Electronic Supplementary Material (ESI) for Analyst.

Electronic Supporting Information (ESI)

Liquid–liquid Interfacial self-assembled triangular Ag nanoplates-based high-density and ordered SERS-active arrays for sensitive detection of dibutyl phthalate (DBP) in edible oils

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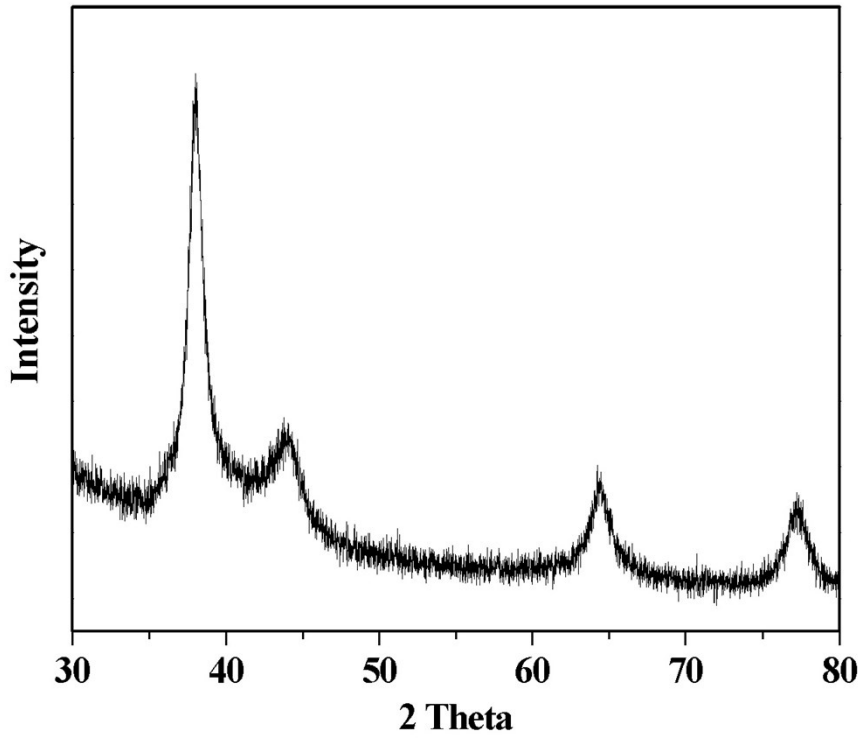

Fig. S1 XRD patterns of the TAgNPs

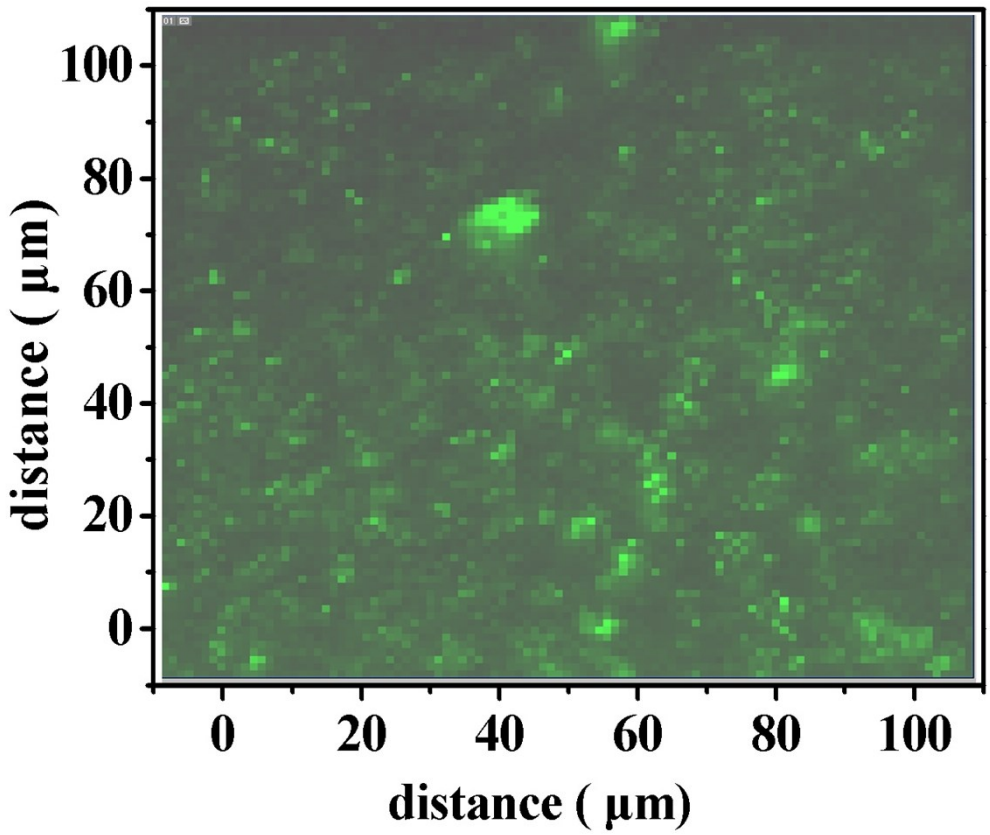

Fig. S2 100 × 100 μm^2 Raman mapping (scanning step: 1μm) of R6G (10^{-5} M) at 1360 cm^{-1} peak, 1 s acquisition time.

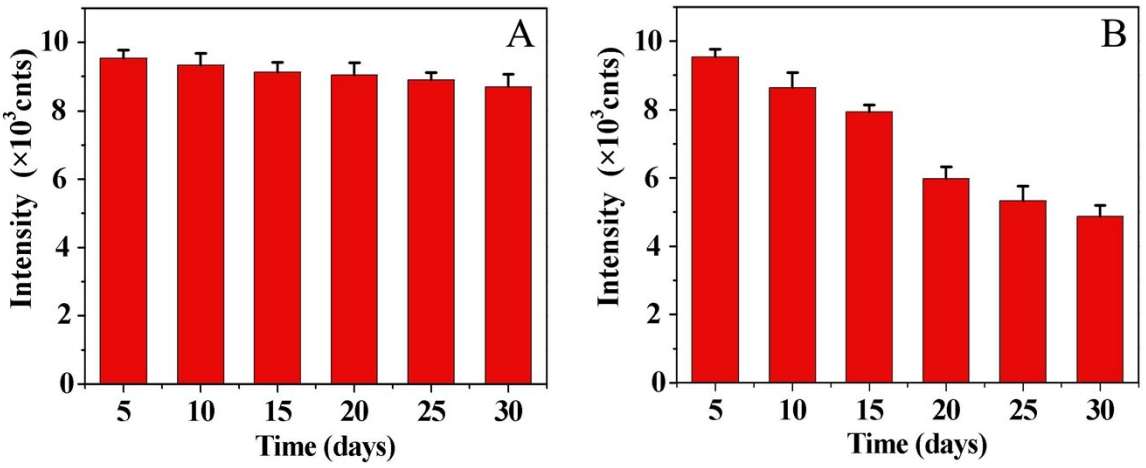

Fig . S3 SERRS intensity at 1360 $cm^{-1}$of R6G (10^{-5} M) on the TAgNPs arrays after TAgNPs was storaged for one month: (A) in the form of TAgNPs colloid and (B) self-assembled TAgNPs arrays.

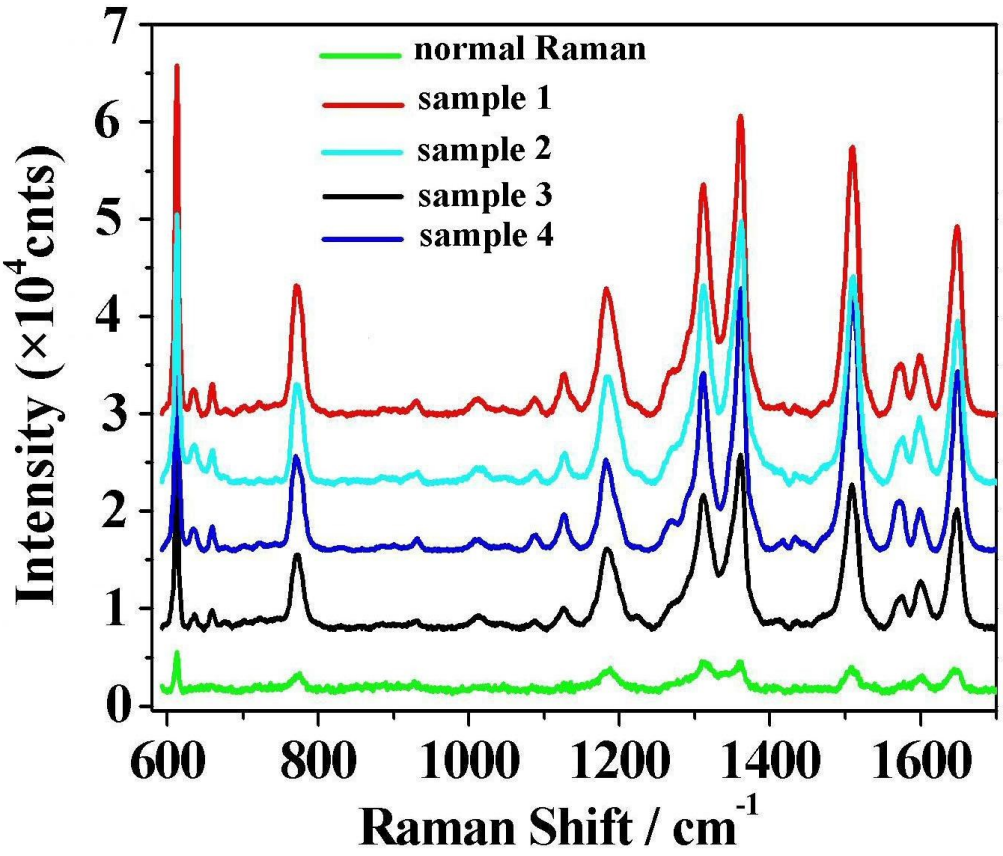

Fig. S4 The normal Raman spectrum (TNRS) and SERRS spectra of R6G (10^{-8} M) of different Ag samples arrays. The normal Raman data were collected using R6G solid. All the Raman spectra were recorded using 532 nm laser light and a collection time of 10 s.

The EF was calculated using the equation:

$$EF = \frac{I_{SERS} / N_{SERS}}{I_{NRS} / N_{NRS}}$$

I_{SERS} and I_{NRS} represent the intensity of the same band of R6G (here, 1360 cm^{-1}) of SERS spectrum and normal Raman spectrum, and N_{SERS} and N_{NRS} represent the corresponding molecules number of SERS spectrum and normal Raman spectrum in the focused incident laser spot.

R6G solid was directly tested to estimate the molecule number illuminated in the normal Raman characterization. The N_{NRS} has been estimated using the following relation:

$$N_{NRS} = Ah\rho N_A / M_W$$

A = Area of the laser spot

h = Confocal depth ~ 1.4 μm for 50× objective lens

ρ = Density of the R6G solid = 0.79 g/cm^{-3} (20℃)

N_A = Avogadro number

M_W = Molecular weight of R6G (479.01 g/mol)

N_{SERS} is calculated using the relation:

$$N_{SERS} = C_{SERS} V N_A A / A'$$

C_{SERS} =Concentration of R6G at SERS measurement = 1.0×10^{-8} M

V = Volume of the R6G solution = 25 μL

N_A = Avogadro number

A = Area of the laser spot

$A^{/}$ = Area of the R6G solution drop on the substrate ~ 1.9×10^{-5} m^2 for 25 μL solution

$N_{NRS} / N_{SERS} \approx 3.1 \times 10^5$

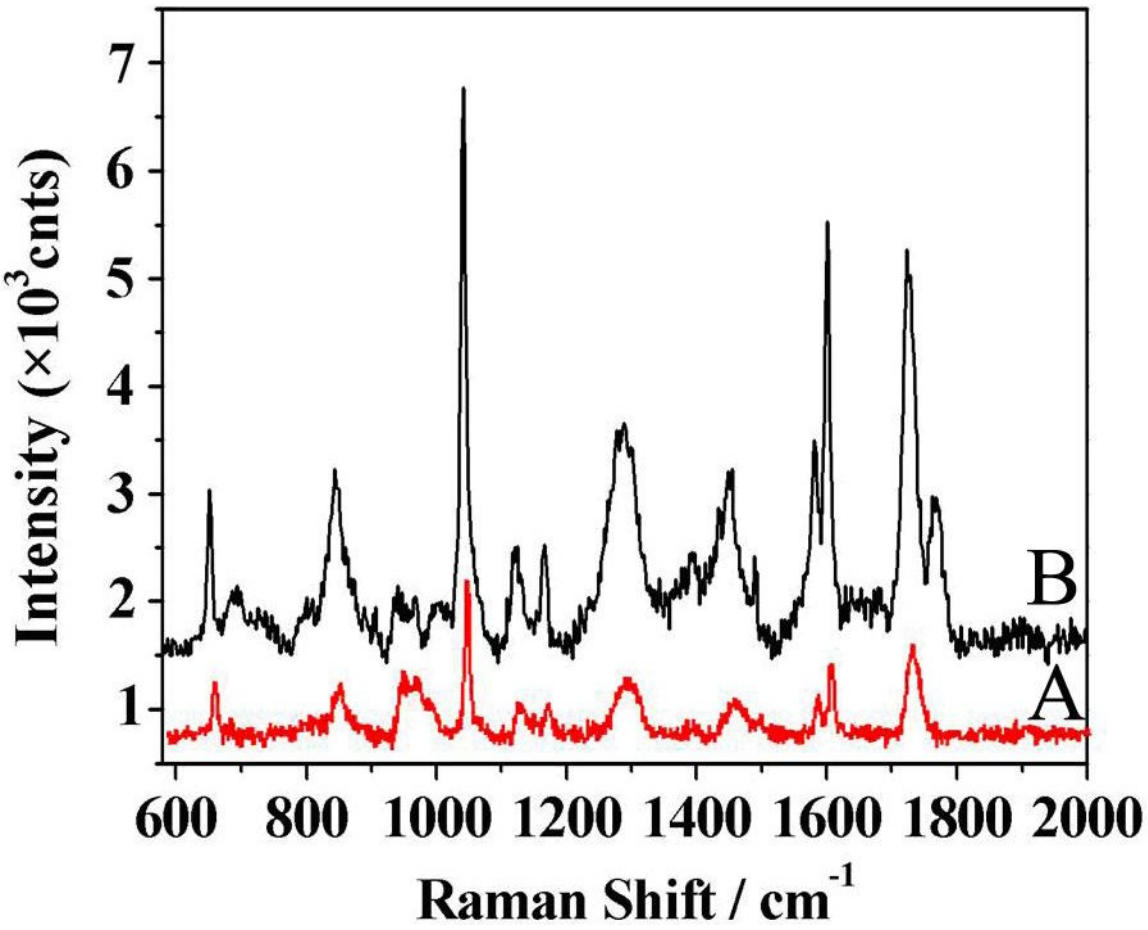

Fig. S5 (A) The normal Raman spectra of DBP. (B) SERS spectra of DBP using the TAgNPs arrays as substrate.

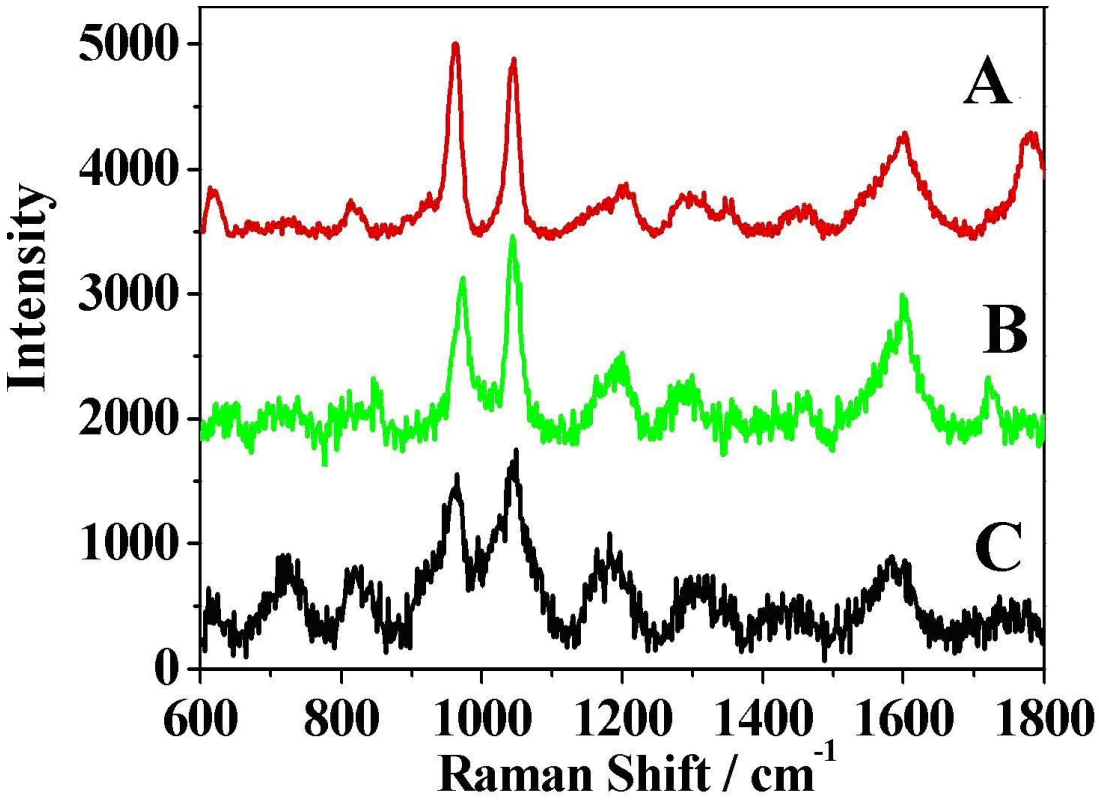

Fig. S6 (A) SERS spectra of DEP (10^{-6} M) on the TAgNPs arrays. (B) SERS spectra of DOP (10^{-6} M) on the TAgNPs arrays. (C) SERS spectra of mixtures of DEP, DOP and DBP on the TAgNPs arrays, each with a concentration of 10^{-6} M.

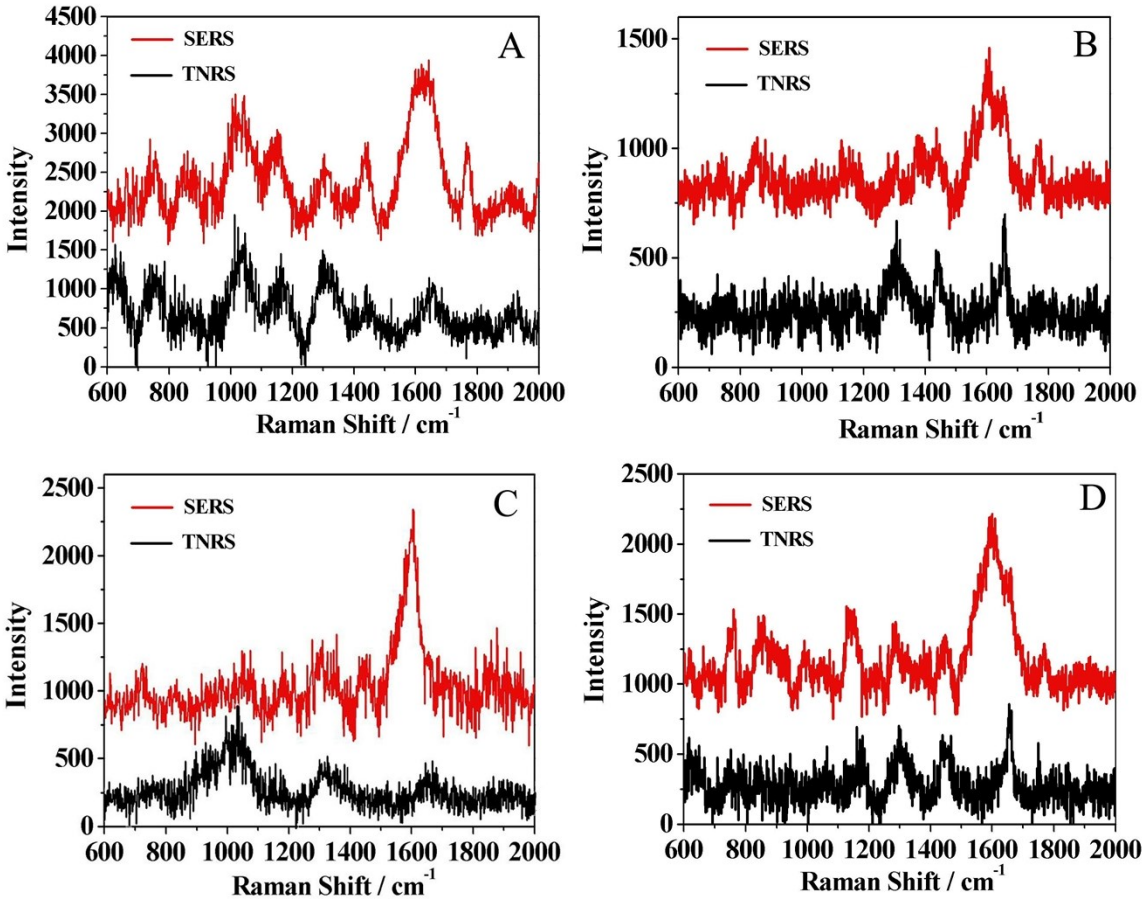

Fig. S7 The normal Raman spectrum (TNRS) and SERS of the (A) bean oil, (B) corn oil, (C) peanut oil and (D) sunflower oil on the TAgNPs arrays.

Table 1 Comparison of conventional methods for DBP detection in edible oils

Method applied	Analytical range	LOD	Ref.
GC-MS	0.01-5.0 μg/mL	0.39 μg /kg	[1]
HPLC	50-1000 ng g^{-1}	8 ng g^{-1}	[2]
GC-MS	0.25-10.0 mg/L	0.05 mg/L	[3]
GC-MS/MS	0.1-0.2 mg Kg^{-1}	149 μg kg^{-1}	[4]
SERS	5×10^{-7} to 5×10^{-5} M	5×10^{-7} M	This work

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