# Supporting Information

## Scouting for Strong Light-Matter Coupling Signatures in Raman Spectra

Wassie Mersha Takele,[1,2] Lukasz Piatkowski,[3] Frank Wackenhut,[2] Sylwester Gawinkowski,[1] Alfred J. Meixner,[2] and Jacek Waluk[1,4]

[1]*Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland;*

[2]*Institute of Physical and Theoretical Chemistry and LISA+, University of Tübingen, Auf der Morgenstelle 18, D-72076 Tübingen, Germany;*

[3]*Faculty of Materials Engineering and Technical Physics, Poznań University of Technology, Piotrowo 3, 60-965 Poznań, Poland;*

[4]*Faculty of Mathematics and Science, Cardinal Stefan Wyszyński University, Dewajtis 5, 01-815 Warsaw, Poland;*

The sample transmission spectra of an empty microcavity as a function of applied voltage are shown in Figure S1. From these plots it can be estimated that a voltage increment of 1 V leads to a 5 cm$^{-1}$ shift of the resonant frequency.

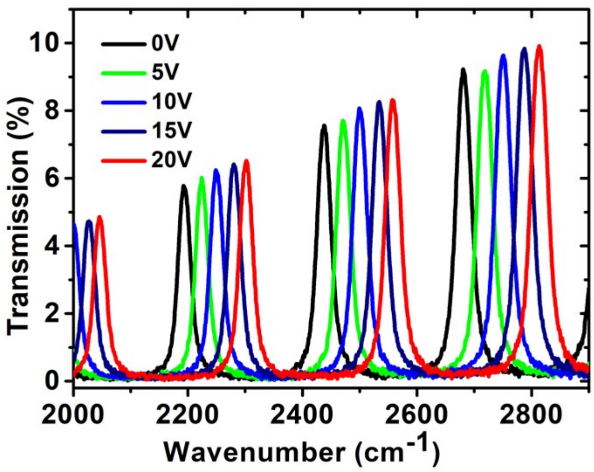


Figure S1. Transmission spectrum of an empty microcavity, as a function of voltage applied to a piezoelectric element of the mirror holder.

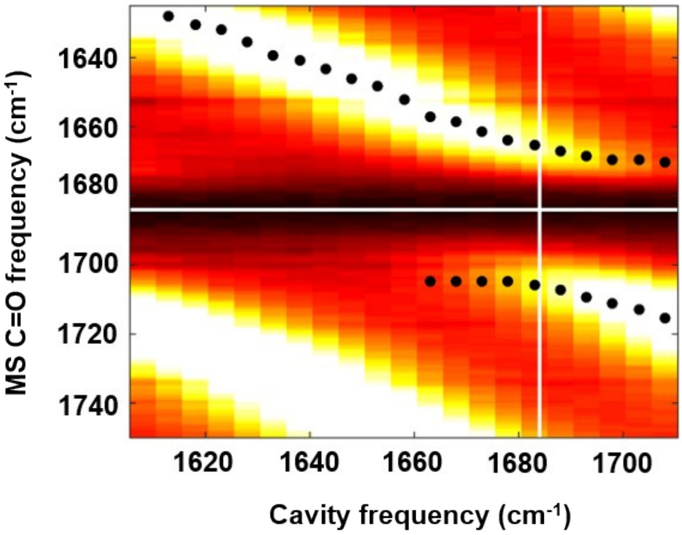


Figure S2. Dispersion plots for the C=O vibration of MS coupled to a microcavity. Dots indicate maxima of the intensity of polaritonic peaks. Solid white lines indicate resonant frequencies of the cavity and of the C=O stretching.

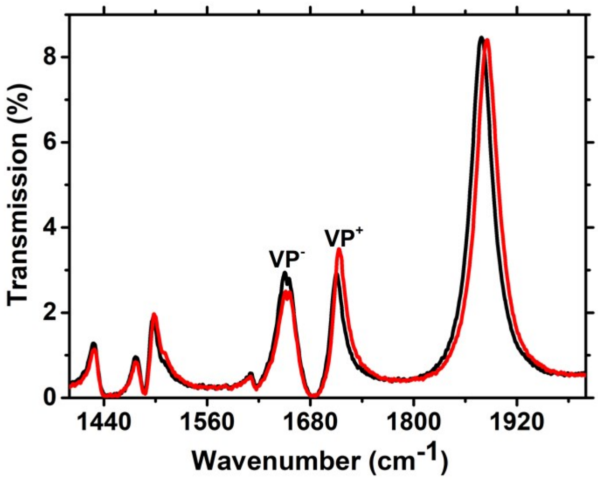


Figure S3. Transmission spectrum of MS filled microcavity, measured before (black) and after (red) Raman measurement.

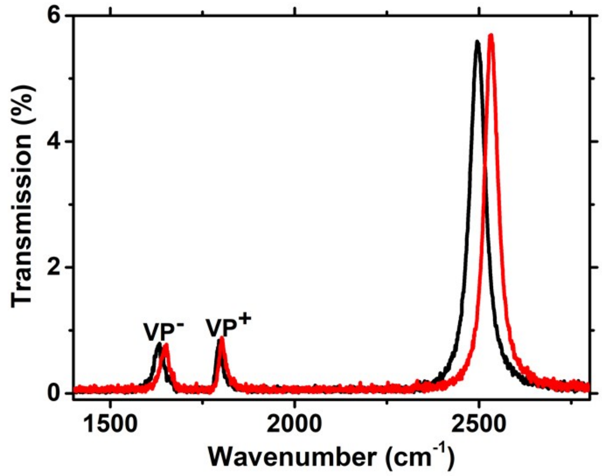


Figure S4. Transmission spectrum of PVAc film embedded in an optical microcavity, measured before (black) and after (red) Raman measurement.

The cavity transmission with the C=O vibrations of PVAc film when a thin Cr layer (about 10 nm) was used to separate the PVAc film from the top Ag layer is shown in Figure S5 (red line). This result confirmed that the Cr layer does not affect coupling of the PVAc film with the cavity mode or its quality.

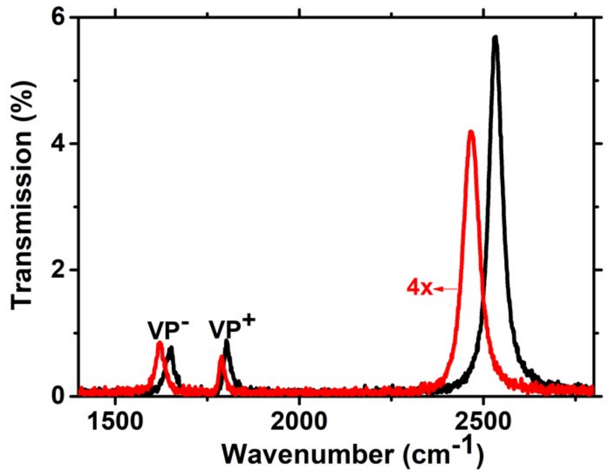


Figure S5. Cavity transmission with the C=O vibrations of PVAc film when a thin Cr layer (10 nm) was used to separate the PVAc film from the top Ag layer (red) and when 10 nm Ag was used as both the bottom and top cavity mirrors (black).

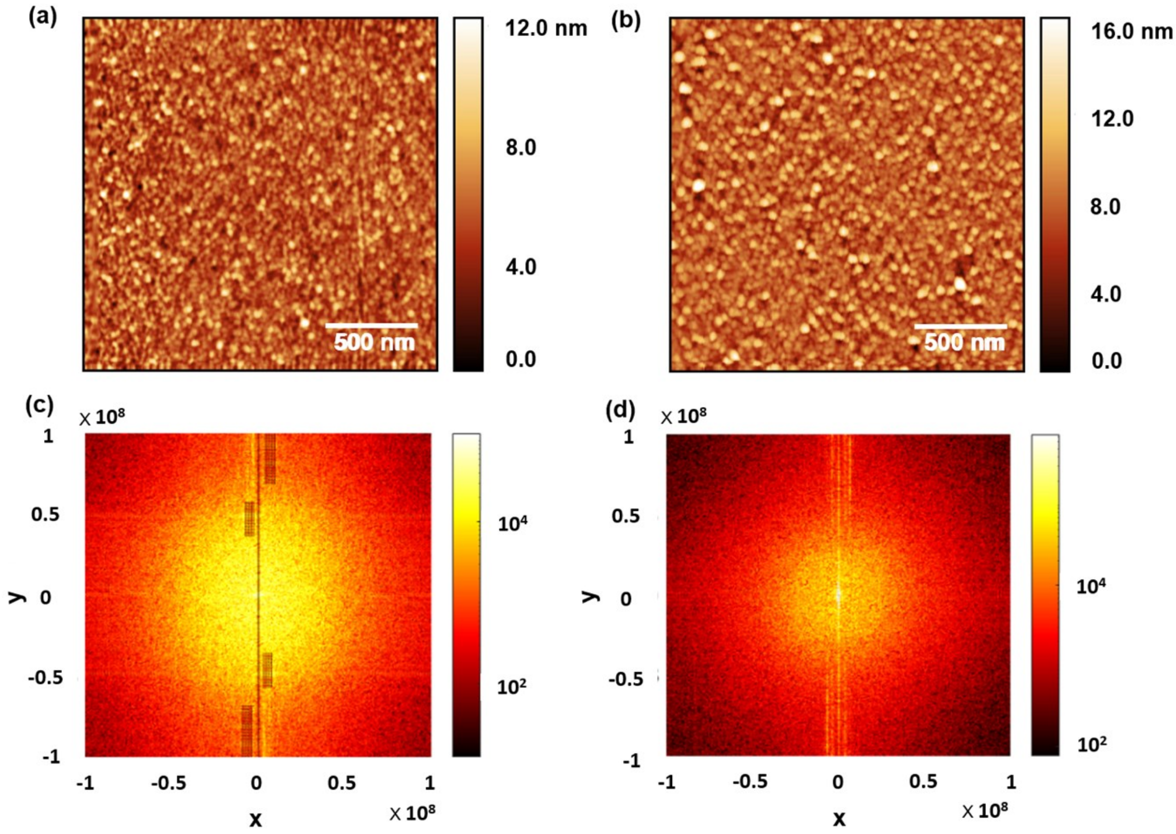


Figure S6. AFM images of different Ag films sputtered on glass surfaces. (a) 10 nm Ag, (b) 30 nm Ag. 2D fast Fourier transform (FFT) patterns of the 10 nm Ag and 30 nm Ag are shown in panels c and d, respectively. The size of the distribution at the origin, which indicates the periodicity in the surface morphology, in the 2D FFT plots decreases with an increase of the Ag film thickness. This confirms that the 10 nm Ag cavity mirrors have rougher features than the 30 nm Ag.