Supporting Information

Ionic liquids-based liposome for selective SERS detection

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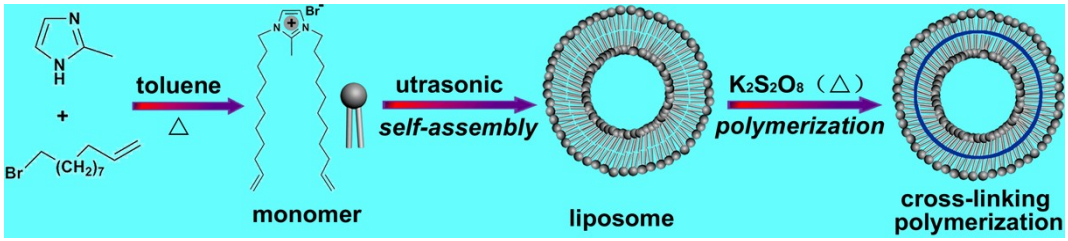
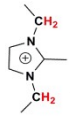
Experimental Details



Scheme S1 Schematic diagram for the synthesis of ternary co-assembled SERS platform.

The ILs-based liposome was prepared according to a previously reported method with some modifications.[1] As shown in Scheme S1, the synthesis process was consisted of two steps. First, the lipid of liposome comprising a hydrophilic imidazolium head and two long hydrophobic alkenyl tails was synthesized, and the vesicle-like liposome was formed through subsequent self-organization under ultrasound. Second, the innate structure of the liposome was reinforced through thermally initiated polymerization of the C=C bonds in the long lipid tails. This effectively 'froze' the unique isotropic structure and vesicular shape, thereby achieving liposome with remarkably physical stability.[2]

The as-prepared lipid was characterized by ^{1}H-NMR spectra in CD_3OD.

^{1}H NMR (CD_3OD, **Fig. S1**): δ=7.46 (s, 2H, ), 5.77-5.62 (ddt, 2H, ), 4.92-4.79 (m, 4H, ), 4.11-3.98 (m, 4H, ), 2.55 (s, 3H, ), 2.00-1.87 (q, ), 1.79-1.66 (d, ), 1.37-1.31 ppm (d, ).

The elemental analysis of the as-prepared liposome was characterized by EDS (%) for C 77.5, N 20.4, Br 2.1 (**Fig. S2**).

A series of structural characterizations of the related liposome materials were carried out: DLS (**Fig. S3**), UV-Vis (**Fig. S5**), FT-IR (**Fig. S6**) and XPS (**Fig. S7**).

Figures

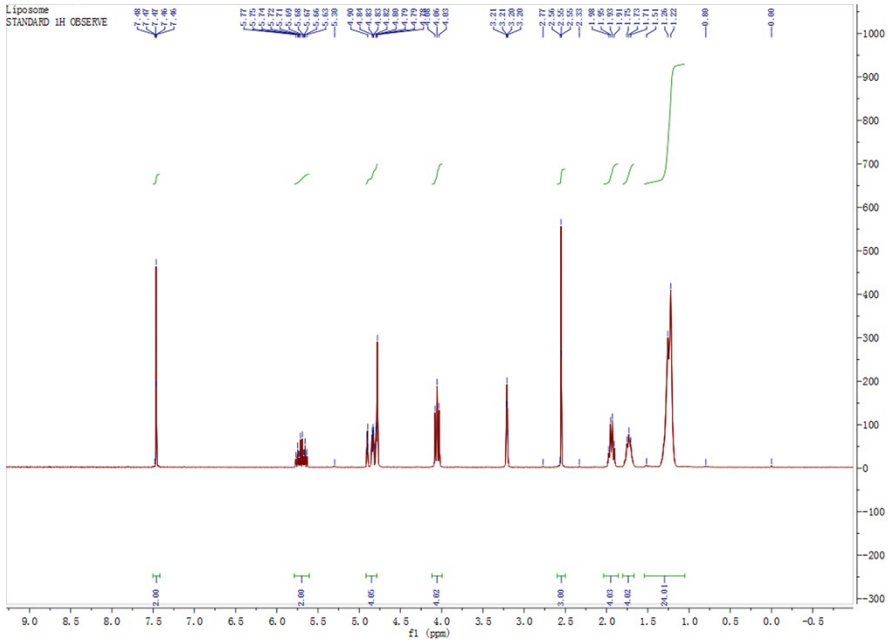


Fig. S1 ^{1}H-NMR spectra of the lipid of ILs-based liposome in CD_3OD.

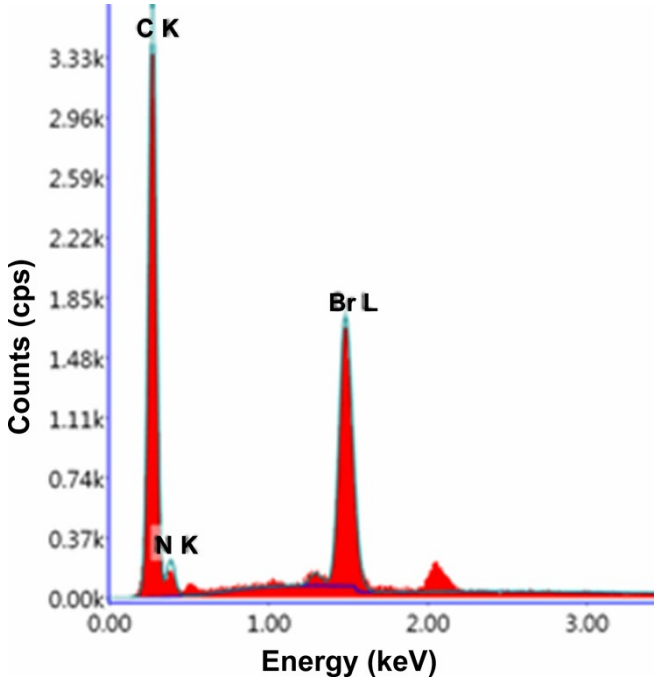


Fig. S2 EDS analysis of the ILs-based liposome.

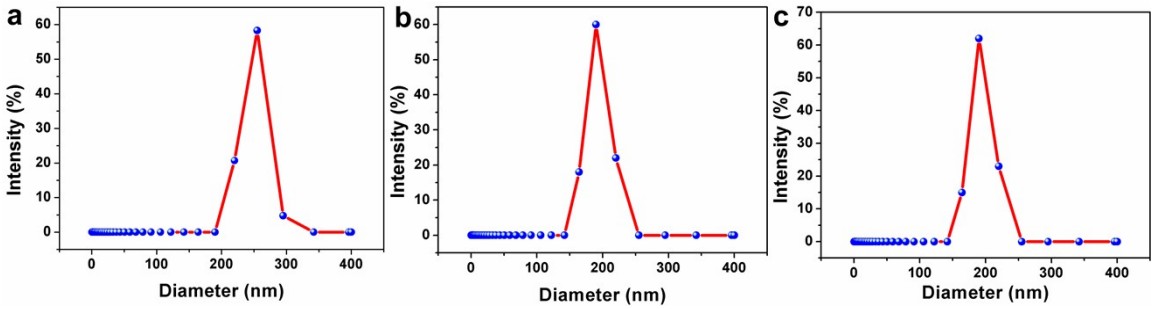


Fig. S3 Dynamic light scattering (DLS) data of liposome (a), polymerized liposome (b) and liposome@Au NPs (c) dispersed in aqueous solution.

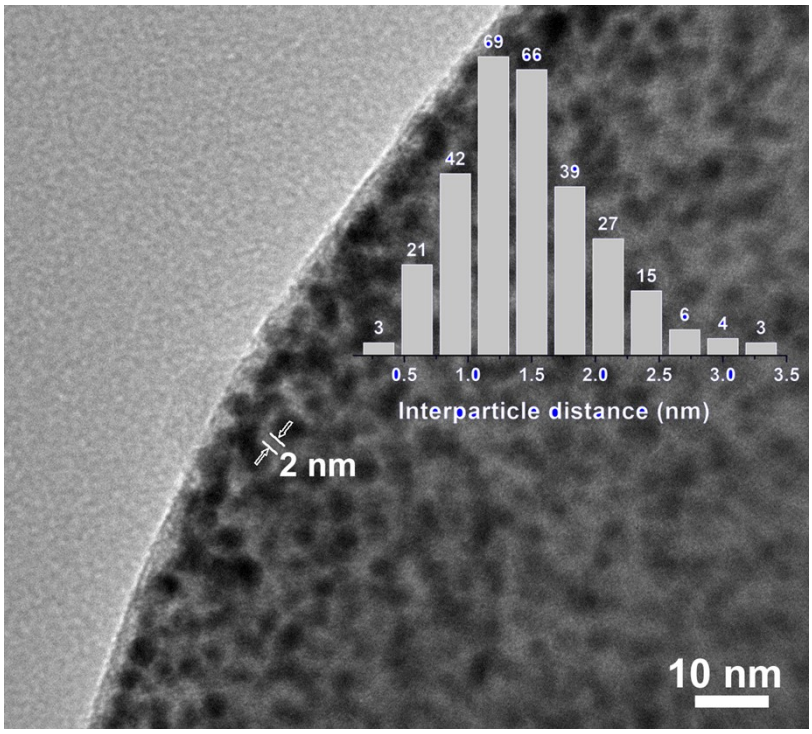


Fig. S4 Interparticle distance of liposome@Au NPs.

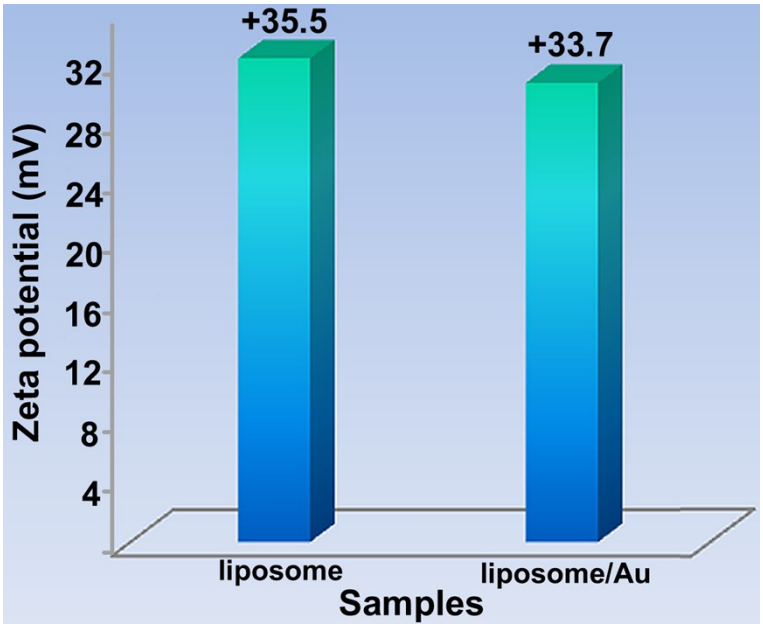


Fig. S5 Zeta potential of liposome and liposome@Au NPs.

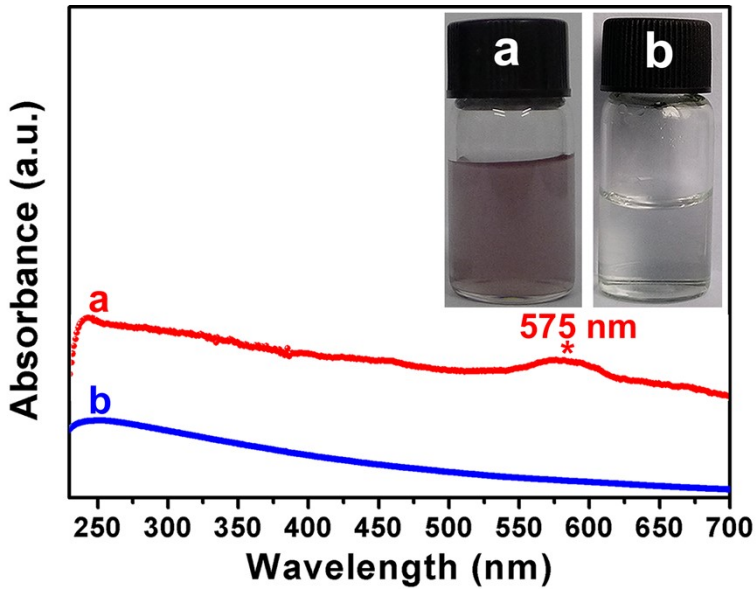


Fig. S6 UV-Vis spectra of liposome@Au NPs (a) and polymerized liposome (b). Inset: Digital photos of liposome@Au NPs (a) and polymerized liposome (b) in aqueous dispersion.

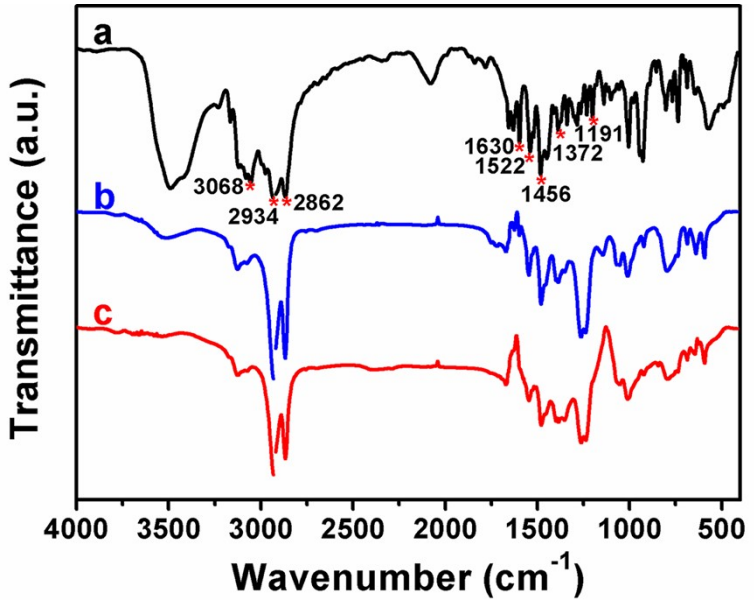


Fig. S7 FT-IR spectra of liposome (a), polymerized liposome (b) and liposome@Au NPs (c).

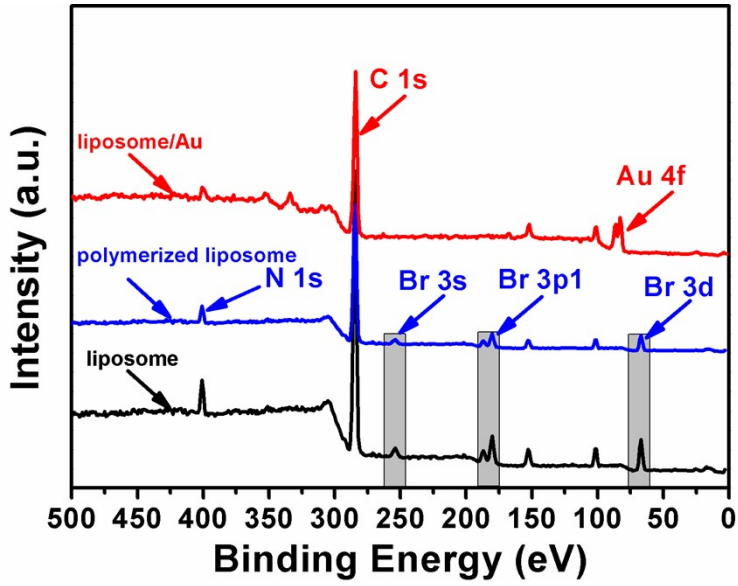


Fig. S8 XPS spectra of liposome, polymerized liposome and liposome@Au NPs.

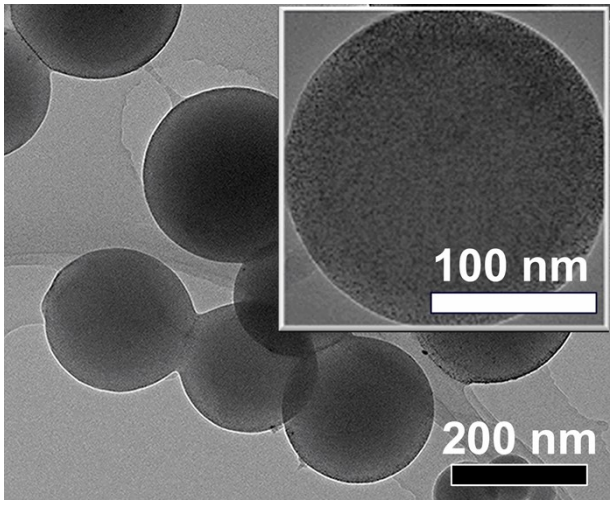


Fig. S9 TEM image of liposome@Au NPs/EBA.

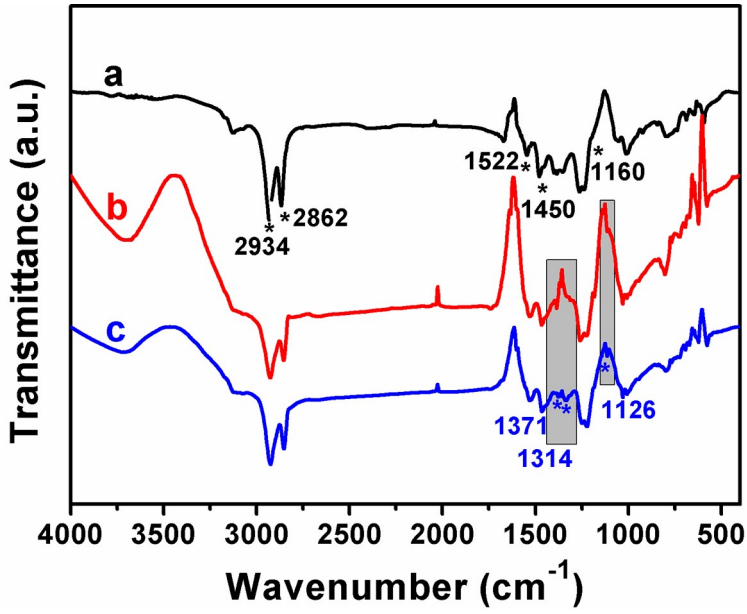


Fig. S10 FT-IR spectra of liposome@Au NPs (a), liposome/MO (b) and liposome@Au NPs/MO (c).

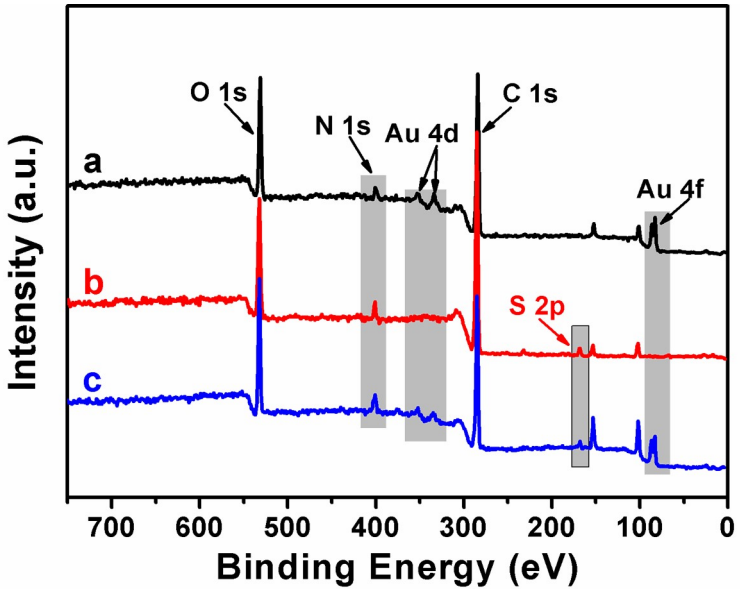


Fig. S11 XPS spectra of liposome@Au NPs (a), liposome/MO (b) and liposome@Au NPs/MO (c).

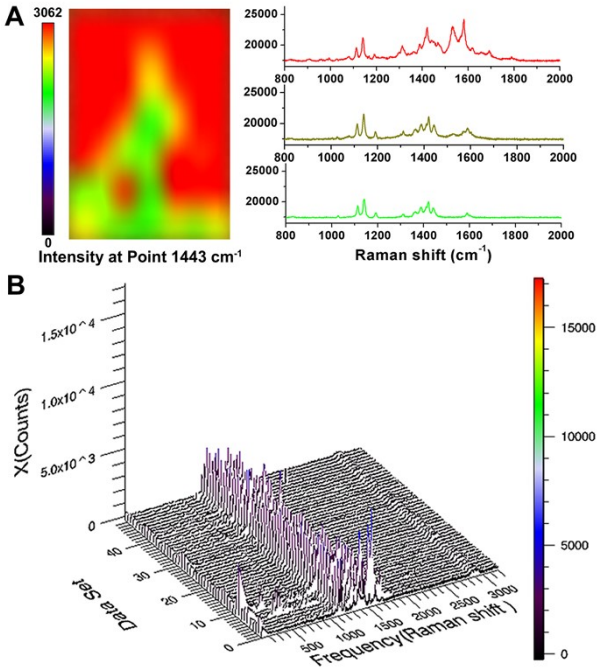


Fig. S12 Mapping image of the peak position at 1443 cm^{-1} obtained using Wire 4.0 software and different colors indicate the distribution of 1443 cm^{-1} peak intensity (A). 3D representation of Raman spectral mapping of polymerized liposome@Au NPs/MO after baseline correction (Data set corresponds to the Raman spectral data number; the upright axis indicates the Raman intensity) (B).

Conditions: concentration of target molecule: 1.0×10^{-6} M; excitation wavelength: 633 nm; power: 1.7 mW; Lens: 50× objective; acquisition time: 10 s.

References

1 Y. Qiao, K. Tahara, Q. Zhang, X. M. Song and J. KiKuchi, *Chem. Eur. J.* 2016, **22**, 1340–1348.

2 S. L. Regen, A. Singh, G. Oehme, M. Singh, *J. Am. Chem. Soc.*, 1982, **104**, 191–795.