Supplementary Information

Piezoelectric and microfluidic tuning of infrared cavity for vibrational polariton studies

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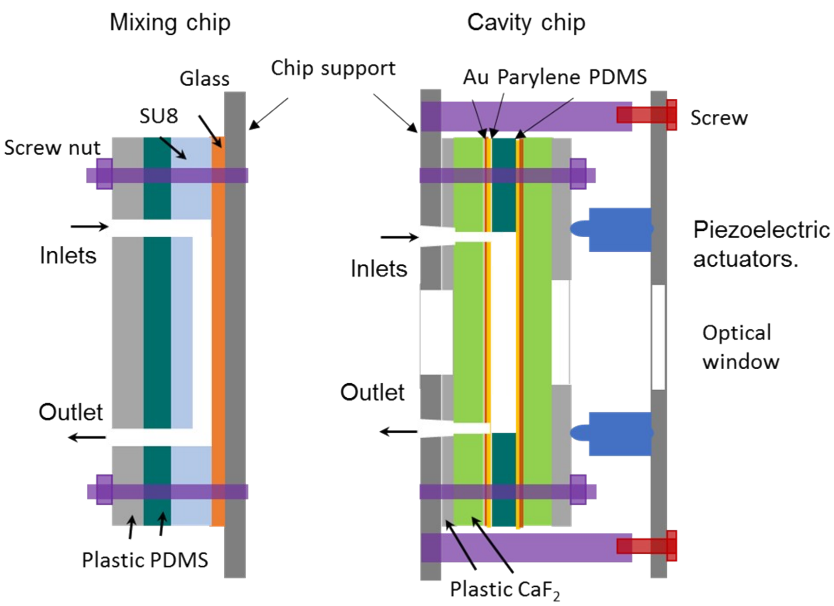

Figure S1. Schematic diagram of mounted mixing chip (left) and cavity chip (right) with piezoelectric actuators and optical windows.

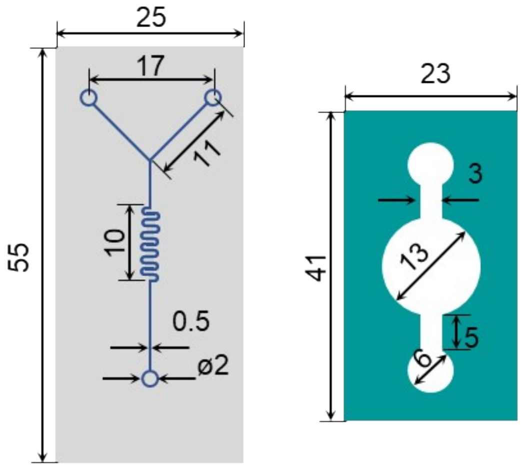

Figure S2. Layout and geometry parameters of mixing chip (left) and cavity chip (right).

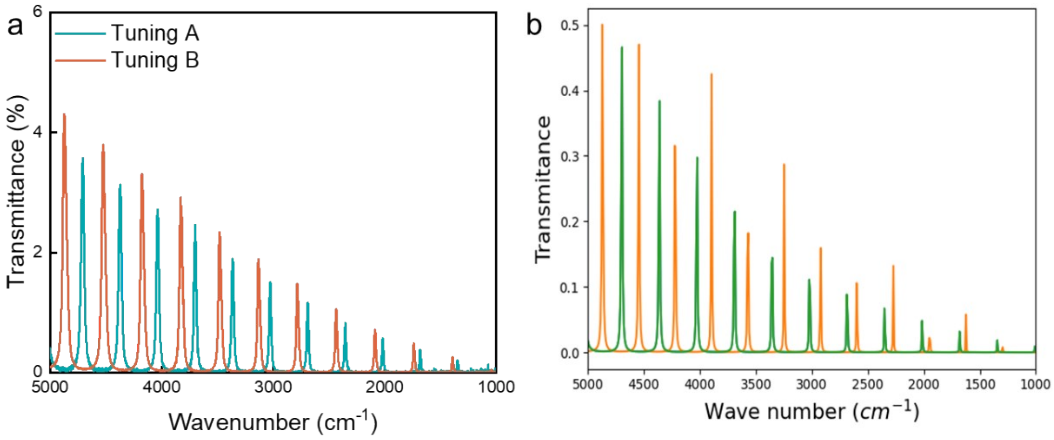

Figure S3. (a) Transmission spectra, showing the air-cavity modes with and without activating the piezoelectric actuators. A cavity length of 14.8 μm (A) and 14.3 μm (B) can be deduced from the spectra, respectively. (b) Transmission spectra of the cavity calculated using the transfer-matrix method, 10 nm thick gold mirrors and air cavities of the same cavity lengths.

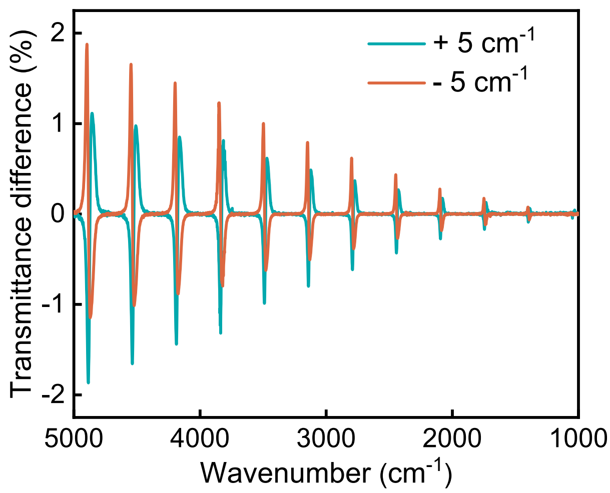

Figure S4. Differential transmittance of cavity modes obtained by varying the cavity length with the piezoelectric actuators.

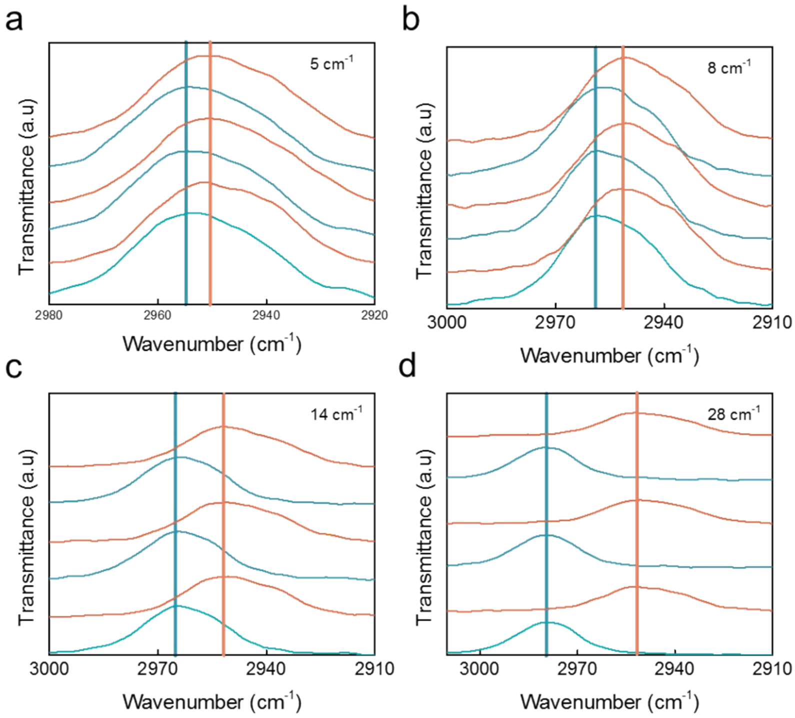

Figure S5. Transmission spectra of a cavity mode obtained by repeatedly applying the same piezo electric actuation voltage for different targeting wavenumber shifts (5, 8, 14, and 28 cm^{-1}), suggesting an excellent tuning reproducibility of the system.

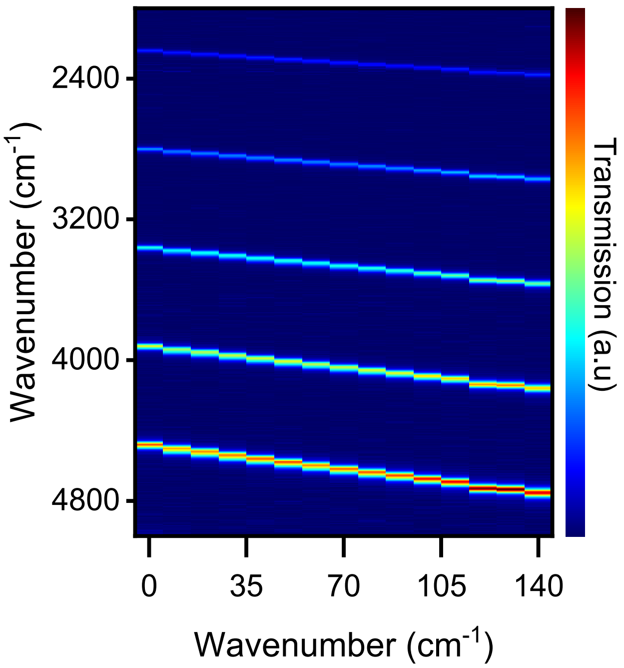

Figure S6. Piezoelectric tuning of cavity modes with an air-filled cavity and a PDMS spacer

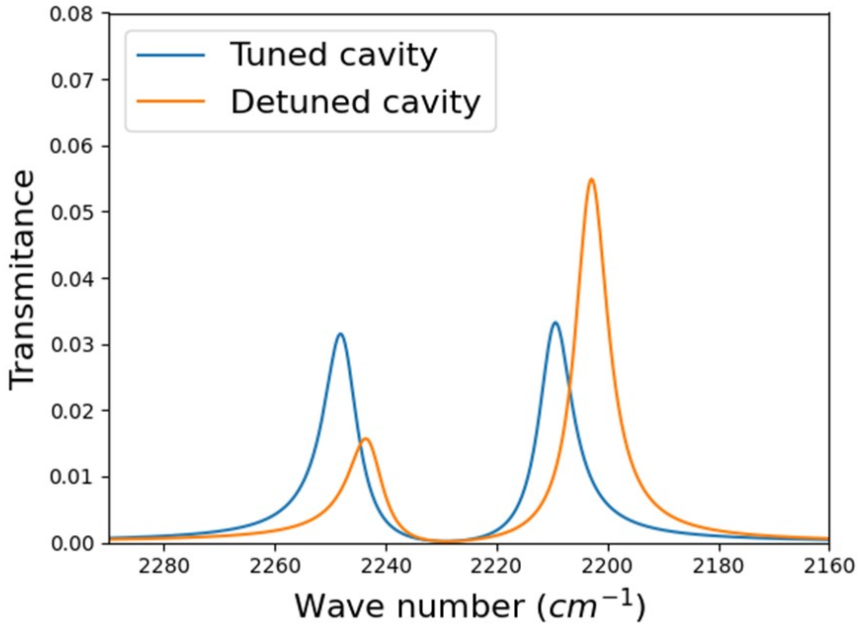

Figure S7. Transmission spectra of vibrational polaritons calculated using realistic parameters.

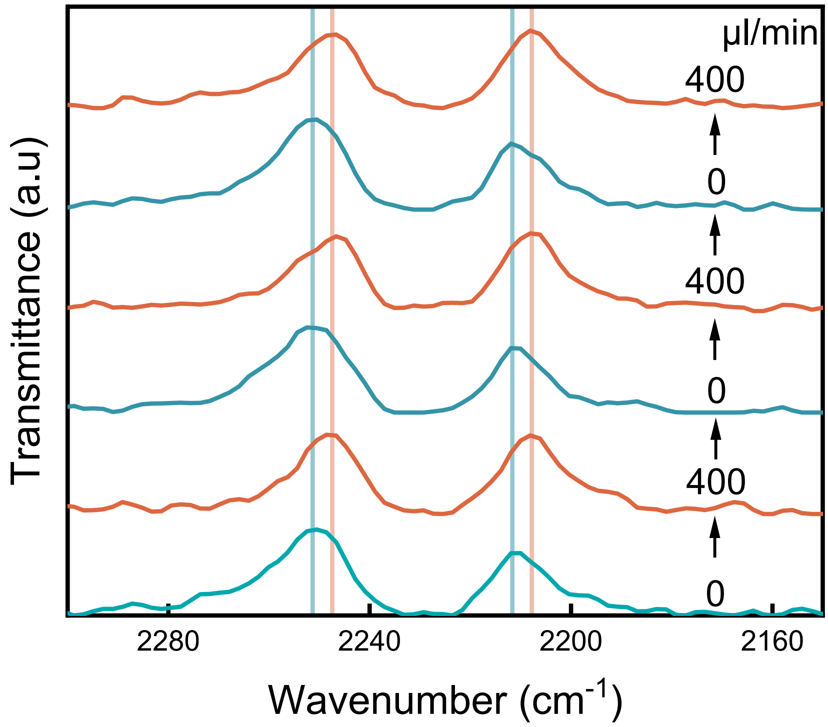

Figure.S8 Transmission spectra of the vibrational polariton modes by repeatedly switch on and off a 400 μl/min flow in the cavity; showing a good reproducibility and a fine tuning capability of the system.

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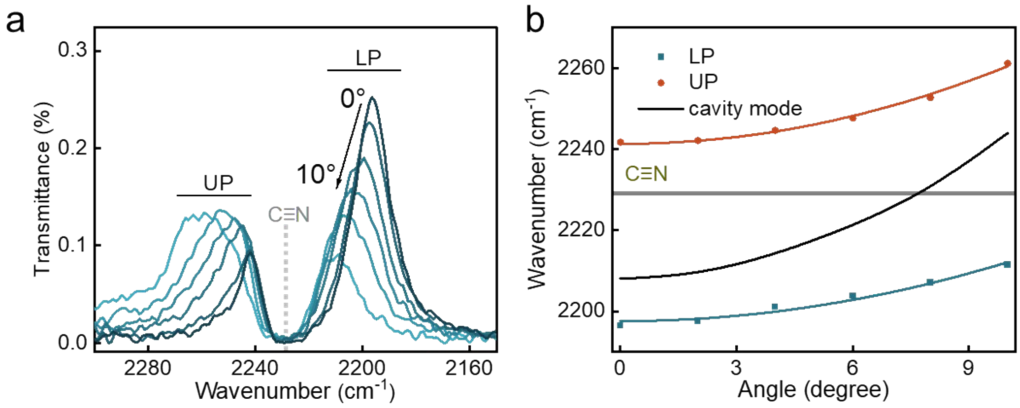

Figure S9. (a) Transmission spectra of C≡N stretching mode of acrylonitrile-filled cavity with different light incident angles, varying from 0 to 10° in steps of 2°. (b) Dispersion of the angle-dependent transmission taken from (a) and fitted according to polariton energies. Black line: Cavity mode; Gray line: vibrational mode of C≡N bond.

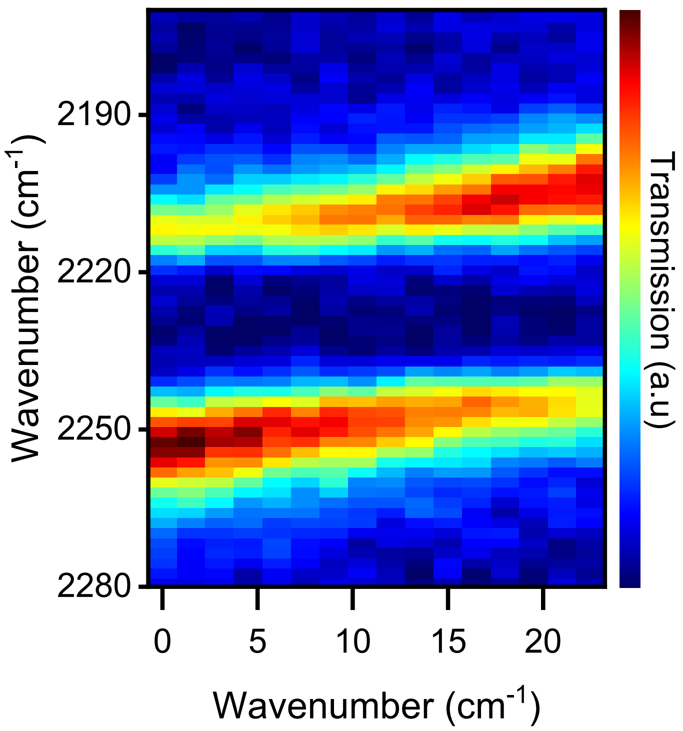

Figure S10. Polariton dispersion of an acrylonitrile-filled cavity obtained by piezoelectric tuning.