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MDPI

Supplementary Materials

Gold-Deposited Nickel Foam as Recyclable Plasmonic Sensor for Therapeutic Drug Monitoring in Blood by Surface-Enhanced Raman Spectroscopy

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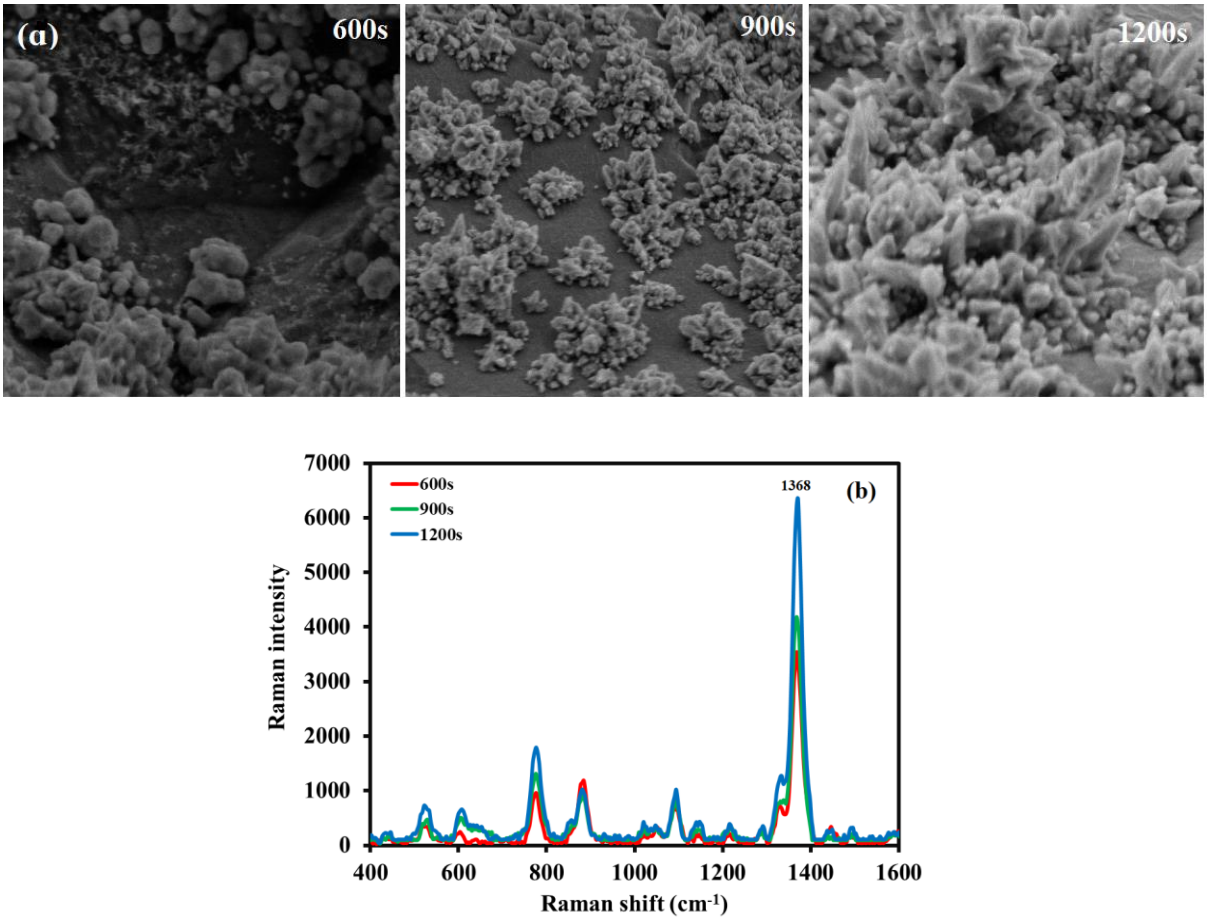
Surface-Enhanced Raman spectroscopy (SERS) Quantification Using Raman Probe

SERS enhancement factor was calculated by the deposition of 10^{-12} M solution of 2-Quinoline thiol, 2-QT (Raman probe) on plasmonic nickel substrate and 10^{-2} M on bare Ni-F for 15 min. The acquired SERS spectra of QT before and after deposition of gold on SERS substrate are depicted in Figure S1.



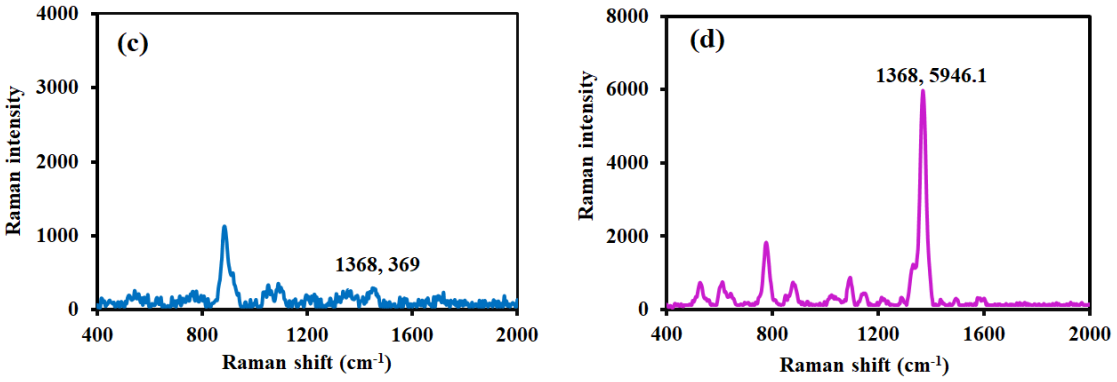


Figure S1. (**a**) SEM images of gold deposition on nickel foam at different acquisition times 600, 900, and 1200 s (resolution 1 µm); (**b**) SERS spectrum of 2-QT (10^{-6} M) at different acquisition times 600, 900, and 1200 s; (**c**) 2-QT on bare nickel foam substrate (10^{-2} M); (**d**) 2-QT on plasmonic nickel foam substrate (10^{-12} M).

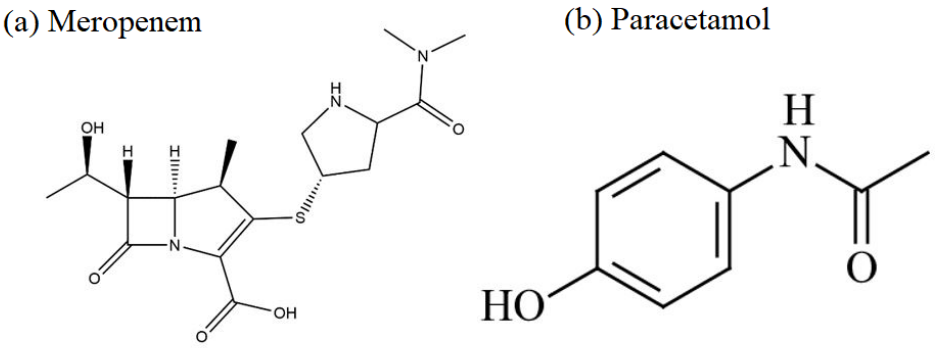


Figure S2. Chemical structure of: (**a**) meropenem; (**b**) paracetamol.

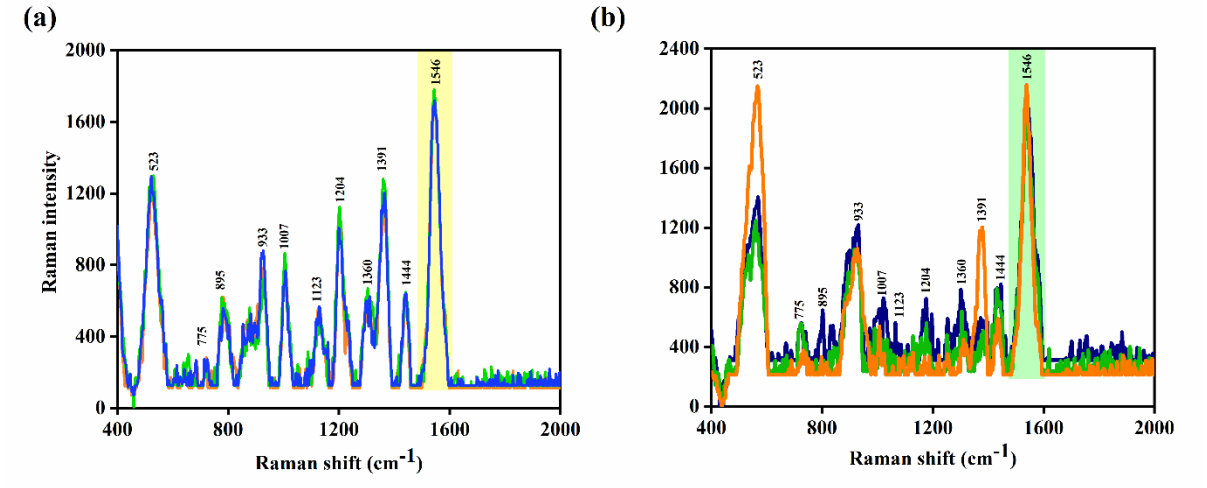


Figure S3. (**a**) Reproducibility of SERS measurements in human blood plasma (RSD = 2.86%); (**b**) reproducibility of signals on SERS measurements in aqueous solution (RSD = 5.52%) (MPN conc. 200 µg/mL, 5×10^{-4} M).

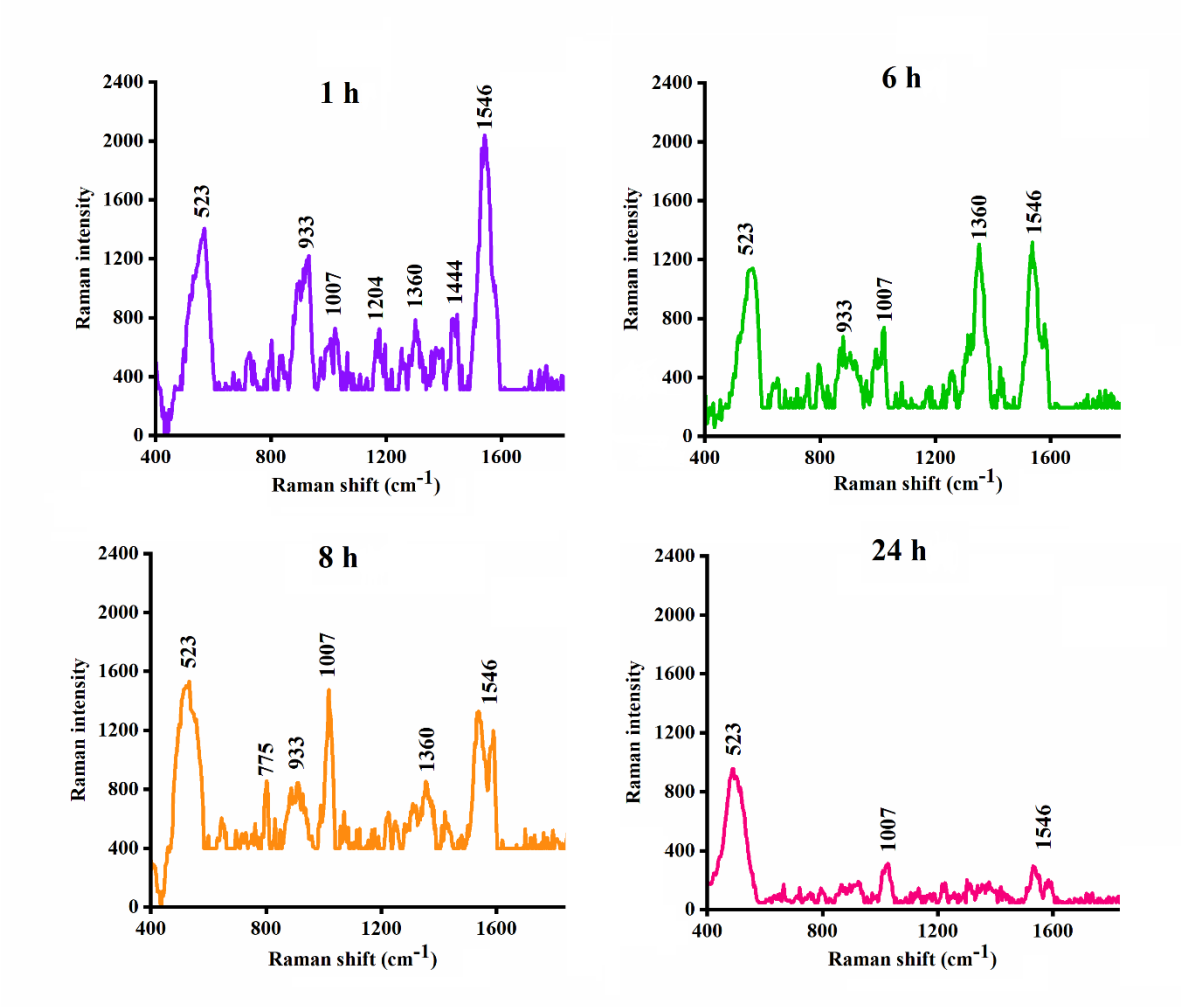


Figure S4. Degradation of drug in aqueous medium over time measured by plasmonic nickel SERS sensor.

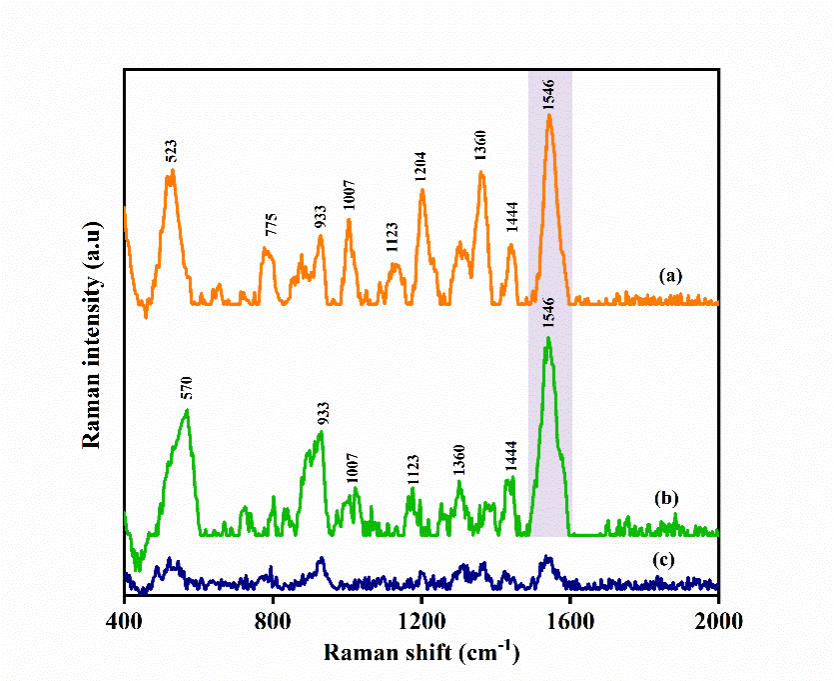


Figure S5. SERS spectra of (**a**) meropenem (MPN) spiked in human blood plasma; (**b**) MPN in aqueous solution; (**c**) blank plasmonic nickel substrate.

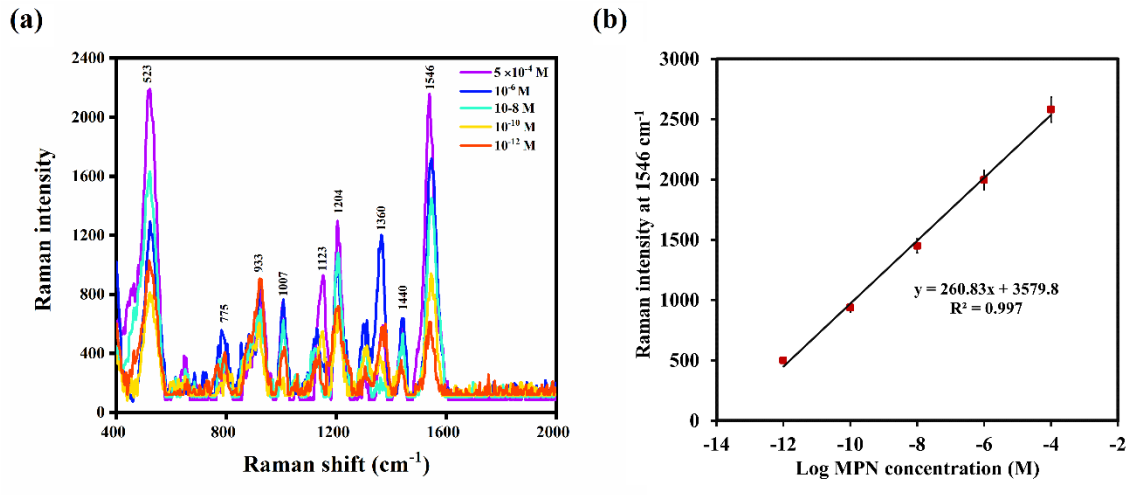


Figure S6. (**a**) Trend of SERS signal intensity of MPN in human blood plasma in concentration range of 5 × 10^{-4} M to 1 × 10^{-12} M; (**b**) SERS calibration plot of MPN in human blood plasma within the same concentration range.

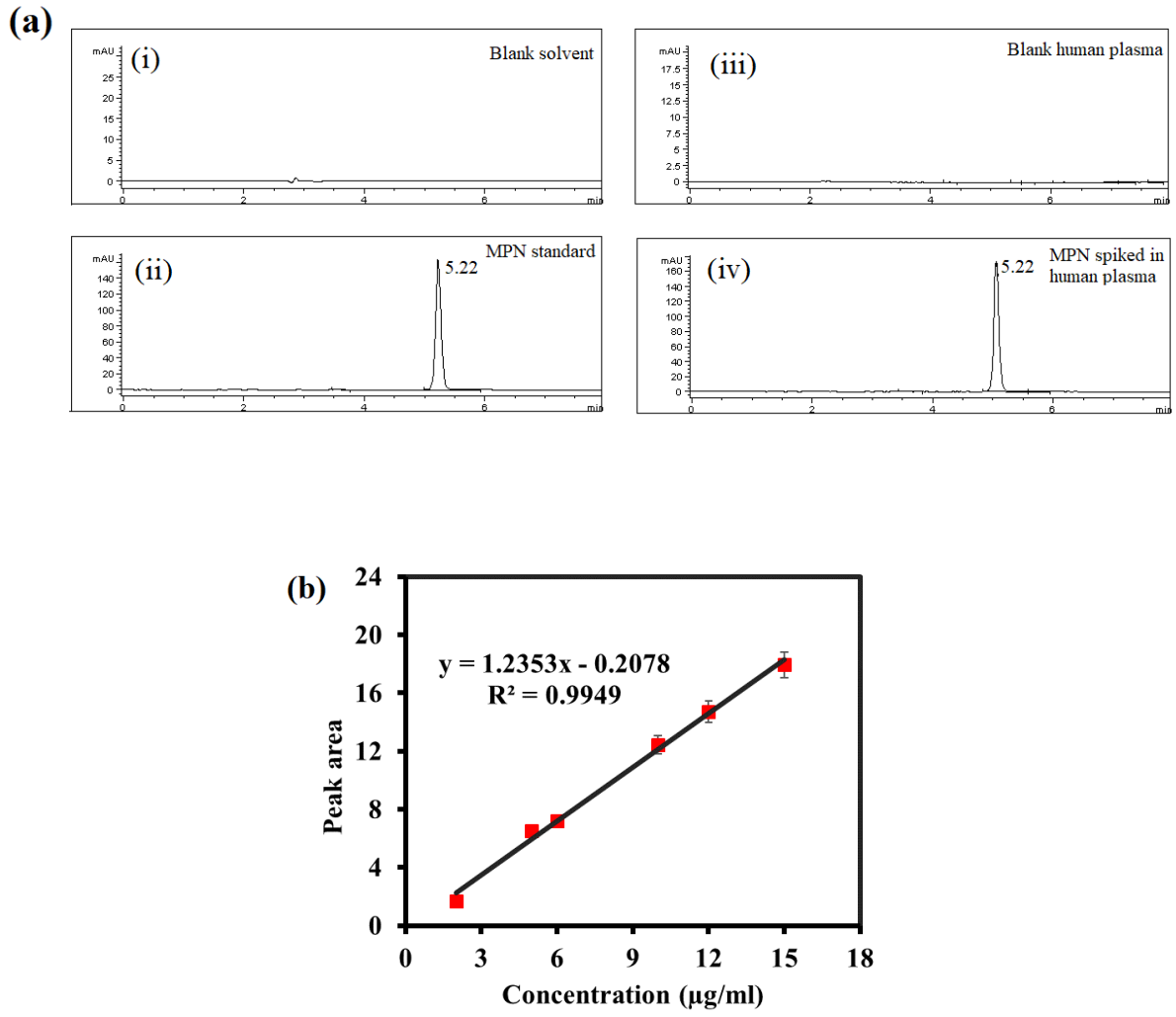


Figure S7. (**a**) MPN high-performance liquid chromatography (HPLC) chromatograms (n = 3) (RT = 5.22 min): (i) blank solvent, (ii) standard MPN in aqueous solution, (iii) blank human plasma, (iv) MPN spiked in human plasma; (**b**) calibration curve of MPN by HPLC (working concentration range 0.25 to 18 μg/mL).

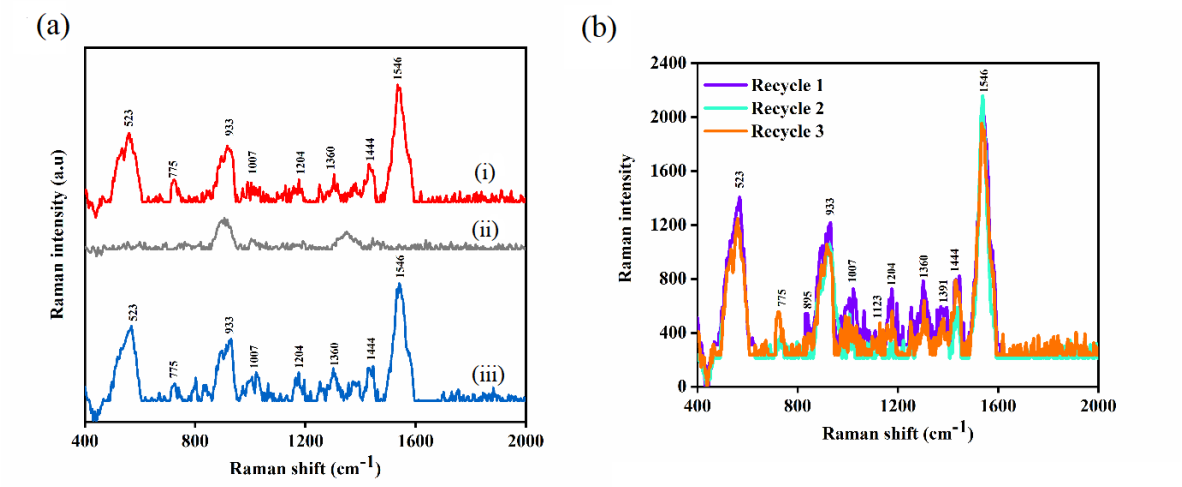


Figure S8. SERS spectra of (**a**) (i) MPN on plasmonic nickel SERS substrate (ii) SERS substrate after desorption of MPN (iii) Fresh aliquot of MPN on recycled SERS substrate (**b**) Repeated cycles of measurements.

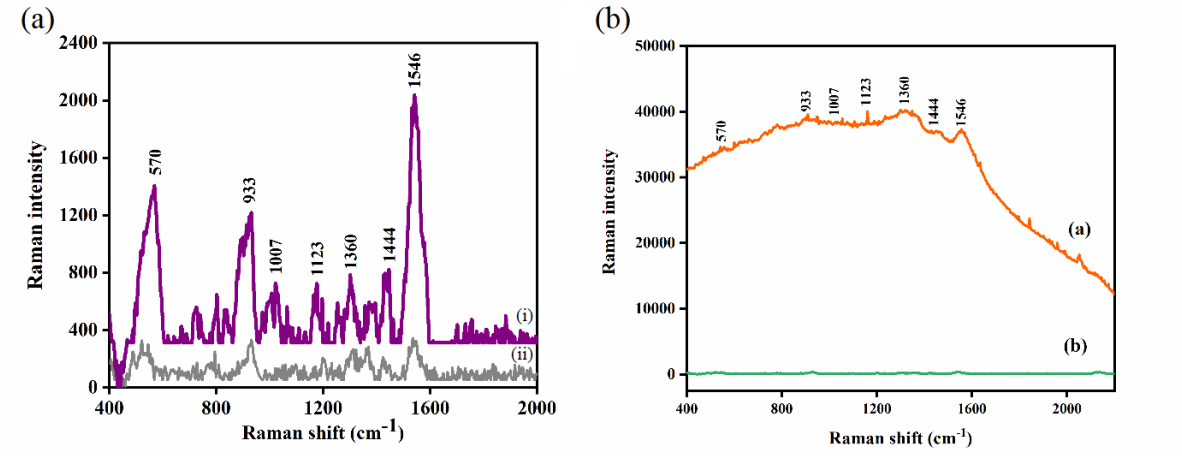


Figure S9. SERS spectra of 5 × 10^{-4} M MPN on plasmonic nickel foam. The spectra were acquired by the handheld Raman spectrometer (**a**) using automatic background correction, (**b**) without background correction.

Calculation of Limit of Quantification (LOQ) by SERS

For SERS measurements, limit of quantification (LOQ) is calculated by the formula; LOQ = 10* (standard deviation of low concentration/slop of calibration curve) [1].

References

[1] Shrivastava, A.; Gupta, V.B. Methods for the determination of limit of detection and limit of quantitation of the analytical methods. *Chron. Young. Sci*. **2011**, *2*, 21–25.