Electronic Supplementary Material (ESI) for Analyst.

Supplementary information

Surface-enhanced (SERS) and tip-enhanced (TERS) Raman scattering in label-free characterization of erythrocyte membranes and extracellular vesicles at the nano-scale and molecular level

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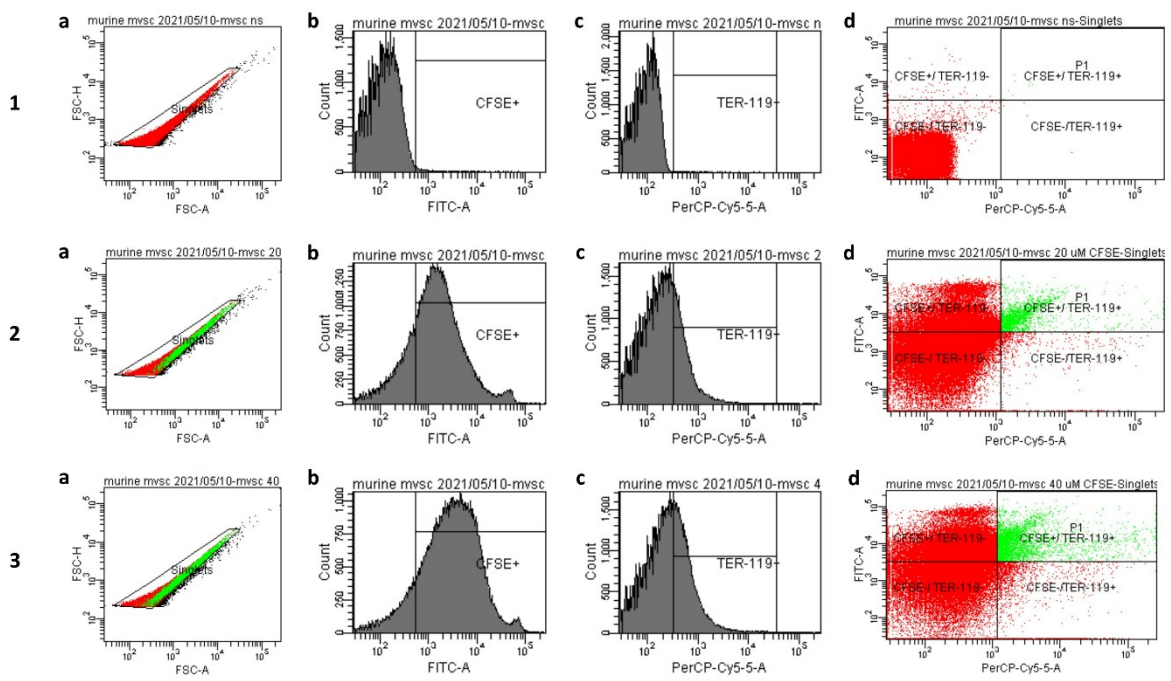

Fig. SI1. Assessment of red blood cell-derived extracellular microvesicles (REVs) with use of flow cytometry. Samples were unstained (Control) (1) or stained with either 20 (2) or 40 µM (3) CFSE Cell Trace Proliferation Kit and 1:100 anti-TER-119 antibody. 150,000,000 events were acquired in log mode for height forward side scatter (FSC-H), area forward scatter (FSC-A) and fluorescent signals. Singlets were gated according to FSC-H to FSC-A ratio (1-3a). Simultaneous presence (d) of CFSE (b) and anti-TER-119 (c) signal indicated the presence of REVs.

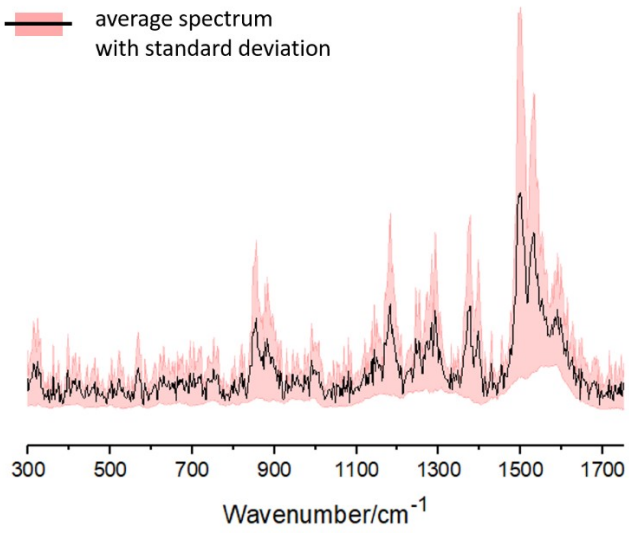

Fig. SI2. Averaged spectrum of 20 SERS spectra of the isolated erythrocyte membranes measured with 633 nm laser with AuNp.

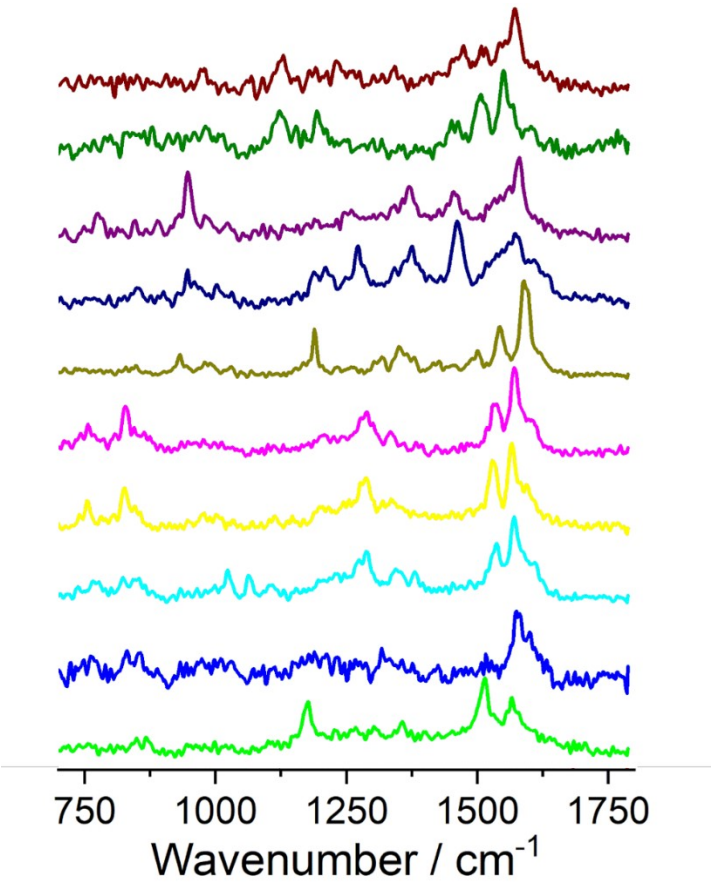

Fig. SI3. The single point TERS spectra.

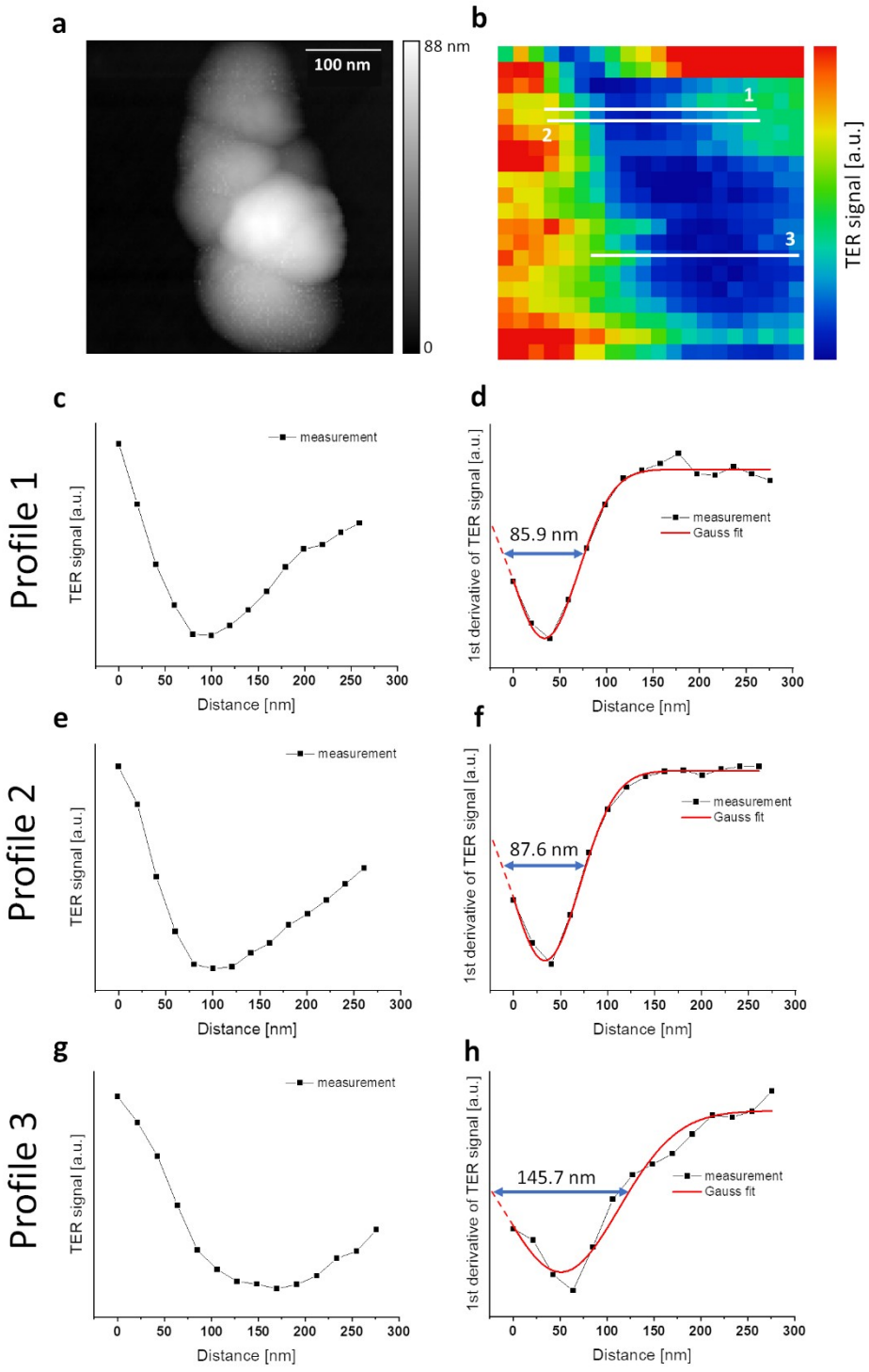

Fig. SI4. The spatial resolution of TERS mapping. AFM image of microvesicles (a) with corresponding TERS map integrated in the spectral range from 984 to 1018 cm^{-1} attributed to ring breathing vibrations of aromatic acids residues (b). Three intensity profiles were extracted along x axis of the TERS map (c, e, g), and their second derivatives were calculated (d, f, h). The FWHM of Gauss function fitted to the derivative of TERS signal is an equivalent of the spatial resolution. The exact spots of profile extraction are marked on TERS map (b).

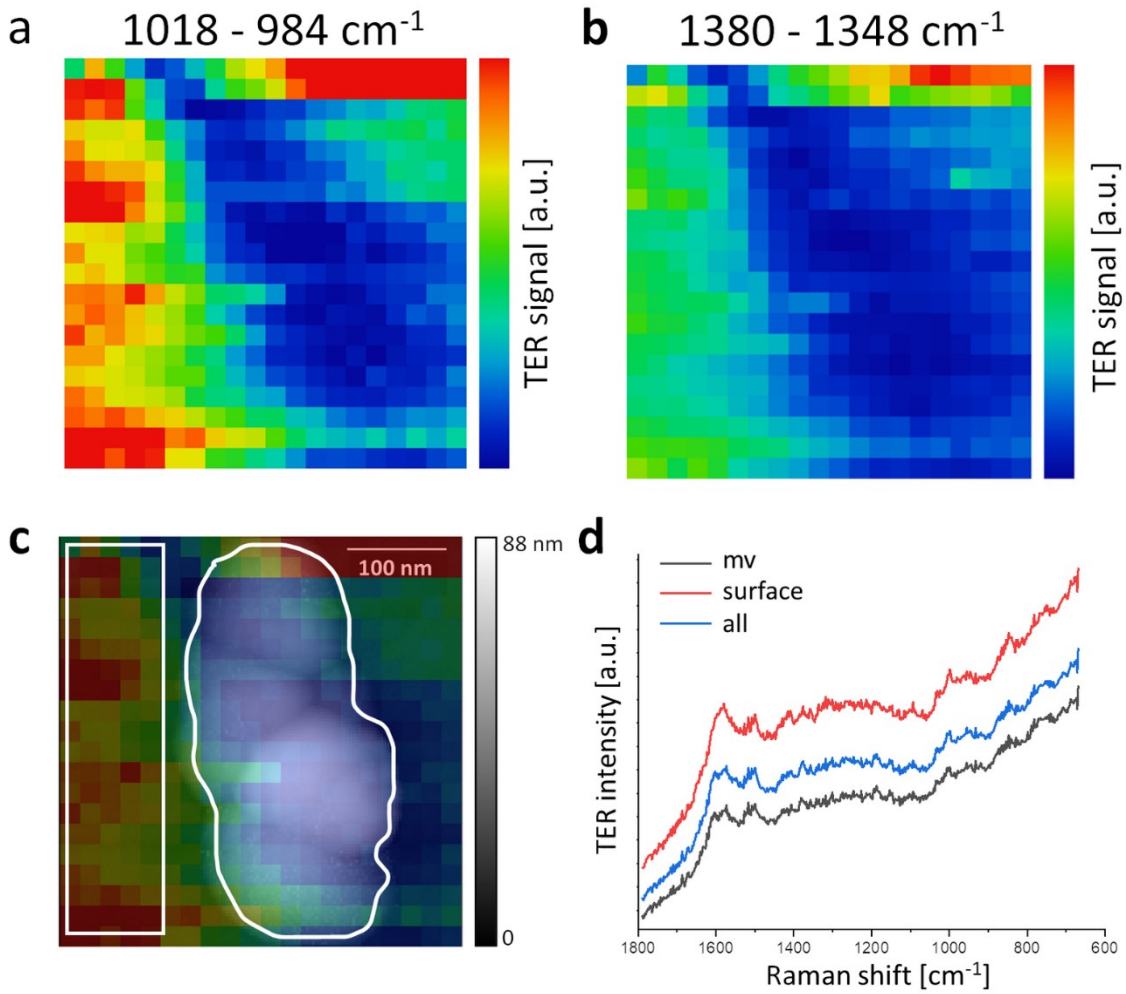

Fig. SI5. TERS maps of microvesicles presented in Fig. SI4 integrated in the spectral region of 1018-984 cm^{-1} (ring breathing vibrations of aromatic acids residues) (a), and 1380-1348 cm^{-1} (the amide III). Map (a) superimposed in AFM topography image (c) with corresponding averaged TERS spectra from MV (black), surrounding surface (red), and the whole map (d). The contours on the (c) insert represent the spatial locations from which the spectra were averaged.