	Epsx-real	Epsx-imag
1	0	3.4043	0
2	1.48	-5.4129	19.0569
3	45.41	-11.428	1.3203
4	0	1	0

layer system (prism+1.5nm Cr+48nm Au+20nm SiO_2+air)			
L-Nr	Thick/[nm]	Epsx-real	Epsx-imag
1	0	3.4043	0
2	1.48	-5.4129	19.0569
3	45.41	-11.428	1.3203
4	19.97	1.7311	0
5	0	1	0

Table S1 The layer systems of characterize of the existence of Cr and SiO_2.

The calculation of the SPR angle

The wave vector of the incident light in air: $k = \frac{\varpi}{c} = \frac{2\pi}{\lambda}$, c is the speed of light, λ is the wavelength of the incident light.

The wave vector of the interface between the plasmonic nanograting and the PBS solution: $\beta_{sp} = k\sqrt{\frac{\varepsilon_m \varepsilon_0}{\varepsilon_m + \varepsilon_0}}$, ε_m and ε_0 are the dielectric constants for metal and dielectric.

The wave vector of the grating surface: $\beta_{\Lambda} = k\sqrt{\varepsilon_0}\sin\theta + K$, K is the vector of the grating structure, $K = \frac{2\pi}{\Lambda}$, Λ is the grating pitch.

When the surface plasmon resonance happens: $\beta_{sp} = \beta_{\Lambda}$

In conclusion, $\frac{\Lambda}{\lambda} = \frac{1}{\sqrt{\frac{\varepsilon_m \varepsilon_0}{\varepsilon_m + \varepsilon_0}} - \sqrt{\varepsilon_0}\sin\theta}$

For the plasmonic gold nanograting, ε_m= -12.3+1.29i, ε_0=1 (plasmonic nanograting in air); ε_0=1.77 (plasmonic nanograting in PBS solution)

In this work, the grating pitch Λ =400 nm, the incident light wavelength λ=633 nm.

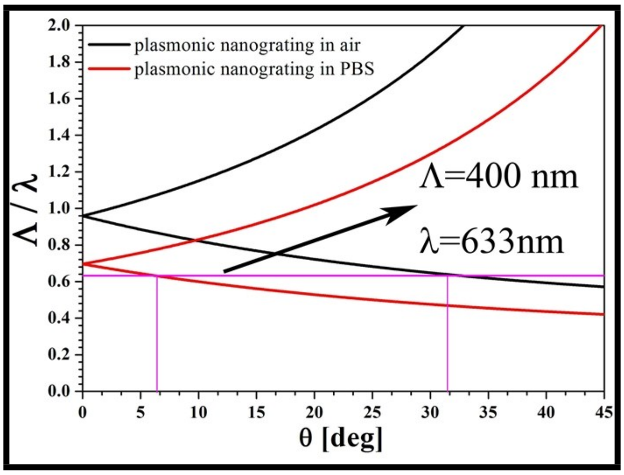

Figure S3 The calculated results of grating pitch Λ and the wavelength of the incident light λ varies with the incident angle θ.