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Exploring the feasibility of an air sensor array for real-time detection and characterization of VOCs

Amanda Gao et al.

Correspondence to: Amanda Gao (amanda.gao@usda.gov) and Jesse H. Kroll (jhkroll@mit.edu)

Table S1: Summary of VOC air sensor sensitivities.

	PID Sensitivity (mV/ppb)			EC Sensitivity (mV/ppb)		
Compound	10.0 eV	10.6 eV	HS	Type 1 (no bias)	Type 1 (bias)	Type 2
1-hexene	5.1×10^{-3} (± 2.6×10^{-4})	5.2×10^{-3} (± 5.5×10^{-4})	2.5×10^{-1} (± 4.2×10^{-3})	2.0×10^{-3} (±2.6×10^{-4})	-	1.8×10^{-3} (± 3.0×10^{-4})
1-octene	6.12×10^{-4} (± 1.5×10^{-4})	-	1.2×10^{-1} (± 2.1×10^{-3})	1.4×10^{-3} (± 2.3×10^{-4})	8.4×10^{-3} (± 1.7×10^{-3})	1.1×10^{-3} (± 1.2×10^{-4})
2-pentanone	3.6×10^{-3} (± 3.7×10^{-4})	3.3×10^{-3} (± 6.6×10^{-4})	4.0×10^{-1} (± 6.6×10^{-3})	-	-	-
2-heptanone	-	-	1.5×10^{-1} (± 6.3×10^{-3})	-	-	-
acetone	3.32×10^{-2} (± 3.7×10^{-4})	8.1×10^{-2} (± 1.0×10^{-3})	1.8 (± 2.3×10^{-2})	-	-	-
α-pinene	3.5×10^{-3} (± 2.4×10^{-4})	-	3.1×10^{-1} (± 6.5×10^{-3})	-	-	-
chloro- benzene	1.6×10^{-2} (± 7.2×10^{-4})	2.5×10^{-2} (± 7.0×10^{-4})	8.6×10^{-1} (± 1.2×10^{-2})	-	-	-
isoprene	1.5×10^{-2} (± 9.5×10^{-4})	1.9×10^{-2} (± 2.4×10^{-3})	6.6×10^{-1} (± 1.9×10^{-2})	1.0×10^{-2} (± 6.0×10^{-4})	2.7×10^{-2} (± 2.2×10^{-3})	1.1×10^{-2} (± 3.3×10^{-4})
o-xylene	3.1×10^{-3} (± 5.7×10^{-5})	2.1×10^{-3} (± 1.0×10^{-5})	4.9×10^{-2} (± 7.5×10^{-4})	1.3×10^{-3} (± 2.5×10^{-4})	-	-
toluene	3.3×10^{-3} (± 1.8×10^{-4})	3.3×10^{-3} (± 3.7×10^{-4})	2.7×10^{-1} (± 3.2×10^{-3})	6.4×10^{-4} (± 1.8×10^{-4})	2.8×10^{-3} (± 6.1×10^{-4})	-
	MOx Type 1 **Sensitivity: A (mV/ppb$^{\beta}$)**			**MOx Type 2** **Sensitivity: A (mV/ppb$^{\beta}$)**		
Compound	4.75 V	5.0 V	5.25 V	4.75 V	5.0 V	5.25 V
1-hexene	A: 17 (± 5.4) β: 7.1×10^{-1} (± 6.3×10^{-2})	A: 3.5 (± 1.6) β: 9.6×10^{-1} (± 9.3×10^{-2})	A: 17 (± 4.8) β: 6.5×10^{-1} (± 5.6×10^{-2})	A: 65 (± 32) β: 7.4×10^{-1} (± 9.8×10^{-2})	A: 32 (± 14) β: 8.4×10^{-1} (± 9.0×10^{-2})	A: 38 (±14) β: 7.5×10^{-1} (± 7.5×10^{-2})
1-octene	A: 9.4 (± 6.4) β: 7.5×10^{-1} (± 1.4×10^{-1})	A: 6.4×10^{-1} (± 3.4×10^{-1}) β: 1.2 (± 1.2×10^{-1})	A: 18 (± 9.6) β: 5.7×10^{-1} (± 9.9×10^{-2})	A: 17 (± 6.2) β: 9.6×10^{-1} (± 7.7×10^{-2})	A: 11 (± 4.9) β: 9.9×10^{-1} (± 9.3×10^{-2})	A: 19 (± 7.9) β: 8.2×10^{-1} (± 8.4×10^{-2})
2-pentanone	A: 19 (± 5.8) β: 6.9×10^{-1} (± 6.2×10^{-2})	A: 4.9 (± 1.2) β: 9.0×10^{-1} (± 5.0×10^{-2})	A: 20 (± 4.6) β: 6.2×10^{-1} (± 4.5×10^{-2})	A: 1.4×10^{2} (± 65) β: 6.0×10^{-1} (± 8.8×10^{-2})	A: 53 (± 20) β: 7.6×10^{-1} (± 7.7×10^{-2})	A: 56 (± 18) β: 6.9×10^{-1} (± 6.5×10^{-2})
2-heptanone	A: 9.2 (± 2.8) β: 7.8×10^{-1} (± 6.2×10^{-2})	A: 5.3×10^{-1} (± 2.2×10^{-1}) β: 1.3	A: 15 (± 4.1) β: 6.4×10^{-1} (± 5.1×10^{-2})	A: 50 (± 9.5) β: 7.8×10^{-1} (± 3.8×10^{-2})	A: 13 (± 1.6) β: 9.9×10^{-1} (± 2.5×10^{-2})	A: 24 (± 3.2) β: 8.1×10^{-1} (± 2.6×10^{-2})

		(± 8.7×10^{-2})				
acetone	A: 13 (± 4.5) β: 7.5×10^{-1} (± 7.1×10^{-2})	A: 6.1 (± 1.5) β: 8.4×10^{-1} (± 5.0×10^{-2})	A: 17 (± 3.3) β: 6.5×10^{-1} (± 3.9×10^{-2})	A: 84 (± 32) β: 6.9×10^{-1} (± 7.5×10^{-2})	A: 38 (± 13) β: 8.0×10^{-1} (± 6.7×10^{-2})	A: 39 (± 11) β: 7.6×10^{-1} (± 5.7×10^{-2})
α-pinene	A: 18 (± 9.8) β: 7.3×10^{-1} (± 1.1×10^{-1})	A: 2.1 (± 7.8×10^{-2}) β: 1.1 (± 8.0×10^{-3})	A: 36 (± 18) β: 5.2×10^{-1} (± 9.2×10^{-2})	A: 2.9×10^{2} (± 2.0×10^{2}) β: 4.8×10^{-1} (± 1.2×10^{-1})	A: 93 (± 21) β: 6.7×10^{-1} (± 4.4×10^{-2})	A: 1.4×10^{2} (± 28) β: 5.4×10^{-1} (± 3.8×10^{-2})
chloro- benzene	A: 5.7 (± 3.9) β: 8.4×10^{-1} (± 1.4×10^{-1})	A: 2.6 (± 1.4) β: 8.7×10^{-1} (± 1.1×10^{-1})	A: 5.3 (± 2.7) β: 7.6×10^{-1} (± 1.0×10^{-1})	A: 4.2 (± 2.0) β: 9.2×10^{-1} (± 1.0×10^{-1})	A: 4.1(± 1.3) β: 9.9×10^{-1} (± 6.5×10^{-2})	A: 6.5 (± 2.0) β: 9.1×10^{-1} (± 6.4×10^{-2})
isoprene	A: 22 (± 5.1) β: 7.0×10^{-1} (± 4.5×10^{-2})	A: 14 (± 4.8) β: 7.6×10^{-1} (± 6.9×10^{-2})	A: 14 (± 7.4) β: 7.2×10^{-1} (± 1.0×10^{-1})	A: 3.1×10^{2} (± 1.7×10^{2}) β: 4.4×10^{-1} (± 9.4×10^{-2})	A: 1.7×10^{2} (± 8.3) β: 5.6×10^{-1} (± 8.9×10^{-2})	A: 1.0×10^{2} (± 46) β: 6.1×10^{-1} (± 8.9×10^{-2})
o-xylene	A: 1.2×10^{-1} (± 1.3×10^{-1}) β: 1.4 (± 2.4×10^{-1})	A: 1.0×10^{-1} (± 1.1×10^{-1}) β: 1.4 (± 2.4×10^{-1})	A: 4.8×10^{-1} (± 3.2×10^{-1}) β: 1.1 (± 1.4×10^{-1})	A: 1.4 (± 6.4×10^{-1}) β: 1.2 (± 9.4×10^{-2})	A: 2.0 (± 6.2×10^{-1}) β: 1.1 (± 6.5×10^{-2})	A: 4.8 (± 2.1) β: 1.0 (± 9.2×10^{-2})
toluene	A: 4.6 (± 1.2) β: 8.3×10^{-1} (± 5.2×10^{-2})	A: 1.2 (± 3.3×10^{-1}) β: 1.0 (± 6.1×10^{-2})	A: 8.5 (± 2.2) β: 6.8×10^{-1} (± 5.2×10^{-2})	A: 35 (± 18) β: 7.1×10^{-1} (± 1.0×10^{-1})	A: 8.0 (± 1.2) β: 1.0 (± 3.0×10^{-2})	A: 14 (± 2.0) β: 8.6×10^{-1} (± 3.0×10^{-2})

Table S2: Summary of sensor sensitivities (in mV/ppb) to binary mixtures.

Mixture	Sensor			
	PID0 (10.0 eV)	**PID2 (HS 10.6 eV)**	**EC Type 1 (no bias)**	**EC Type 2**
1-hexene	5.1×10^{-3} ($\pm 2.6 \times 10^{-4}$)	2.5×10^{-1} ($\pm 4.2 \times 10^{-3}$)	2.0×10^{-3} ($\pm 2.6 \times 10^{-4}$)	1.8×10^{-3} ($\pm 3.0 \times 10^{-4}$)
1-octene	6.0×10^{-4} ($\pm 1.6 \times 10^{-4}$)	1.2×10^{-1} ($\pm 2.1 \times 10^{-3}$)	1.4×10^{-3} ($\pm 2.3 \times 10^{-4}$)	1.1×10^{-3} ($\pm 1.2 \times 10^{-4}$)
1:1 mix	2.8×10^{-3} ($\pm 2.1 \times 10^{-4}$)	1.7×10^{-1} ($\pm 2.3 \times 10^{-3}$)	-[a]	-[a]
3:1 mix	3.4×10^{-3} ($\pm 1.5 \times 10^{-4}$)	2.1×10^{-1} ($\pm 3.4 \times 10^{-3}$)	1.8×10^{-3} ($\pm 2.8 \times 10^{-4}$)	1.5×10^{-3} ($\pm 2.1 \times 10^{-4}$)
α-pinene	3.5×10^{-3} ($\pm 2.4 \times 10^{-4}$)	3.1×10^{-1} ($\pm 6.5 \times 10^{-3}$)	2.5×10^{-3} ($\pm 3.4 \times 10^{-4}$)	2.8×10^{-3} ($\pm 1.2 \times 10^{-4}$)
2-heptanone	1.6×10^{-3} ($\pm 2.6 \times 10^{-4}$)	1.5×10^{-1} ($\pm 6.3 \times 10^{-3}$)	-[b]	-[b]
1:10 mix	1.5×10^{-3} ($\pm 7.0 \times 10^{-5}$)	1.6×10^{-1} ($\pm 5.8 \times 10^{-3}$)	1.0×10^{-3} ($\pm 1.5 \times 10^{-4}$)	9.3×10^{-4} ($\pm 1.0 \times 10^{-4}$)
3:1 mix	2.9×10^{-3} ($\pm 4.3 \times 10^{-4}$)	2.7×10^{-1} ($\pm 1.2 \times 10^{-2}$)	8.7×10^{-4} ($\pm 1.3 \times 10^{-4}$)	1.0×10^{-3} ($\pm 1.7 \times 10^{-4}$)

[a] denotes missing values due to issues with EC power supply.

[b] denotes non-detect due to high signal-to-noise ratio.

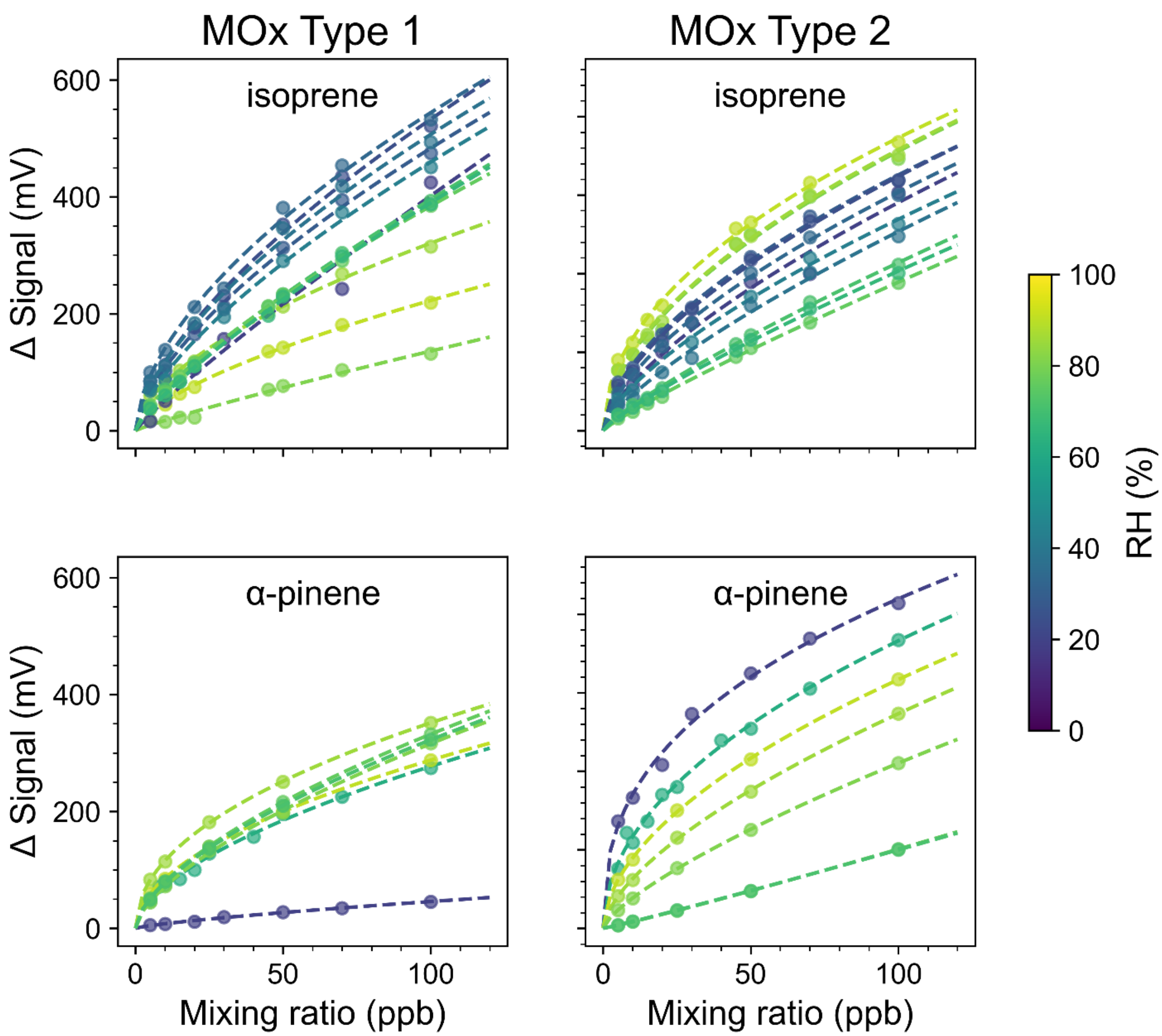

Figure S1: MOx responses to isoprene (first row) and α-pinene. Dotted lines represent the power law regression for measured calibration points. Calibration curves are colored based on the measurement relative humidity.

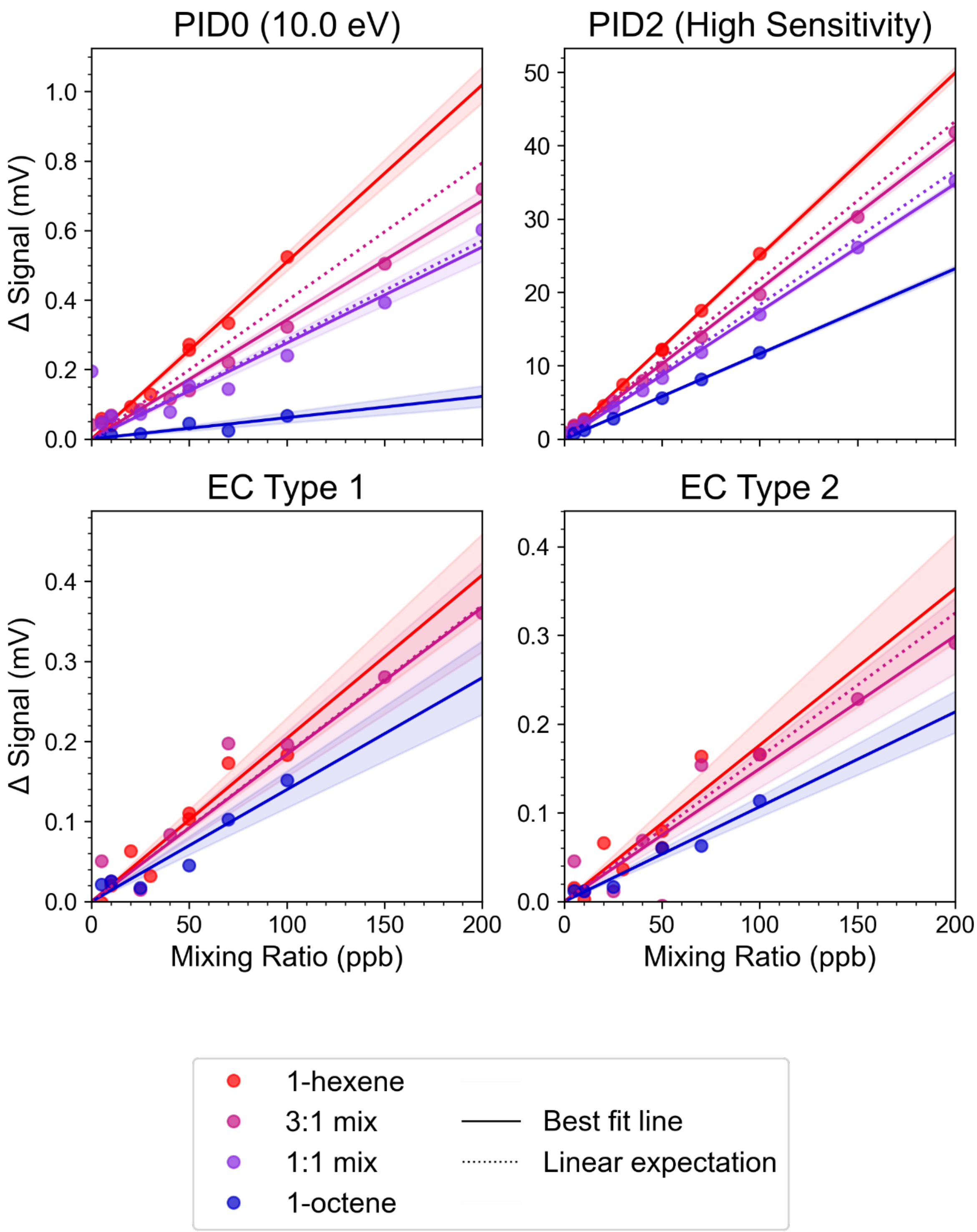

Figure S2: Sensor responses to 1:1 (blue) and 3:1 (dark purple) mixtures of 1-hexene and 1-octene, for (a) two PIDs and (b) two EC sensors. Solid lines indicate the best fit line for each of the points, and the shaded area indicates the 1σ confidence interval; dotted lines indicate the expected signal assuming additivity. The mixing ratio (x axis) refers to the total amount of VOC (i.e., both components of the mixtures) introduced to the sensors. Note that for EC Type 1, the dashed 3:1 mix line partially obscures the respective dotted line. EC measurements of the 1:1 mixture are missing due to issues with the EC power supply.

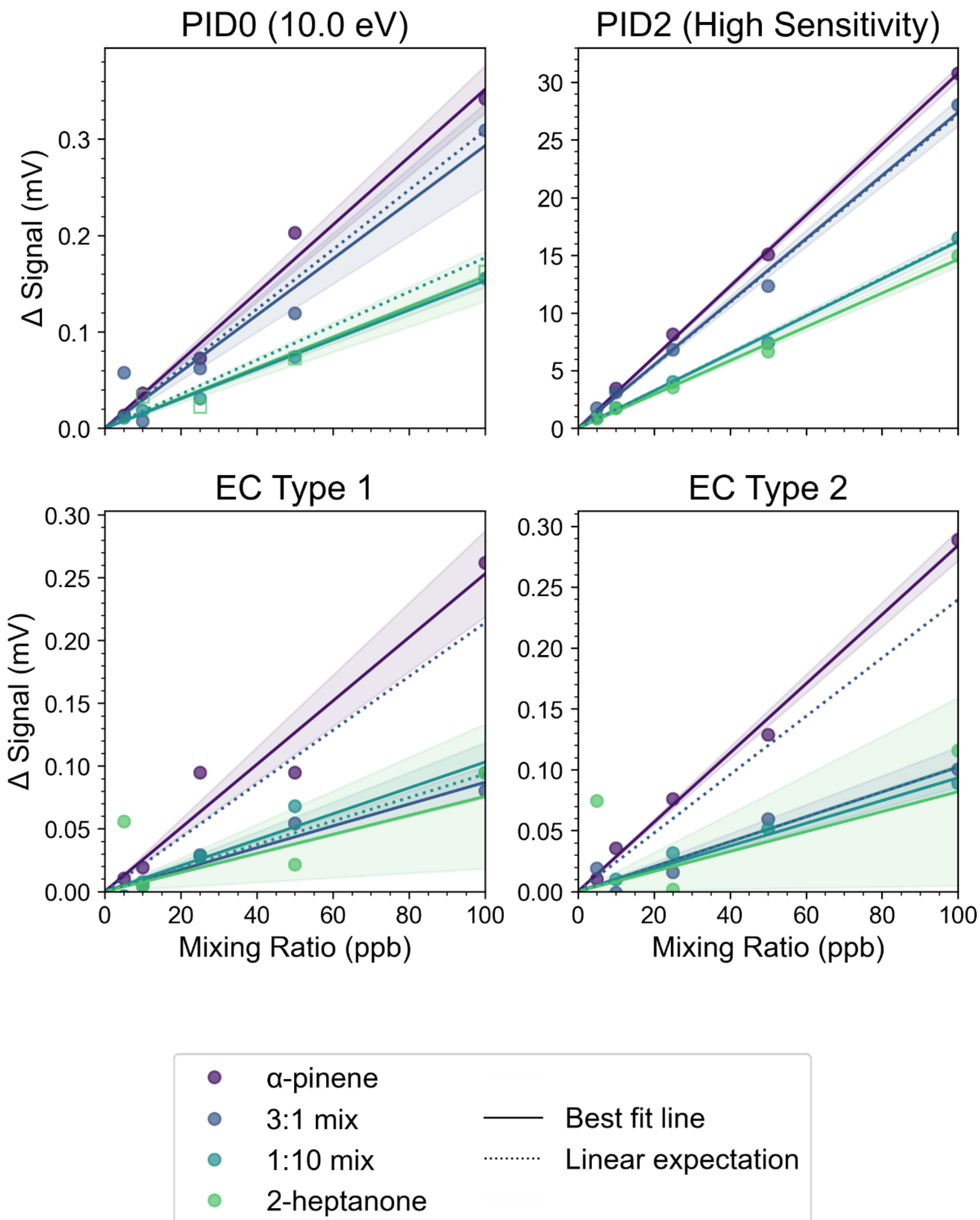

Figure S3: Sensor responses to 3:1 (blue) and 1:10 (teal) mixtures of α-hexene and 2-heptanone, for (a) two PIDs and (b) two EC sensors. Solid lines indicate the best fit line for each of the points, and the shaded area indicates the 1σ confidence interval; dotted lines indicate the expected signal assuming additivity. The mixing ratio (x axis) refers to the total amount of VOC (i.e., both components of the mixtures) introduced to the sensors. Note that for ECs, 2-heptanone signal falls below the signal-to-noise ratio threshold described in the main text and is labelled as a non-detect. We show the fit line here for illustrative purposes.