Supporting Information

for

Vibrational sensing using infrared nanoantennas: towards the non-invasive quantitation of physiological levels of glucose and fructose

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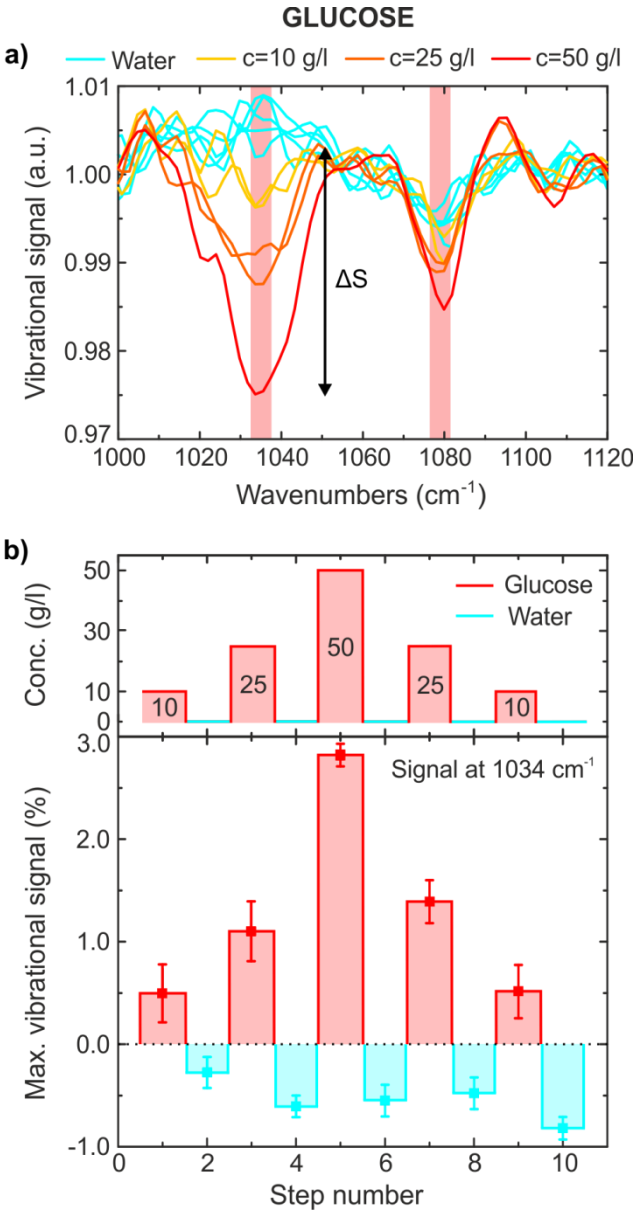

Figure S1. SEIRA measurement of pure aqueous glucose solutions evaluated with baseline-correction. a) Baseline-corrected vibrational data in a water (blue), 10 g/l (yellow), 25 g/l (orange), and 50 g/l (red) flow cell environment. For the quantization of the respective concentrations the maximum vibrational signal ΔS, which is the difference between the baseline of the spectrum and the vibrational signal at 1034 cm^{-1}, is analyzed. b) The maximum vibrational signal ΔS of each

flow cell environment is plotted in the lower panel for the conducted cycle as shown on the top panel. From the signal ΔS, the different concentrations can be differentiated down to a concentration of c=10 g/l, in this case. The discrepancy in the maximum vibrational signal for c=25 g/l can be attributed to the baseline-correction procedure and thus underlines the weakness of this approach.

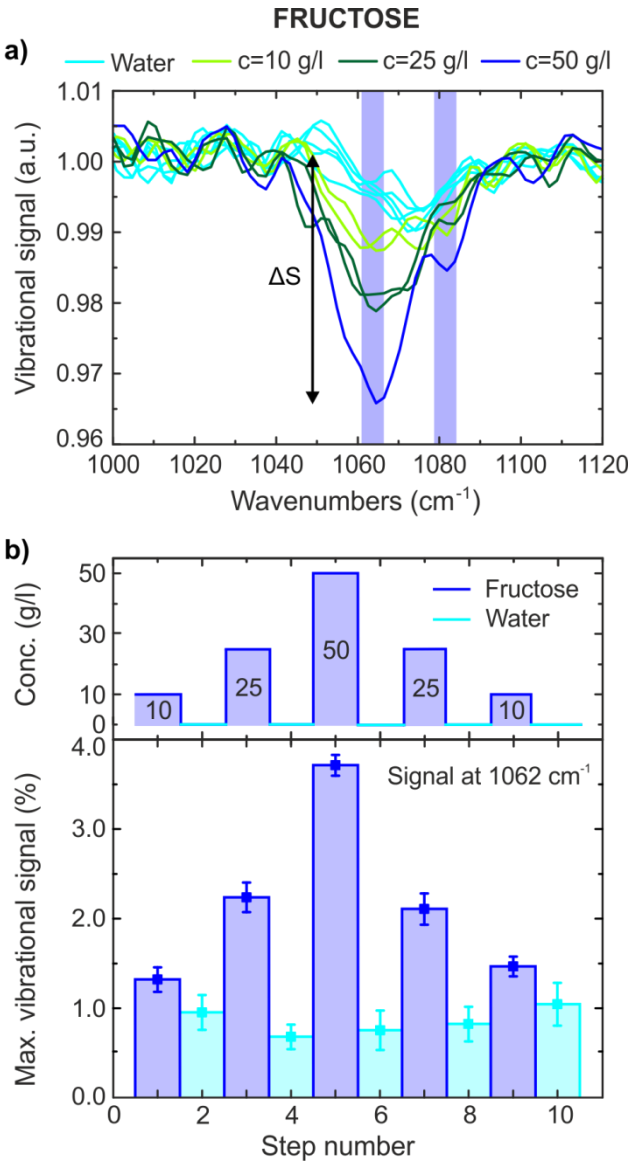

Figure S2. SEIRA measurement of pure aqueous fructose solutions evaluated with baseline-correction. a) Baseline-corrected data of different aqueous fructose environments with c=50 g/l (dark blue), c=25 g/l (dark green), c=10 g/l (bright green), as well as water surrounding (bright blue). Already here, the pure water measurements show vibrational signals which can neither be attributed to water nor

to fructose. Thus, it is most probably a residue from baseline-correction demonstrating again its poor capability of quantifying solution concentrations. Again, the maximum vibrational signal ΔS is analyzed at 1062 cm^{-1} to quantify the fructose concentrations. b) Illustration of the concentration steps for the measurement cycle in the upper panel and maximum vibrational signals for the corresponding step in the lower panel. Concentrations down to c=10 g/l are reproducibly sensed in aqueous solution.

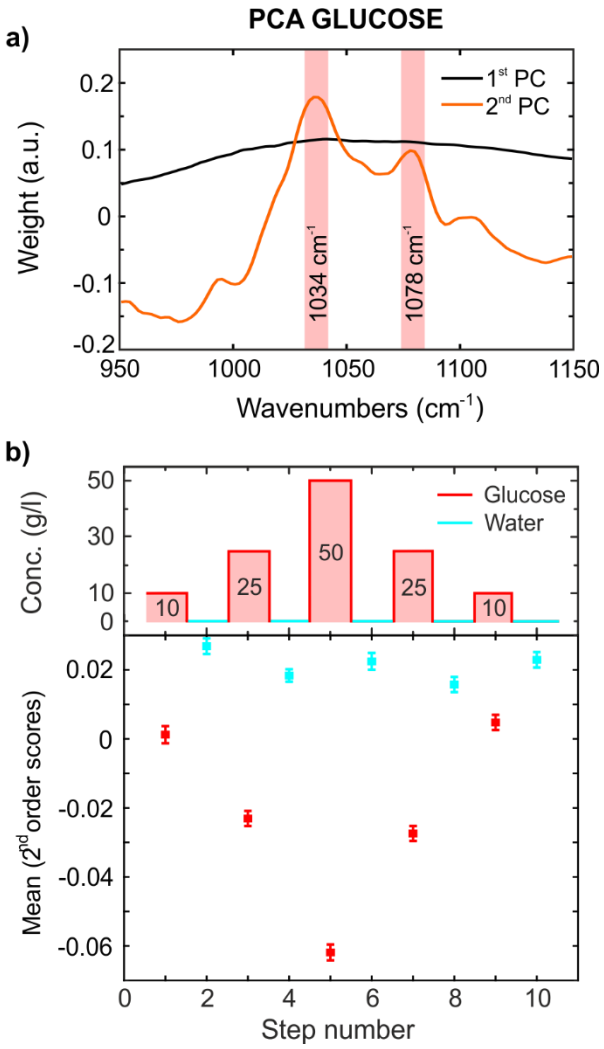

Figure S3. PCA of SEIRA measurements in aqueous glucose solutions. a) First and second principal component for 30 measurements in different aqueous glucose and pure water flow cell environments. As before, the first PC compensates for plasmon intensity shifts while the second one comprises the vibrational

information (indicated by the red bars). b) Examination of the second order scores for each spectrum and averaging them for each measurement concentration step retrieves the vibrational information and thus the glucose concentrations as depicted in the lower panel. Also here, a sensitivity down to c=10 g/l is reached. The upper panel displays the measurement cycle which was conducted.

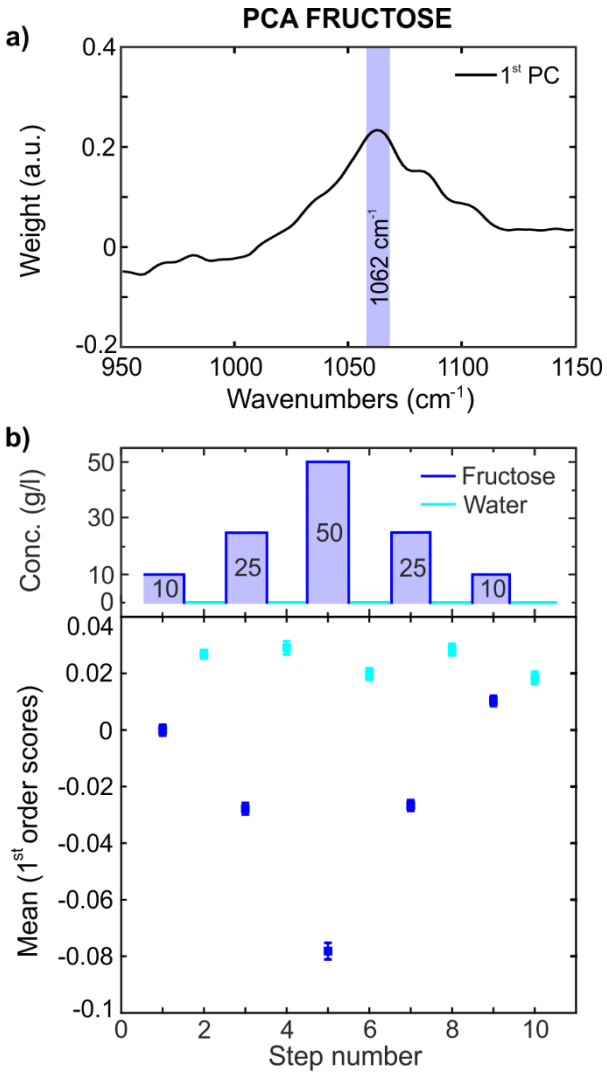

Figure S4. PCA of SEIRA measurements in aqueous fructose solutions. a) The first PC already contains the vibrational information in the case of the fructose measurements here. Thus, the first order scores are used to retrieve the corresponding fructose concentrations. b) Along with the conducted measurement cycle shown in the top panel, all fructose concentrations could be quantified by examining the mean of the first order scores down to a concentration of c=10 g/l.