Radio Frequency Detection and Characterization of Water-Ethanol Solution through Spiral-Coupled Passive Micro-Resonator Sensor

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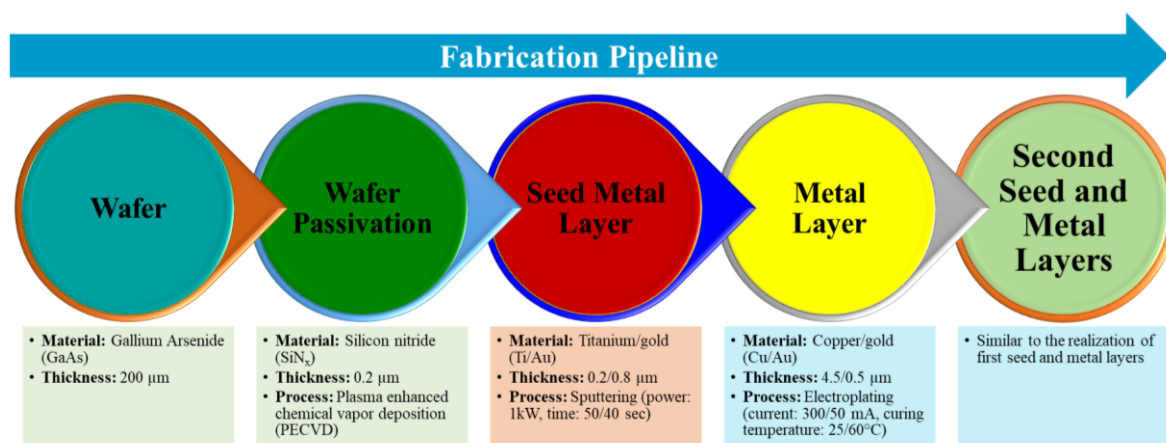
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Figure S1. Passive microresonator sensor fabrication. Realization of the passive microresonator sensor using home-developed IPD fabrication processing.
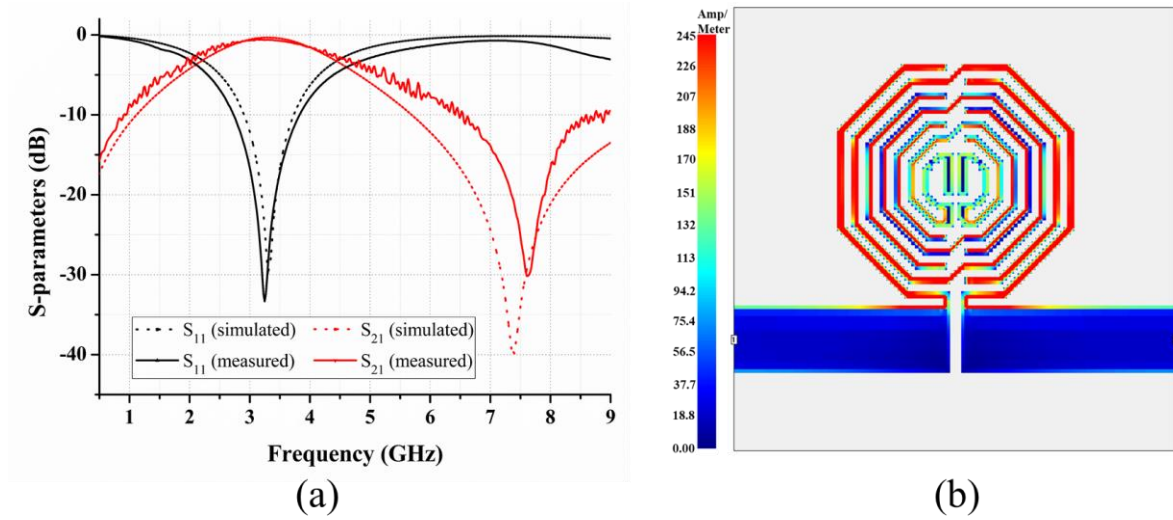
(a)　　　　　　　　　　　　　　(b)

Figure S2. Performance of the bare sensor. (a) Comparison between the simulated and measured scattering parameters, and (b) distribution of the current source density at a simulated resonance frequency of 3.3 GHz.

Table S1. Measured resonance frequencies (in GHz) and corresponding rejection levels (in dB) for three different iterations.

| | Iteration 1 | | Iteration 2 | | Iteration 3 | | Mean ± SE | |
	RF	S_{11}	RF	S_{11}	RF	S_{11}	RF	S_{11}
DI Water	1.16	-27.44	1.16	-29.74	1.14	-26.08	1.15±0.006	-27.75±1.06
5%	1.21	-22.32	1.23	-23.78	1.25	-22.80	1.23±0.010	-22.96±0.43
10%	1.31	-26.20	1.29	-25.04	1.27	-24.36	1.29±0.010	-25.20±0.53
20%	1.36	-23.40	1.36	-22.62	1.38	-22.16	1.37±0.006	-22.73±0.36
30%	1.50	-20.92	1.48	-21.10	1.51	-18.20	1.50±0.008	-20.07±0.94
40%	1.57	-16.91	1.59	-17.02	1.60	-16.35	1.59±0.008	-16.76±0.20
50%	1.72	-13.70	1.68	-14.81	1.70	-13.46	1.70±0.010	-13.99±0.41

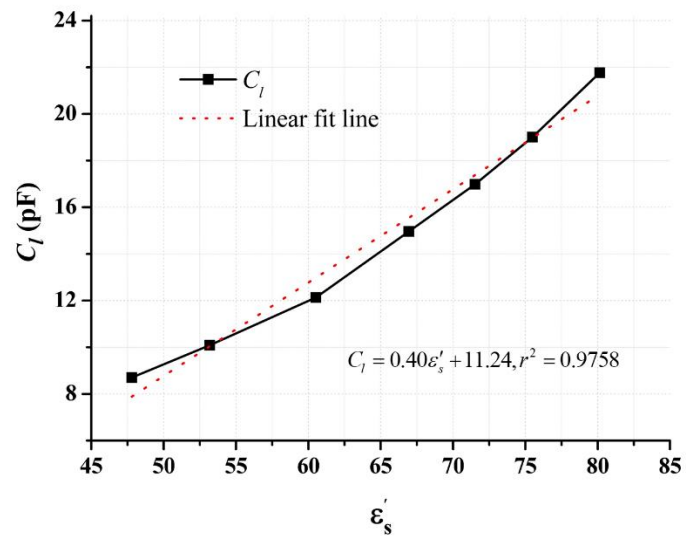DI: deionized; RF: resonance frequency; Mean ± SE: Mean ± Standard Error

Figure S3. Loaded capacitance versus relative permittivity. Relationship between the computed values of the gap capacitance (*Cl*) and the relative permittivity (ε'_s) of the solution.