

## Supporting Information

# Quantitative Determination of Ethylene Using a Smartphone-Based Optical Fiber Sensor (SOFS) Coupled with Pyrene-Tagged Grubbs Catalyst

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### I. ADDITIONAL EXPERIMENTAL PROCEDURES

#### **Procedures for preparing interfering gases.**

Sodium sulfite ( $\text{Na}_2\text{SO}_3$ ) was freshly prepared with a stock solution concentration of 10.0 mM in PB 7.4 solution.  $\text{SO}_2$  gas was prepared from the reaction of  $\text{Na}_2\text{SO}_3$  with concentrated  $\text{H}_2\text{SO}_4$  in a 25 mL round bottom flask. Carbon dioxide ( $\text{CO}_2$ ) was prepared by diluting the pure  $\text{CO}_2$  gas to the target concentration in a 25 mL round bottom flask.  $\text{NO}_2$  gas was prepared from the reaction of pure NO with air in a 25 mL round bottom flask.  $\text{H}_2\text{S}$  gas was prepared from the addition of  $\text{Na}_2\text{S}$  with PB 7.4 solution in a 25 mL round bottom flask.  $\text{NH}_3$  gas was prepared from the reaction of  $\text{NH}_4\text{Cl}$  with  $\text{Ca}(\text{OH})_2$  in a 25 mL round bottom flask. Generally, 2 mL of these gas samples were slowly bubbled 1 mL dichloromethane before addition of 30  $\mu\text{L}$  PYG probe stock solution and shaken for 3 min. The RGB values were recorded using a CMOS sensor with ISO 800, exposure rate 1/30s and 1440p.

## II. TABLE and FIGURE

**Table S1.** RGB values of the PYG solution bubbled with different concentrations of ethylene.

Concentration of Ethylene (ppm)	$R_{\mu}$	$G_{\mu}$	$B_{\mu}$
500	1.33	36.00	107.67
400	1.00	49.67	116.33
350	1.33	72.00	143.00
300	1.67	73.67	139.33
250	1.33	79.00	134.67
200	1.33	84.00	138.00
150	1.33	82.00	120.33
100	1.67	82.67	115.00
75	1.67	85.33	114.33
50	1.67	86.67	111.33
37.5	1.33	90.00	111.67
25	1.00	98.00	117.33
20	1.33	85.00	100.67
15	2.00	74.00	87.67
0	1.00	65.00	74.00

**Table S2.**  $(B/G)/(B/G)_0$  values of the PYG solution bubbled with different interfering gases and ethylene at 100 ppm.

Species	$(B/G)/(B/G)_0$
Blank	1.233
Ethylene	1.029
MeOH	1.022
EtOH	1.000
1-prop	0.992
H <sub>2</sub> O	1.009
EA	1.009
Tol	1.001
THF	1.222

**Table S3.** (B/G)/(B/G)<sub>0</sub> values of the PYG solution bubbled with different interfering gases and ethylene at 100 ppm.

Gas Species	w/o Ethylene	w Ethylene
Blank	1	1.225
SO <sub>2</sub>	1.029	1.235
CO <sub>2</sub>	1.020	1.227
NH <sub>3</sub>	0.989	1.184
NO <sub>2</sub>	1.008	1.224
H <sub>2</sub> S	1.012	1.222

**Table S4.** Ethylene concentration of avocados in an airtight jar incubated over 8 hours.

Time	B/G <sub>1</sub>	B/G <sub>2</sub>	B/G <sub>3</sub>	Mean	STDEV	(B/G)/(B/G) <sub>0</sub>	[Ethylene] (ppm)
0	1.132	1.145	1.135	1.137	0.009	1.000	0
2	1.179	1.187	1.184	1.183	0.004	1.041	19.112
4	1.246	1.235	1.232	1.238	0.008	1.089	41.564
6	1.280	1.284	1.296	1.287	0.008	1.132	61.730
8	1.318	1.326	1.330	1.325	0.006	1.165	77.337

**Table S5.** Ethylene concentration of apples in an airtight jar incubated over 8 hours.

Time	B/G <sub>1</sub>	B/G <sub>2</sub>	B/G <sub>3</sub>	Mean	STDEV	(B/G)/(B/G) <sub>0</sub>	[Ethylene] (ppm)
0	1.321	1.327	1.327	1.325	0.005	1.000	0
2	1.379	1.350	1.357	1.362	0.015	1.027	12.464
4	1.383	1.407	1.393	1.395	0.012	1.050	23.529
6	1.422	1.415	1.418	1.418	0.003	1.069	32.353
8	1.435	1.433	1.448	1.439	0.008	1.084	39.654

**Table S6.** Ethylene concentration of bananas in an airtight jar incubated over 8 hours.

Time	B/G <sub>1</sub>	B/G <sub>2</sub>	B/G <sub>3</sub>	Mean	STDEV	(B/G)/(B/G) <sub>0</sub>	[Ethylene] (ppm)
0	1.241	1.236	1.232	1.236	0.004	1.000	0
2	1.284	1.297	1.299	1.293	0.008	1.046	21.475
4	1.333	1.328	1.333	1.332	0.003	1.077	36.161
6	1.381	1.379	1.375	1.378	0.003	1.115	53.840
8	1.435	1.443	1.429	1.436	0.007	1.161	75.596