Supplementary Information: Filter paper based SERS substrate for the direct detection of analytes in complex matrices

Harmke S. Siebe[‡a], Qinglu Chen[‡b], Xinyuan Li[b], Yikai Xu*[b], Wesley R. Browne[a], Steven E. J. Bell*[b]

a. Stratingh Institute for Chemistry, University of Groningen, Nijenborgh 4, 9747 AG, Groningen, The Netherlands.
b. School of Chemistry and Chemical Engineering, David Keir Building, Queen's University Belfast, BT9 5AG, Belfast, Northern Ireland, United Kingdom.

Corresponding authors:

Yikai Xu, e-mail: yxu18@qub.ac.uk

Steven E.J. Bell, email: s.bell@qub.ac.uk

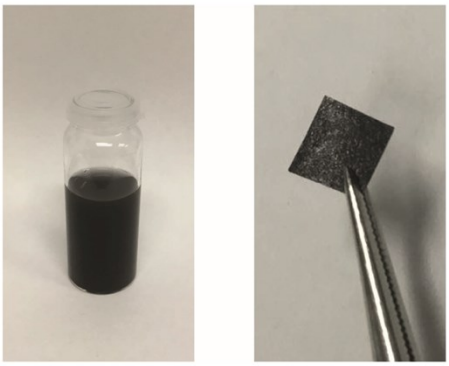

Figure S1: Photos of the aggregated-CRGC-HEC mixture (left) and a piece of SERS-paper film (right).

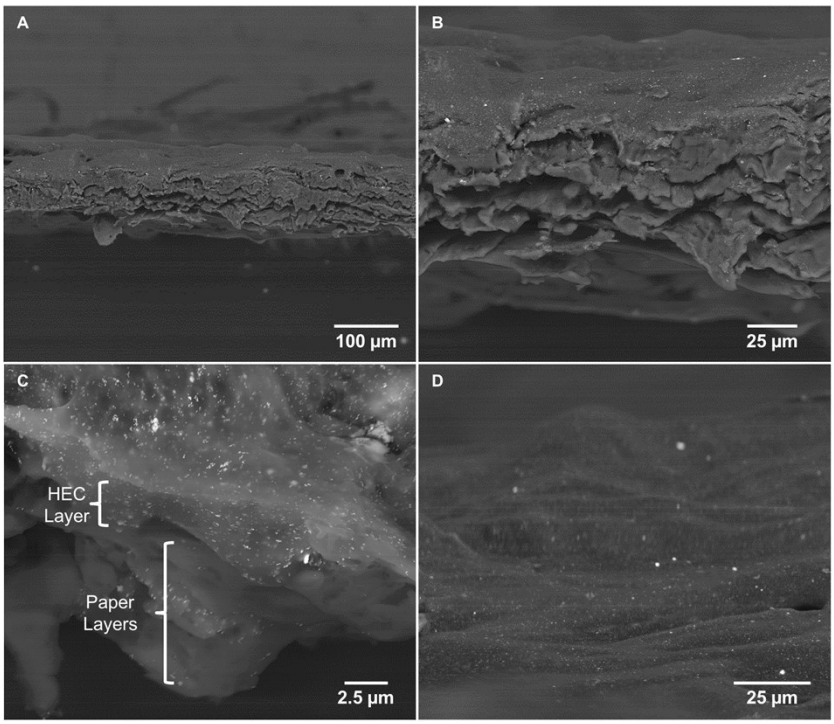

Figure S2: (A-C) show SEM images of the cross-section of a typical SERS-paper film sample under different magnifications. (D) Shows tilted SEM image of the lumpy surface of a typical SERS-paper film sample.

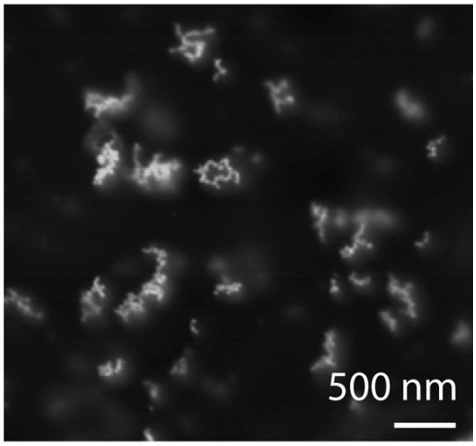

Figure S3: SEM image of a typical SERS-paper film sample showing morphology and density of nanoparticle aggregates in an area (ca. 13.6 μm^2).

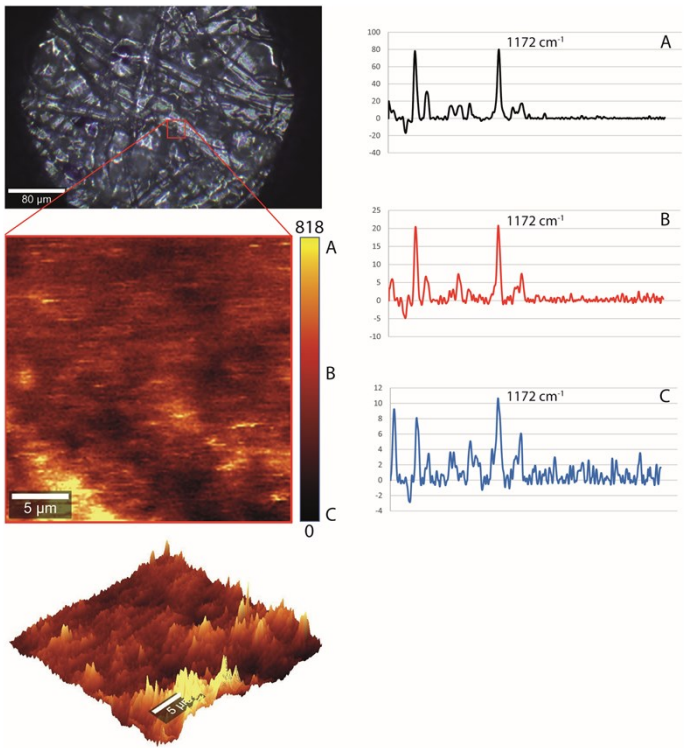

Figure S4: 2D and 3D Raman intensity maps of the 1172 cm^{-1} band measured for a 25 µm × 25 µm area of a 10 µL droplet dried onto the nanoparticle side of SERS-paper substrate. Spectra on the right show typical spectra obtained for yellow, red and black areas of the map, respectively.

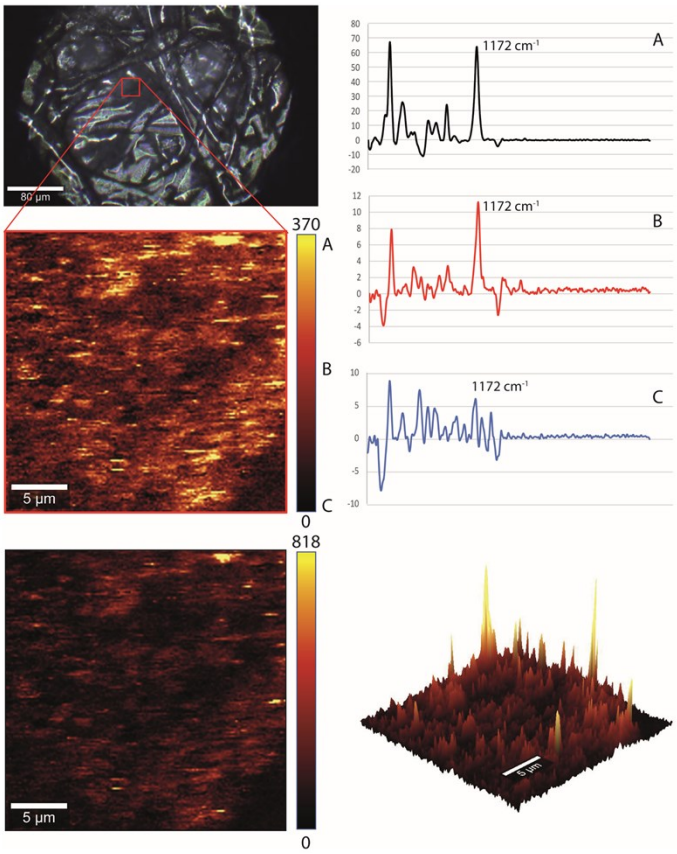

Figure S5: 2D Raman intensity map of the 1172 cm^{-1} band measured for a 25 µm × 25 µm area of a 10 µL CV droplet dried onto the paper side of the SERS-paper substrate. Spectra on the right show typical spectra obtained for yellow, red and black areas of the map, respectively. The 2D and 3D maps at the bottom have been rescaled to allow better comparison with Figure S2.

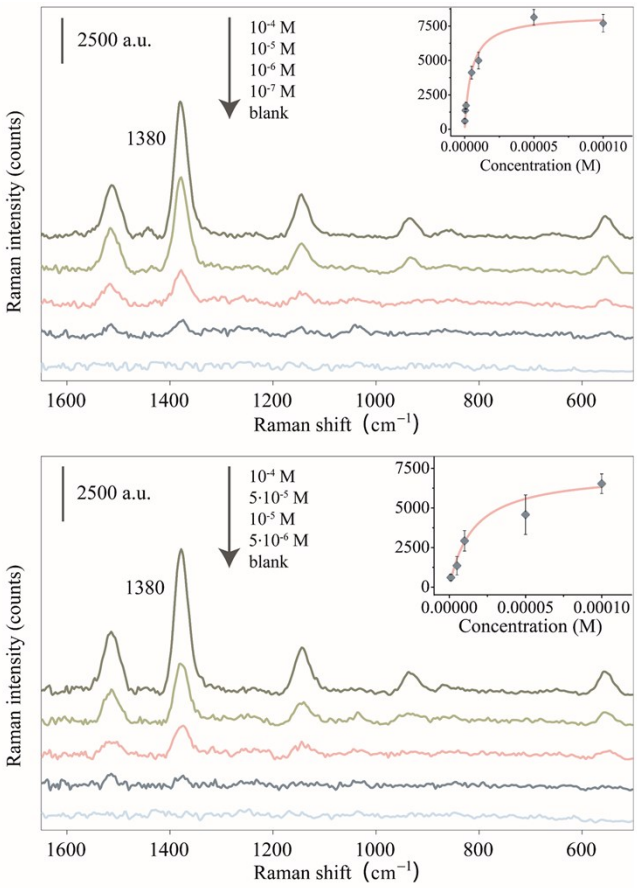

Figure S6: (top) SERS spectra of 10 µL of aqueous thiram solutions dried onto the nanoparticle side of the substrate. The concentrations are 10^{-4} M, 10^{-5} M, 10^{-6} M and 10^{-7} M from top to bottom. The detection limit is 10^{-7} M. (bottom) SERS spectra of 10 µL of aqueous thiram solutions dried onto the paper side of the substrate. The concentrations are 10^{-4} M, 5×10^{-5} M, 10^{-5} M and 5×10^{-6} M from top to bottom. The detection limit is 5×10^{-6} M.

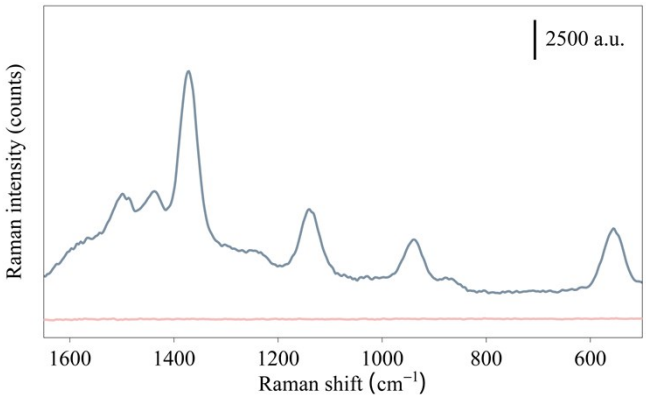

Figure S7: SERS spectrum of 10 µL 10^{-4} M thiram (pink) with and (blue) without sand, added onto the nanoparticle side of the substrate.

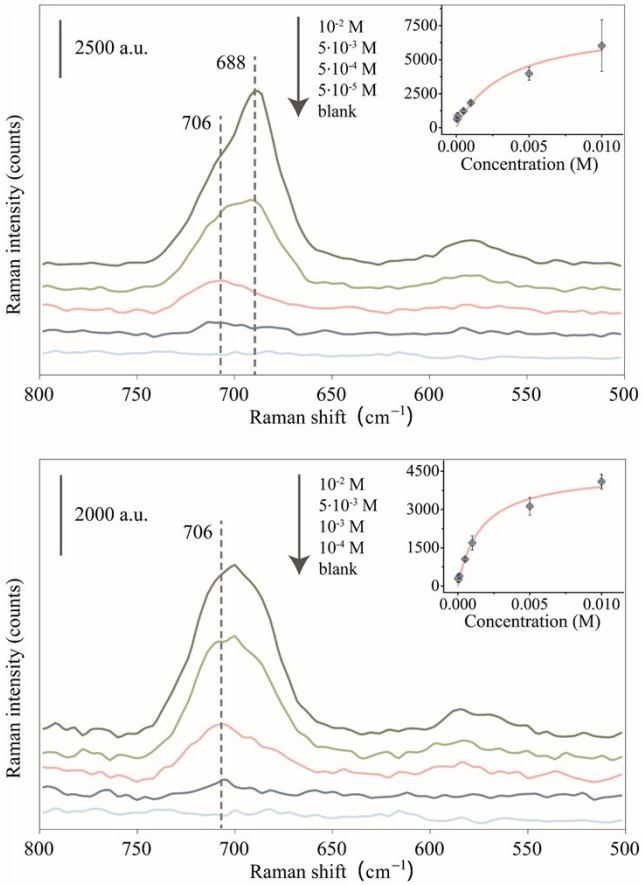

Figure S8: (top) SERS spectra of 10 µL of aqueous melamine solutions dried onto the nanoparticle side of the substrate. The concentrations are 10^{-2} M, 5×10^{-3} M, 5×10^{-4} M and 5×10^{-5} M from top to bottom. The detection limit is 5×10^{-5} M. (bottom) SERS spectra of 10 µL of aqueous melamine solutions dried onto the paper side of the substrate. The concentrations are 10^{-2} M, 5×10^{-3} M, 10^{-3} M and 10^{-4} M from top to bottom. The detection limit is 10^{-4} M.