

# Detection of Trace Amounts of Water in Organic Solvents by DNA-Based Nanomechanical Sensors

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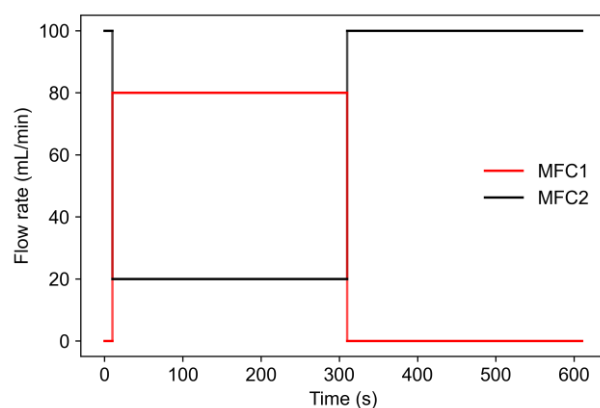
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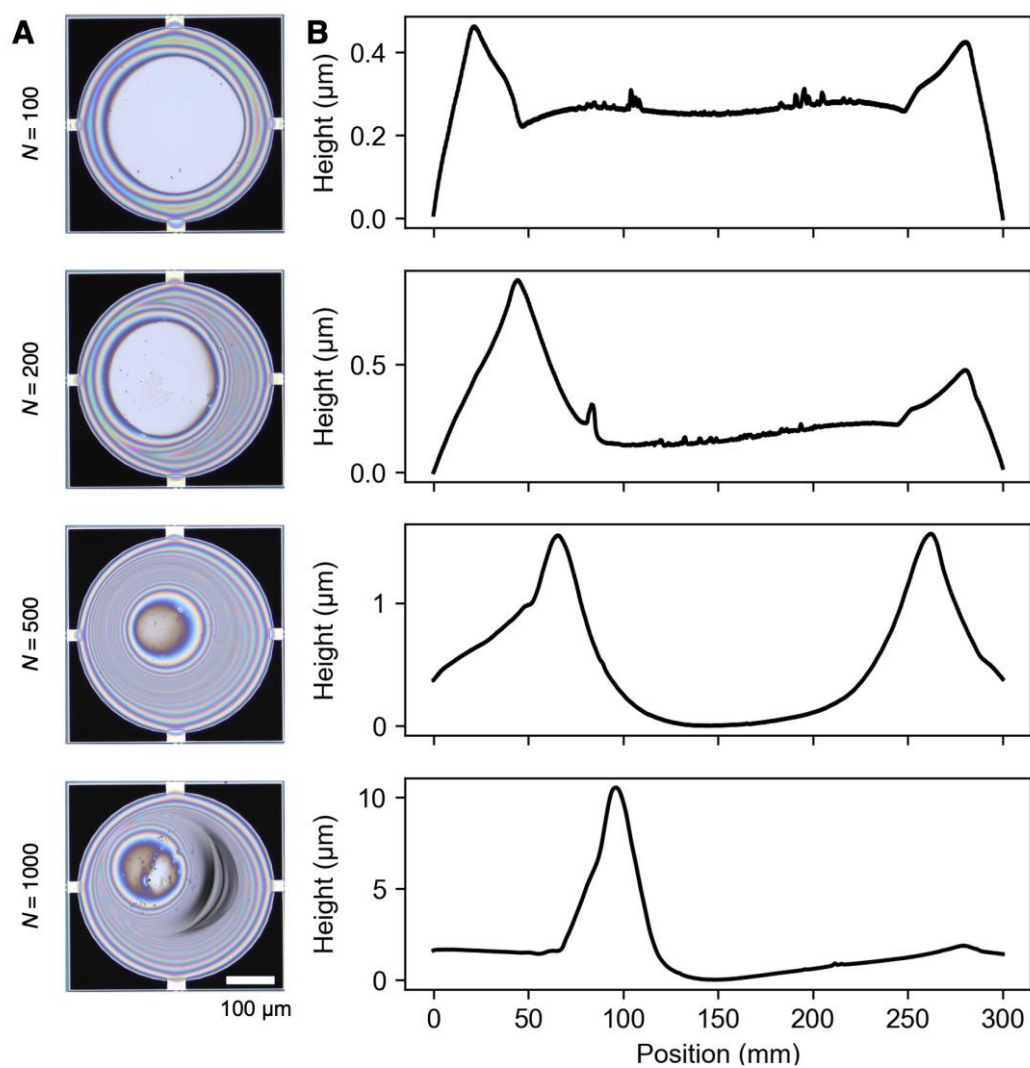
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## Supplementary Figures

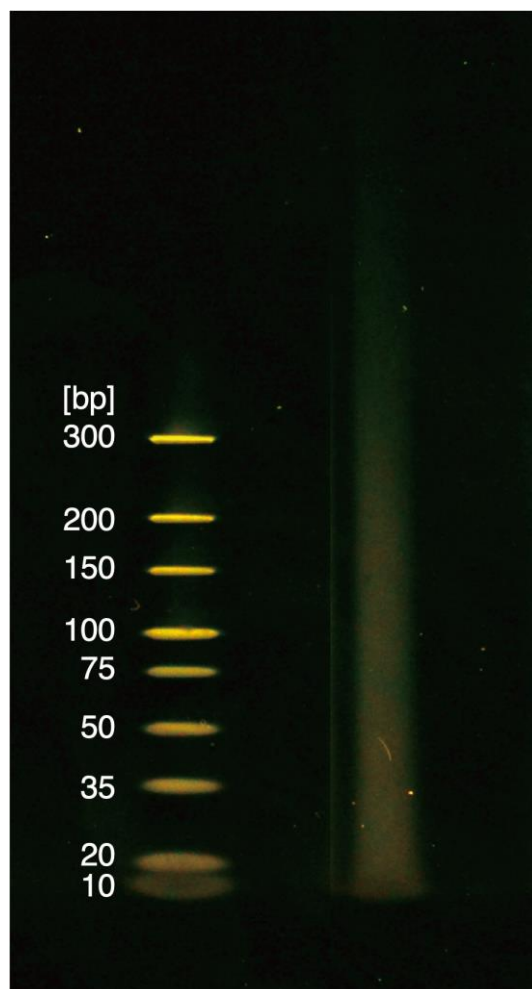


**Figure S1.** Sensing sequence of mass flow controllers (MFCs).



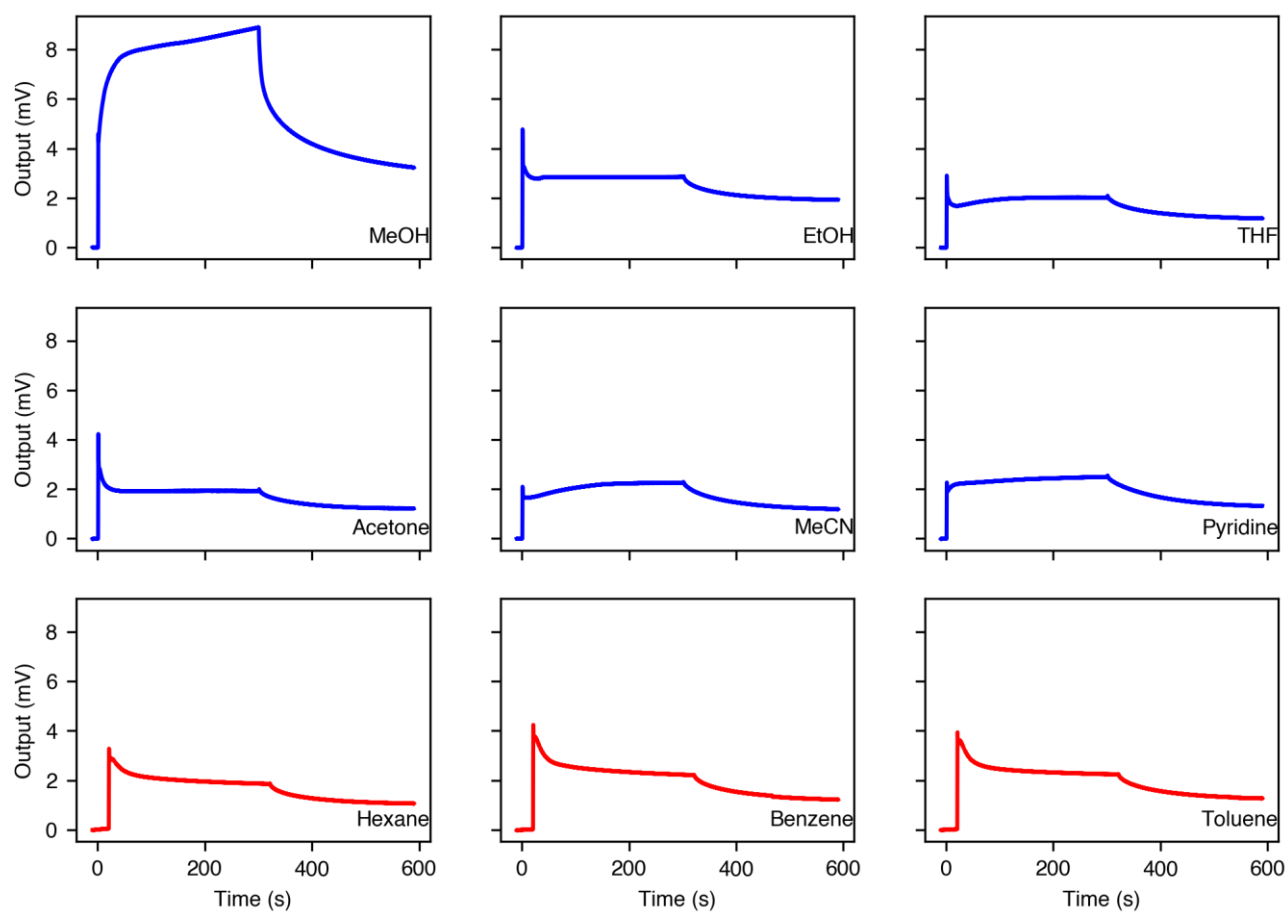
**Figure S2.** Surface profile of the DNA films coated on MSS.

**A,** Optical microscope mages of the DNA films with different number of inkjet drop-lets ( $N$ ). **B,** Surface profile of the DNA films on MSS measured by surface stylus profiler.

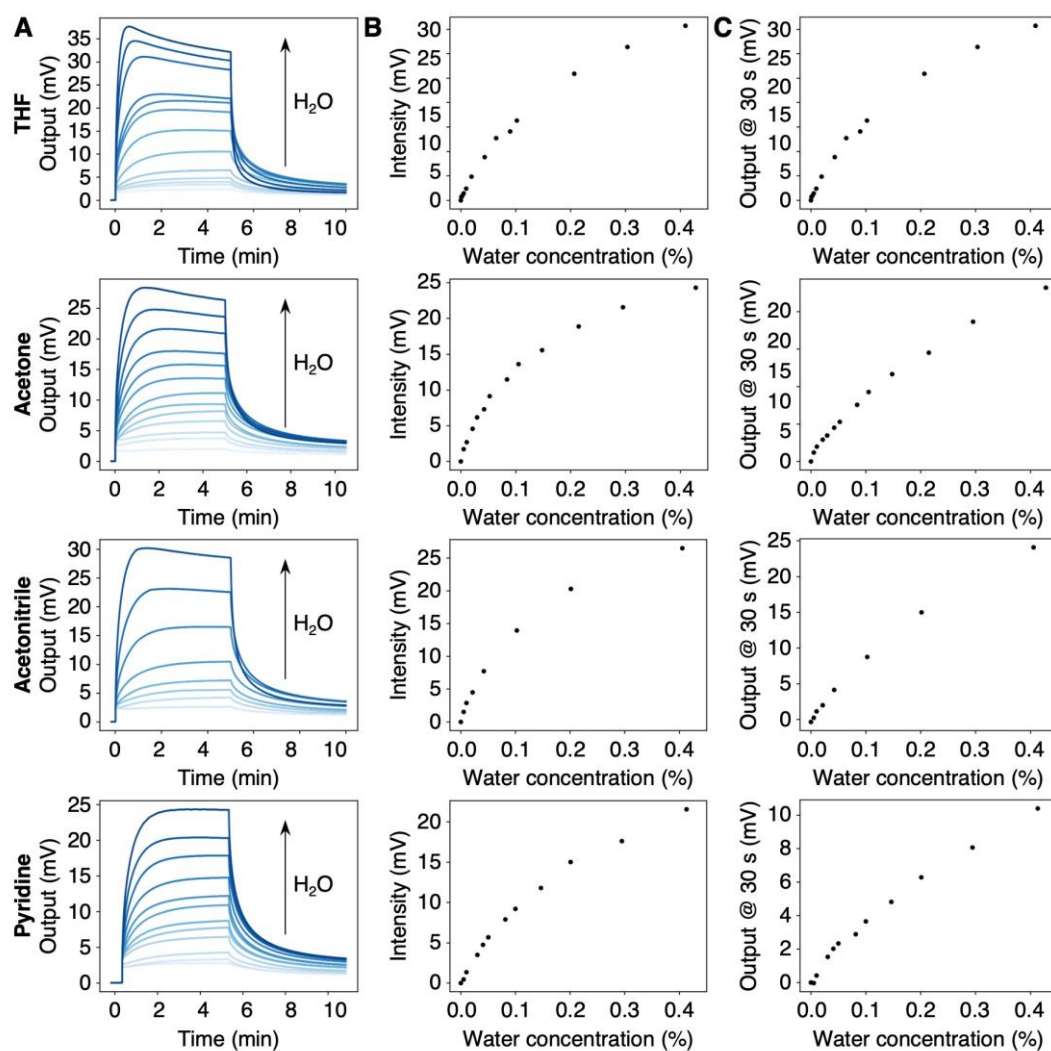


**Figure S3.** Electrophoresis of calf thymus DNA used in this work.

Polyacrylamide gel electrophoresis (e-PAGE) in TG buffer. DNA was stained with SYBR Gold.

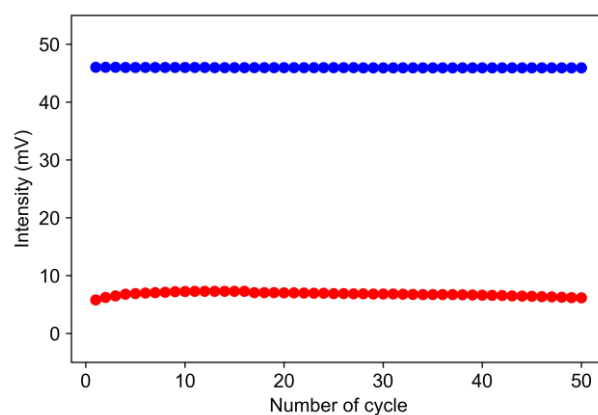


**Figure S4.** Signal responses to various vapors of organic solvents.



**Figure S5.** Signal responses to trace amount of water in various organic solvents.

**A,** Concentration-dependent signal responses to water in organic solvents: THF, acetone, acetonitrile, and pyridine. **B,C,** Plots of signal intensities (**B**) and output at 30 s after vapor injection (**C**) as a function of water concentration (w/w%).



**Figure S6.** Reproducibility of DNA-based MSS.

Plots of signal intensities to water vapor (80%RH, blue) and vapor of water in THF (100 ppm, red).

## Supplementary Table

**Table S1.** Relative sensitivity and Limit of Detection (LoD) of relative humidity sensors reported in literature.

Device	Receptor material	LoD [%RH]	Reference
Surface acoustic wave resonator (SAW)	MWCNT/nafion	0.5	[1]
Capacitive ultrasonic transducer (CMUT)	GO	0.4	[2]
Quartz crystal microbalance (QCM)	ZnO nanotetrapods	0.3	[3]
Surface acoustic wave resonator (SAW)	GO/PVA/SiO <sub>2</sub>	0.25	[4]
Microcantilever, dynamic mode	ZnO-based cantilever	0.20	[5]
Film bulk acoustic wave resonator (FBAR)	ZnO	0.12	[6]
Membrane-type surface stress sensor (MSS)	CAB	0.09	[7]
Membrane-type surface stress sensor (MSS)	PEI	0.05	[8]
Quartz crystal microbalance (QCM)	TiO <sub>2</sub> nanoparticles	0.04	[9]
Microcantilever, dynamic mode	Hydrogel	0.03	[10]
Membrane-type surface stress sensor (MSS)	PEI	0.02	[8]
Microcantilever, dynamic mode	PMMA	0.02	[11]
Membrane-type surface stress sensor (MSS)	GO	0.019	[12]
Quartz crystal microbalance (QCM)	Cellulose nanocrystal	0.015	[13]
Membrane-type surface stress sensor (MSS)	PSS	0.008	[14]
Quartz crystal microbalance (QCM)	GO/PEI film	0.0069	[15]
Microcantilever, dynamic mode	CMOS metal	0.005	[16]
Capacitive micromachined ultrasonic transducer (CMUT)	Mesoporous silica	0.0014	[17]
<b>Membrane-type surface stress sensor (MSS)</b>		<b>0.0017</b>	<b>This work</b>

Abbreviations: CAB, cellulose acetate butyrate; GO, graphene oxide; MWCNT, multi-wall carbon nanotube; PEI, poly(ethylene imine); PSS, poly(sodium 4-styrenesulfate); PVA, poly(vinyl alcohol)

**Table S2.** Limit of Detection (LoD) of DNA-based MSS to trace amount of water in organic solvents.

Solvent	LoD	
	(w/w%)	(ppb)
THF	0.000053	530
Acetone	0.000082	820
Acetonitrile	0.000076	760
Pyridine	0.000120	1200

## Supplementary References

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