Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Label-free and selective SERS-based sensor for determination of ampicillin contamination in water using Fabric Gold-Silver alloy substrate with handheld Raman spectrometer

Kullavadee Karn-orachai*, Aroonsri Ngamaroonchote

National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani 12120, Thailand

E-mail: kullavadee.kar@nanotec.or.th

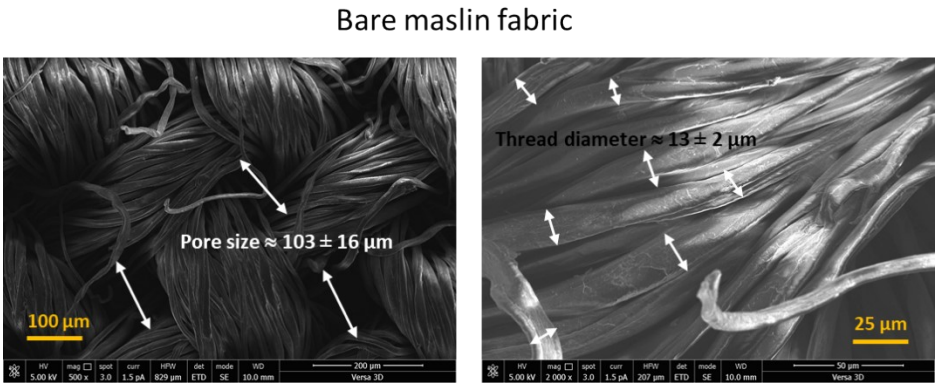

Fig. S1 SEM images of bare Maslin fabric.

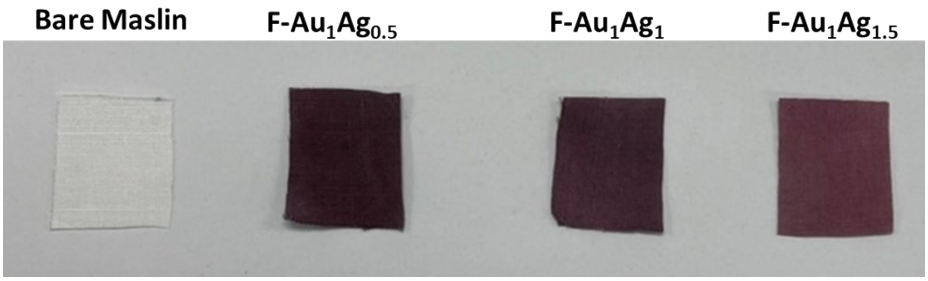

Fig. S2 The photos of bare maslin fabric and plasmonic textiles at three different ratios of Au and Ag.

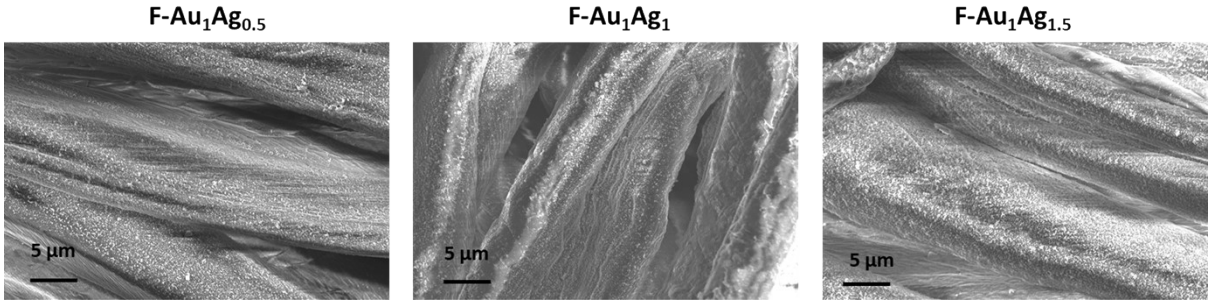

Fig. S3 SEM images with low magnification of Au-Ag alloy NPs deposited on Maslin fabric.

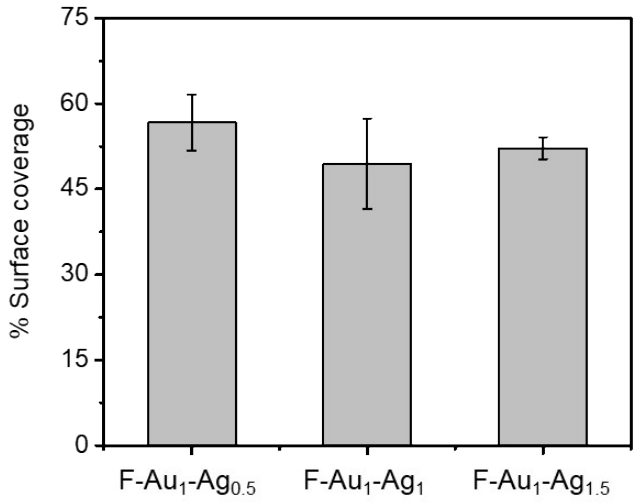

Fig. S4 Bar graph of surface coverage of Au-Ag NPs on each plasmonic fabric.

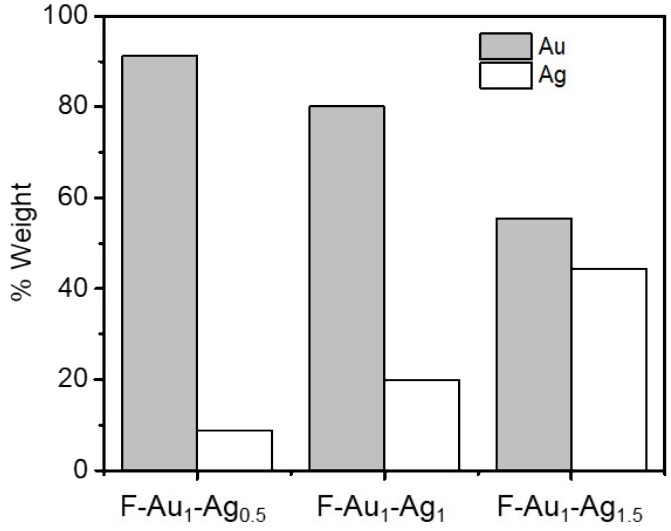

Fig. S5 Percentage of Au and Ag contents in Au-Ag alloy NPs from three different Au-Ag molar ratios coated plasmonic fabrics.

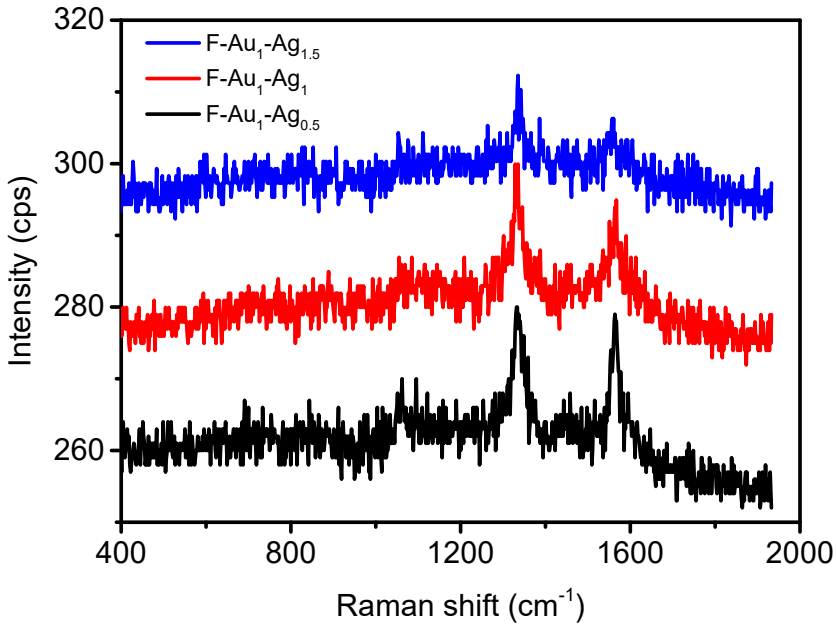

Fig. S6 SERS spectra of DSNB coated plasmonic substrates with three different Au and Ag molar ratios extracted from 2D Raman mapping image.

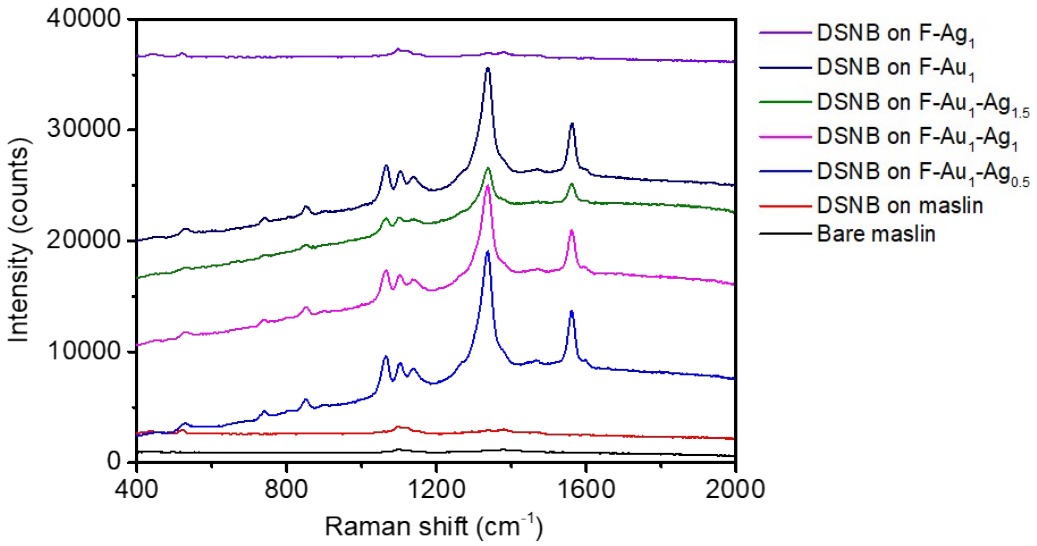

Fig. S7 SERS spectra of bare maslin fabric, 1µM DSNB on maslin textile and all plasmonic fabric substrates.

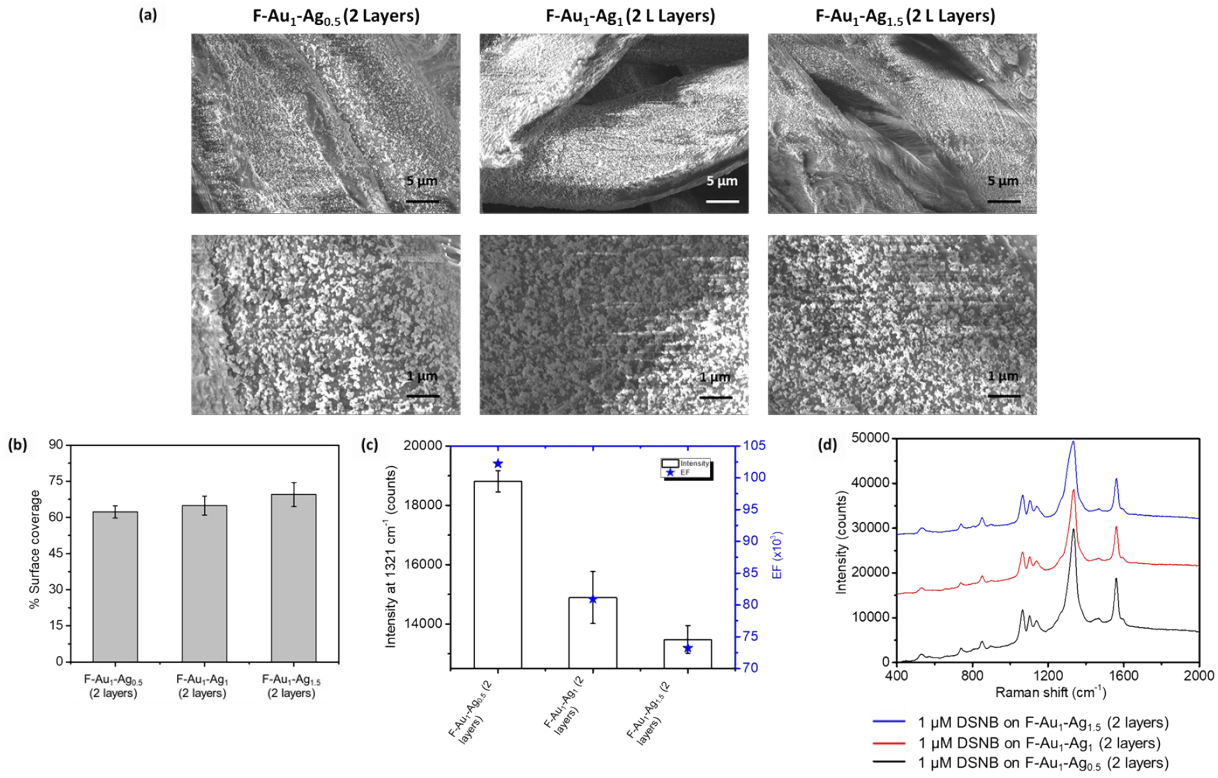

Fig. S8 (a) SEM images with low (upper), and high (lower) magnifications and (b) surface coverage of two-layer deposition of all plasmonic fabrics with three different Au-Ag molar ratios. (c) double y-axes: DSNB signal (on the left) and enhancement factor (on the right) versus two-layer deposition of plasmonic fabrics with different Au-Ag molar ratios. (d) SERS spectra of 1µM DSNB on all plasmonic fabric substrates with two cycles deposition.

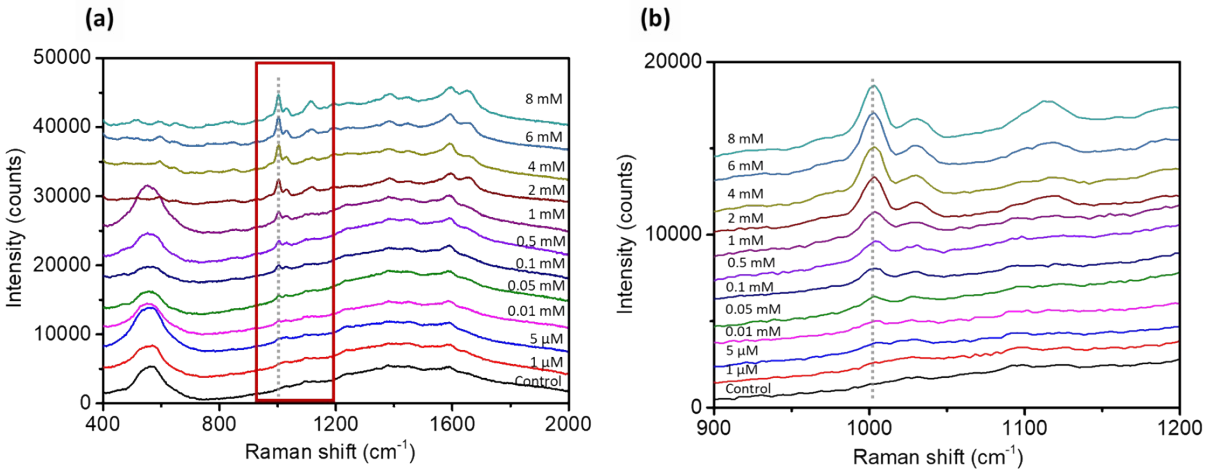

Fig. S9 (a) SERS spectra of Ampicillin performed on F-Au_1-$Ag_{0.5}$ substrate. (b) A zoom on the 900 – 1200 cm^{-1} region of ampicillin spectra. The dotted line at 1004 cm^{-1} shows the characteristic peak of all concentration of ampicillin on plasmonic fabrics.

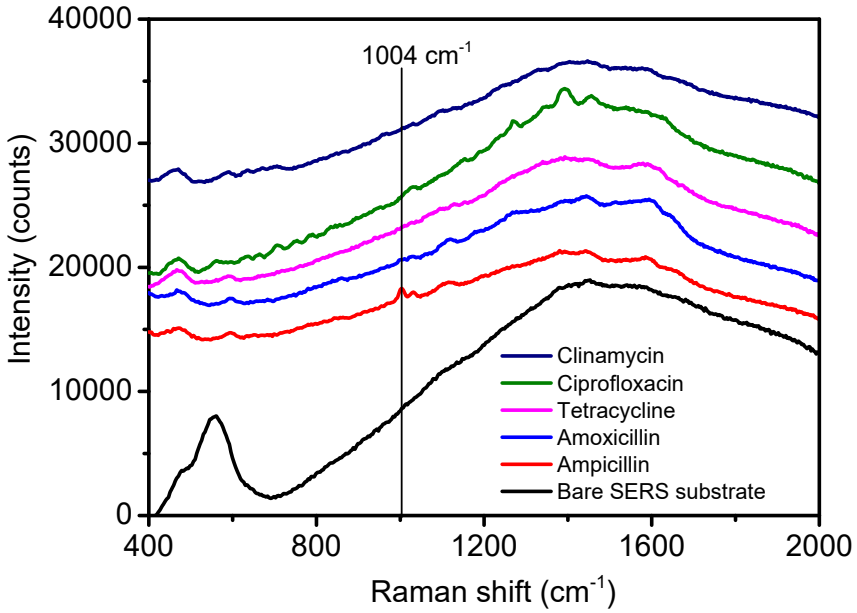

Fig. S10 SERS spectra of all antibiotics at the fixed concentration of 1 mM performed on F-Au_1-$Ag_{0.5}$ substrate.

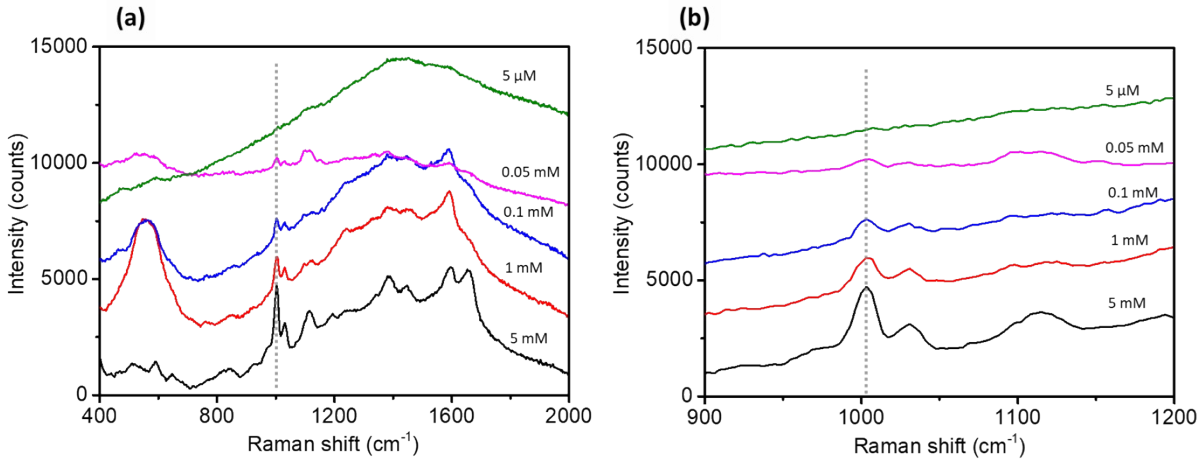

Fig. S11 (a) SERS spectra of ampicillin spiked in raw natural water (5 mM to 5 µM) performed on F-Au_1-$Ag_{0.5}$ substrate. (b) A zoom on the 900 – 1200 cm^{-1} region of ampicillin spectra. The dotted line at 1004 cm^{-1} shows the characteristic peak of all concentration of ampicillin on plasmonic fabrics.

Table S1 Comparison of EF calculation from various SERS substrate based on metal NPs coated fabric textiles.

SERS substrate	EF	Shape	Raman spectrometer	Reference
Au-Ag alloy nanoparticles on filter paper (immersing)	EF = 4.43×10^4 for crystal violet detection	Sphere	Andor SR750 spectrometer with a 532 nm Verdi V-6 laser excitation source	1

AuNPs coated paper substrate (immersing)	EF = 7.8×10^8 for 2-naphthalenethiol detection	Sphere	SENTERRA confocal Raman system (Bruker Optics, Billerica, MA) by focusing a 785 nm diode laser	2
AgNPs coated cotton fabric (sputtering)	EF = 10^4 for 1 mM methylene blue detection	Sphere	NomadicTM Raman 3-in-1 microscope with excitation lasers of 532 nm and 785 nm	3
PDA@AgNPs on non-woven fabrics	EF = 7.02×10^6 for crystal violet detection	Sphere	Raman analyses were performed on a inVia9 Raman Microscope using a 532 nm laser irradiation (Renishaw, UK)	4
Au_1-$Ag_{0.5}$ NPs coated maslin fabrics	EF = 5.2×10^4 for 5,5′-dithiobis (succinimidyl-2-nitrobenzoate (DSNB) detection	Sphere	handheld Raman spectrometer (Mira M-3, Metrohm)	(our study)

References

1. G. A. Khan, O. O. Demirtas¸ A. Bek, A. S. Bhatti, W. Ahmed, *Vib. Spectrosc.*, 2022, **120**, 103359.

2. W. Kim, J.-C. Lee, J.-H. Shin, K.-H. Jin, H.-K. Park and S. Choi, *Anal. Chem.*, 2016, **88**, 5531-5537.

3. X. Bian, J. Xu, Y. Pu, J. Yang, K.-L. Chiu and S. Jiang, *J. Ind. Text.*, 2021, **51**, 712S-727S.

4. Z. Zhang, T. Si, J. Liu and G. Zhou, *Nanomaterials (Basel)*, 2019, **9**, 384