Electronic Supplementary Material (ESI) for CrystEngComm.

Electronic Supplementary Information

Large-area $Co(OH)_2$ Nanoflower Array Films Decorated with Ag Nanoparticles as Sensitive SERS Substrates

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Part I：Figure S1 to S8

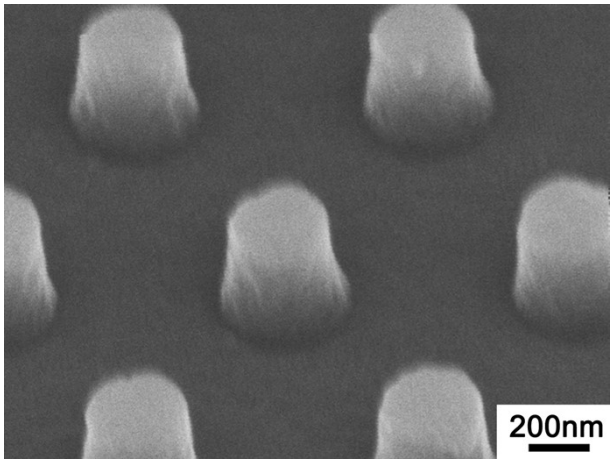

Fig. S1 SEM images of PAN nanopillar

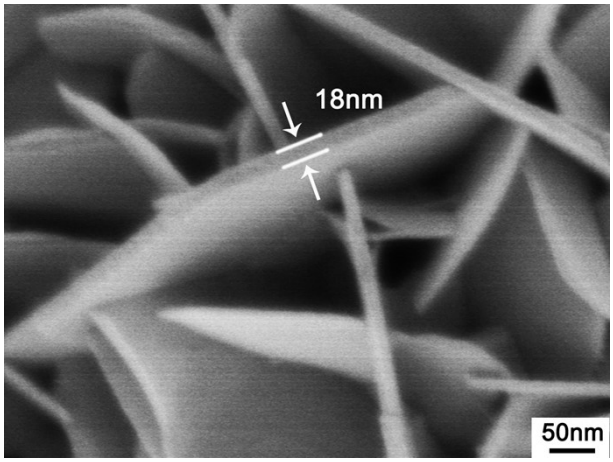

Fig. S2 $Co(OH)_2$ nanosheets synthesized with deposition current of 0.75 mA/cm^2 for 6 min.

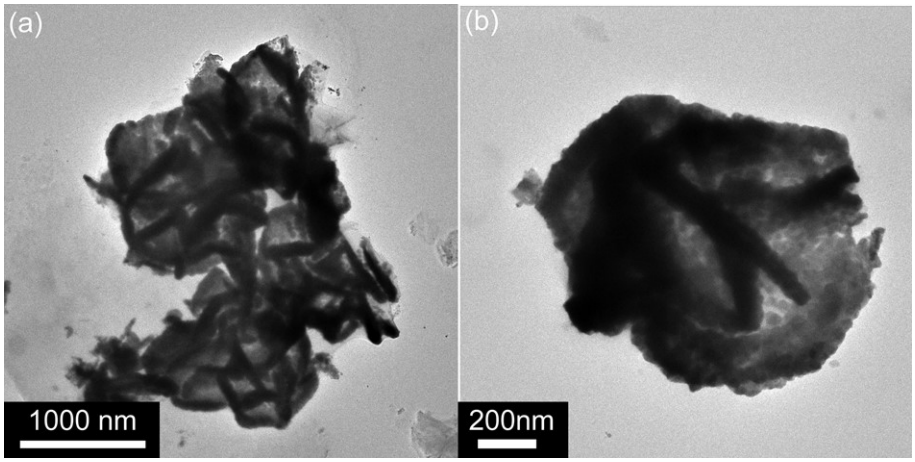

Fig. S3 (a-b) TEM image of $Ag@Co(OH)_2$ nanoflowers broken off from the $Ag@Co(OH)_2$ nanoflower arrays shown in Fig. 3e.

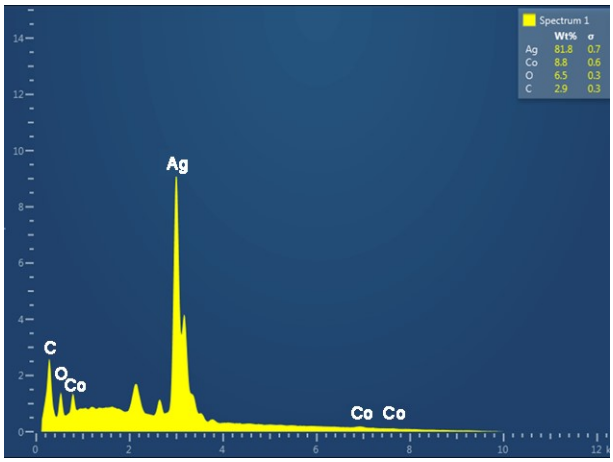

Fig. S4 EDS spectrum of $Ag@Co(OH)_2$ nanoflower arrays shown in Fig. 3e.

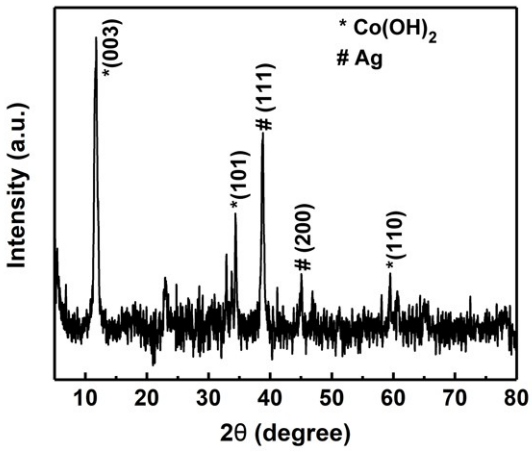

Fig. S5 XRD of Ag@$Co(OH)_2$ nanoflower arrays shown in Fig. 3e.

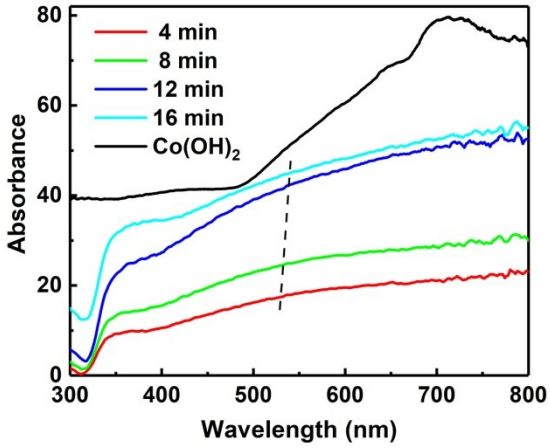

Fig. S6 UV-vis spectra of Ag@$Co(OH)_2$ nanoflower arrays prepared with different Ag-sputtering durations.

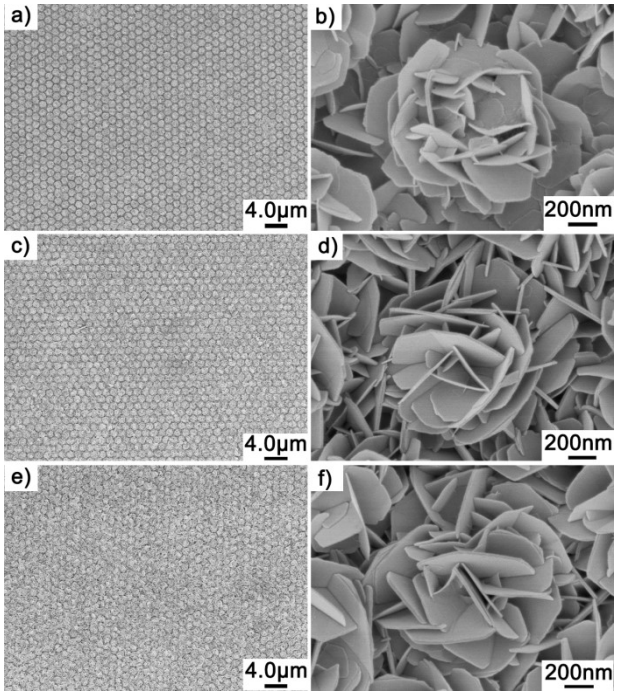

Fig. S7 (a-c) SEM images of $Co(OH)_2$ nanoflower arrays prepared under different deposition currents for 9 min: (a-b) 0.5 mA/cm^2, (c-d) 0.75 mA/cm^2, (e-f) 1.0 mA/cm^2.

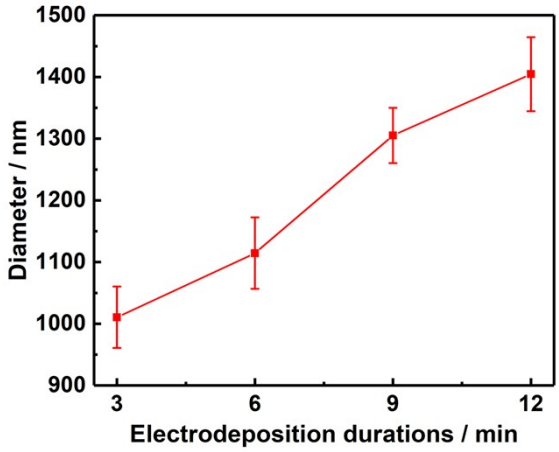

Fig. S8 Diameter of $Co(OH)_2$ nanoflowers obtained at different deposition durations (3-12 min). The error bars were obtained based on 40 independent measurements.

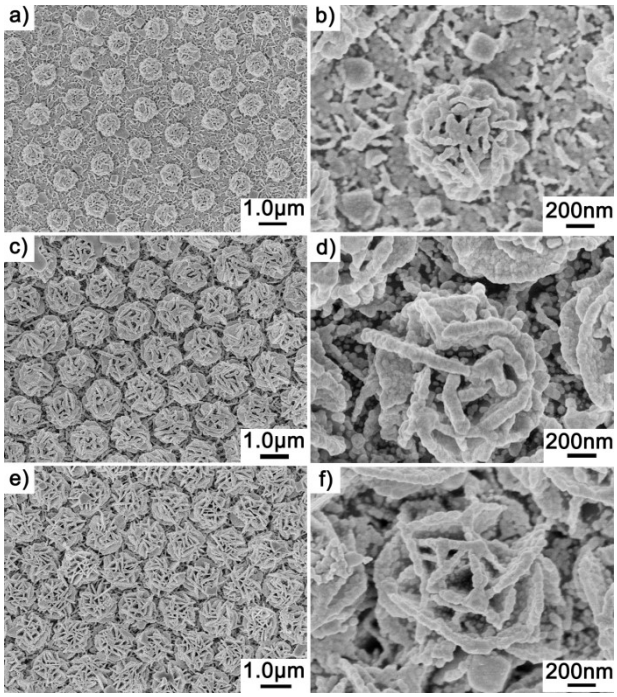

Fig. S9 SEM images of Ag NPs sputtered on corresponding $Co(OH)_2$ nanoflower arrays shown in Fig. S7. The Ag-sputtering duration was set as 12 min.

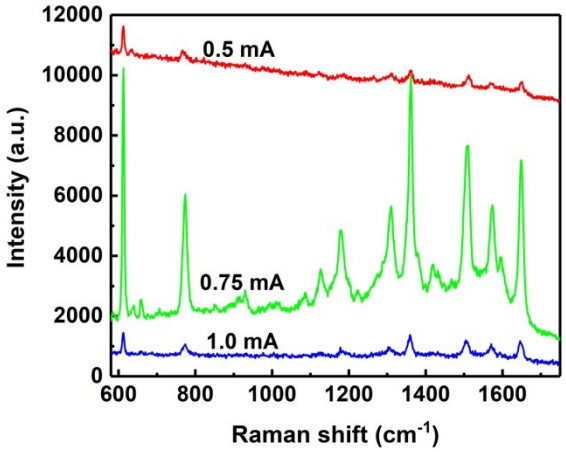

Fig. S10 SERS spectra of 10^{-7} M R6G collected on Ag NPs sputtered on $Co(OH)_2$ nanoflower

arrays shown in Fig. S9.

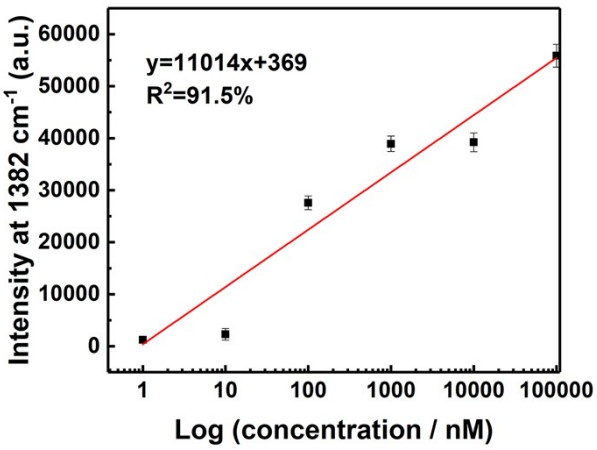

Fig. S11 The linear relationship between the concentration of the thiram molecules and the SERS intensity at 1382 cm^{-1}. The error bars were obtained based on five independent measurements.

Part S2: Estimation of enhancement factor

The enhancement factor is calculated to verify the sensitivity of the substrate. The peak at 1078 cm^{-1} (for 4-ATP molecules) was used to estimate the enhancement factor (EF). The EF can be calculated by the following equation:

$$EF = (I_{SERS} / I_{Ref}) \cdot (N_{Ref} / N_{SERS})$$

Where I_{SERS} and I_{Ref} represent the SERS intensity of 1 μL 10^{-9} M 4-ATP alcoholic solution dispersed on 25 mm^2 substrates and 1 μL 10^{-3} M 4-ATP ethanol solution on 28 mm^2 Si wafer, respectively; N_{SERS} and N_{Ref} represent the number of 4-ATP molecules exposed to the laser on the Ag@$Co(OH)_2$ substrates and Si wafer during the SERS measurement. Herein, a certain concentration (C_{SERS}) and volume (V_{SERS}) 4-ATP ethanol solution was dispersed to an area of S_{SERS} at the Ag@$Co(OH)_2$ substrates. For non-SERS Raman spectra, a certain volume (V_{Ref}) and concentration (C_{Ref}) 4-ATP ethanol solution was dispersed to an area of S_{Ref} at Si substrate. Both the substrates were dried in the air. Then the foregoing equation becomes:

$$EF = (I_{SERS} / I_{Ref}) \cdot (C_{Ref}V_{Ref}) / (C_{SERS}V_{SERS}) \cdot (S_{SERS} / S_{Ref})$$

According to the calculation, average enhancement factor for the band at 1078 cm^{-1} is about 1.77×10^7.

Figure for estimation of enhancement factor:

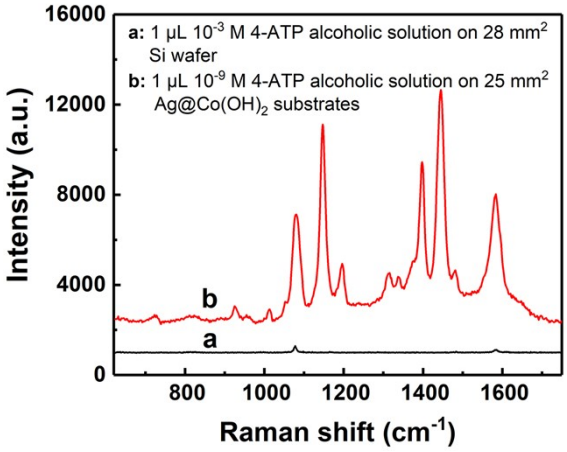

Fig. S10 (a) Raman spectrum of 4-ATP obtained by dispersing 1 μL 10^{-3} M 4-ATP alcoholic solution on 28 mm^2 Si wafer. (b) SERS spectrum of 1 μL 10^{-9} M 4-ATP alcoholic solution dispersed on 25 mm^2 substrates. The exposure time was 60 s.