ELECTRONIC SUPPLEMENTARY INFORMATION
FOR:

Foliar Surface Free Energy Affects Platinum Nanoparticle Adhesion, Uptake, and Translocation from Leaves to Roots in Arugula and Escarole

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S1. Additional surface free energy (SFE) methods and solubility parameter determination. The geometric mean (GM) method is a two-liquid method which considers SFE in terms of the sum of dispersive and hydrogen-bonding forces between the solid and liquid:

$$\gamma_{lv}(1 + cos\theta) = 2(\sqrt{\gamma_s^d \gamma_l^d} + \sqrt{\gamma_s^h \gamma_l^h}) \quad \text{(S1)}$$

where γ_s^d and γ_l^d and γ_s^h and γ_l^h denote the dispersive and hydrogen-bonding force components of the solid and liquid, respectively. Solving for SFE is possible because the dispersive and hydrogen-bonding forces can be treated as a geometric mean.[1]

The harmonic mean (HM) method is another two-liquid method developed by Wu[2] in response to shortcomings of the GM method in accurately predicting SFE for polar solid, polar liquid systems. Instead of treating dispersive and hydrogen-bonding forces as a geometric mean, they are treated as additive forces expressed as reciprocal means:

$$\gamma_{lv}(1 + cos\theta) = \frac{4\gamma_s^d \gamma_l^d}{\gamma_s^d + \gamma_l^d} + \frac{4\gamma_s^h \gamma_l^h}{\gamma_s^h + \gamma_l^h} \quad \text{(S2)}$$

The solublity parameter (δ) of a foliar surface is related to γ_{sv} through the cohesive energy density (e_c)[3]:

$$e_c = \left(\frac{\gamma_{sv}}{0.75}\right)^{3/2} \quad \text{(S3)}$$

which in turn is used to solve for δ:

$$\delta = (e_c)^{1/2} \quad \text{(S4)}$$

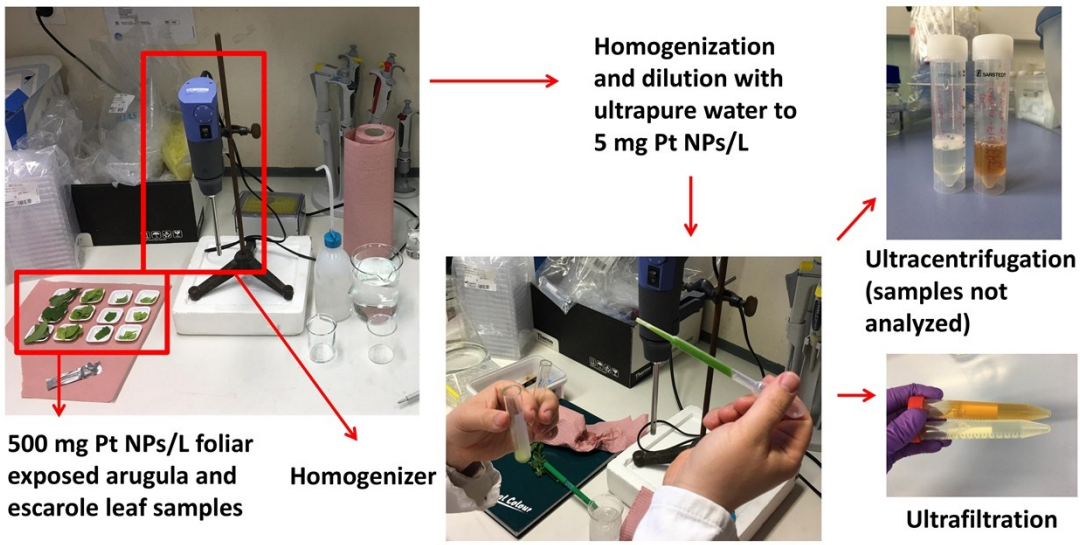
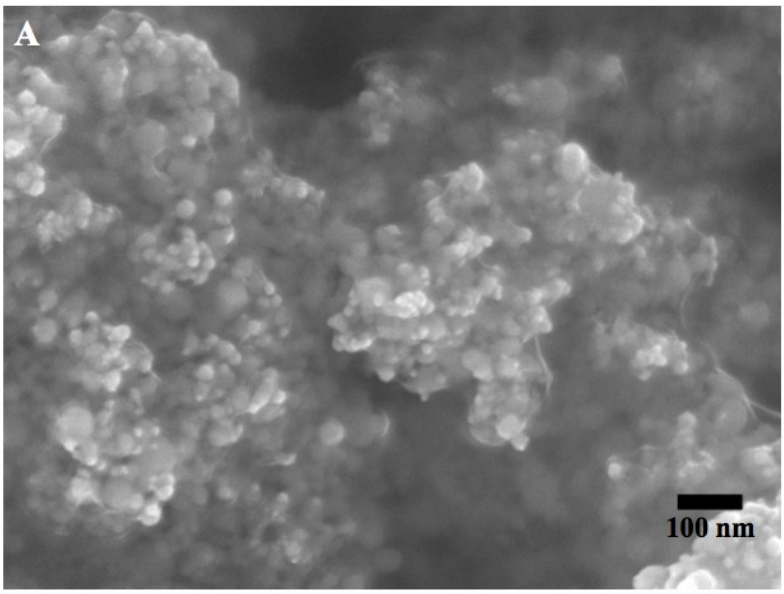
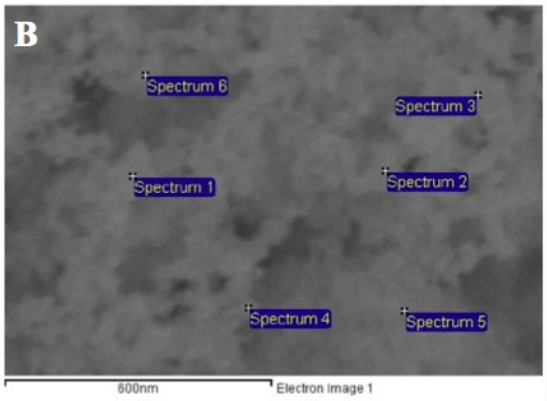


Figure S1. Preparation of foliar exposed arugula and escarole leaf samples (500 mg Pt NPs/L) for Pt NP dissolution analysis using ultracentrifugation and ultrafiltration. The clear and colored supernatant originate from arugula and escarole, respectively.

Figure S2. Photograph of the plant cultivation setup on the day of planting (**A**) along with photographs of arugula (**B**) and escarole (**C**) immediately following foliar application of 500 mg Pt NPs/L dispersion.

Figure S3. Arugula plants 4 weeks following exposure (**A**) in comparison with arugula plants 1 week following exposure (**B**).





Processing option : All elements analysed (Normalised)

Spectrum	In stats.	C	O	S	Pt	Total	
Spectrum 1	Yes	19.30	2.52		78.18	100.00	
Spectrum 2	Yes	18.71	2.01		79.27	100.00	
Spectrum 3	Yes	22.47	3.03	0.96	73.54	100.00	
Spectrum 4	Yes	12.17	2.13	0.83	84.87	100.00	
Spectrum 5	Yes	16.89	2.49		80.61	100.00	
Spectrum 6	Yes		2.92	1.15	95.93	100.00	
Max.		22.47	3.03	1.15	95.93		
Min.		12.17	2.01	0.83	73.54		

Figure S4. SEM micrograph of Pt NPs (**A**) and Pt NP EDX data (**B**).

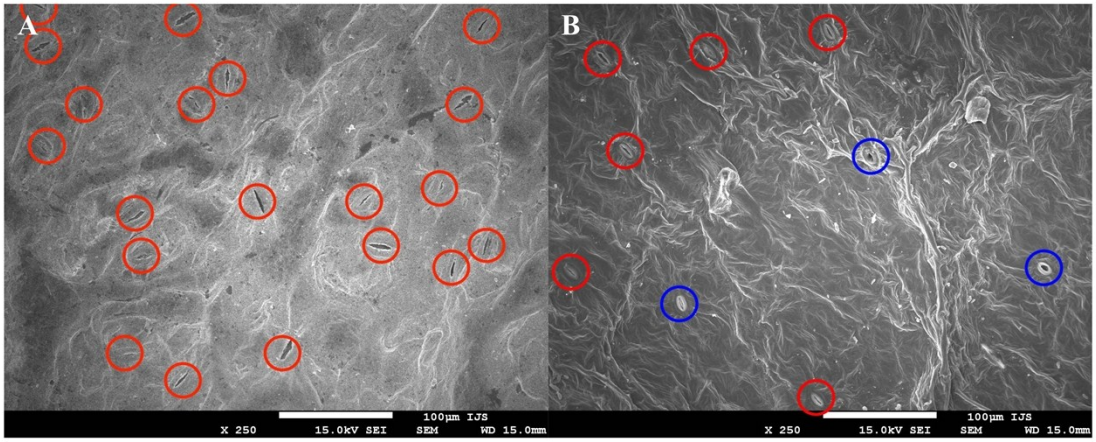


Figure S5. SEM micrographs of 500 mg Pt NPs/L foliar exposed arugula (**A**) and escarole (**B**) leaves. Closed stomata are circled in red and open stomata are circled in blue.

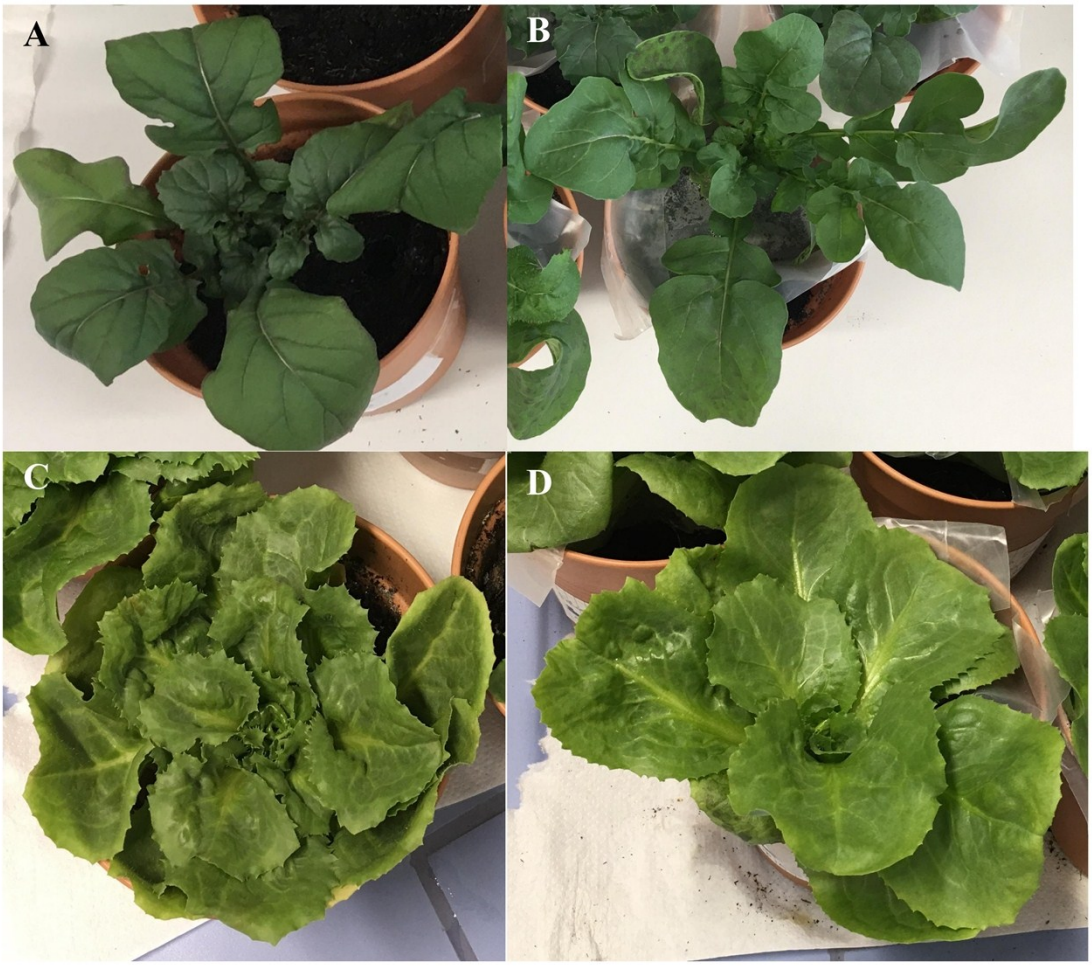


Figure S6. Photographs of arugula (**A**, **B**) and escarole (**C**, **D**) plants (control and 500 mg Pt NPs/L foliar exposed plants on the left and right hand side, respectively) on the day of harvest. No leaf necrosis was observed as a result of the Pt NP experimental exposures.

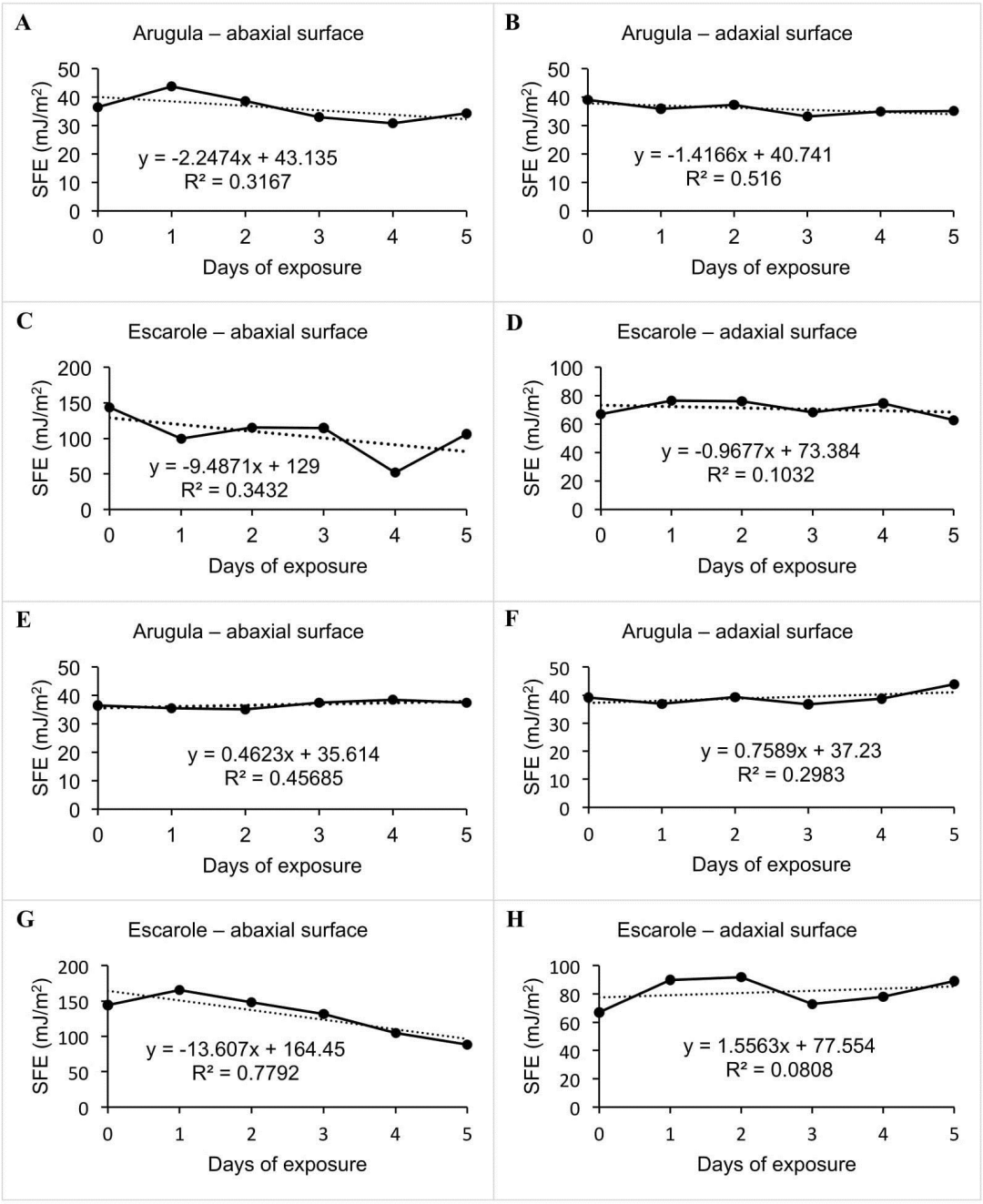


Figure S7. Foliar surface free energy values accompanied by trend lines for abaxial (**A, C, E, G**) and adaxial (**B, D, F, H**) foliar surfaces of arugula (**A, B, E, F**) and escarole (**C, D, G, H**) before the exposure period and following each day of treatment with 5 mg Pt NPs/L (**A-D**) or 50 mg Pt NPs/L (**E-H**). Estimations were made using acid-base theory applying contact angle values from droplets of ultrapure water, diiodomethane, and glycerol (n = 5 per liquid).

Table S1. Preliminary results: arugula leaf and root Pt concentrations as a function of exposure period (4 weeks and 1 week).

Exposure period (weeks)	Exposure	Pt NP Treatment	Leaf Pt Concentration (ng/g DW)	Root Pt Concentration (ng/g DW)
4	Control	0 mg/L	1.99 ± 0.61*	1.88 ± 0.62*
	Root	50 mg/L (20 mL)	22.7 ± 1.2*†	64.3 ± 56.0*†
	Foliar	50 mg/L	147,000 ± 46,600	8.05 ± 2.83
1	Control	0 mg/L	2.59 ± 1.05	1.92 ± 0.794
	Root	50 mg/L (20 mL)	175 ± 56.2†	9.12 ± 1.01†
	Foliar	50 mg/L	123,000 ± 39,700	17.4 ± 11.5

Unless otherwise notated, data are mean ± standard error (SE; n = 3, 5 plants per replicate).

*Data are mean ± SE (n = 2, 5 plants per replicate).

†Significant difference between like exposure groups on the basis of exposure time according to the Mann-Whitney test ($p < 0.05$).

Table S2. Contact angle values from ultrapure water (W), diiodomethane (DM), and glycerol (G) on unexposed abaxial and adaxial arugula and escarole foliar surfaces to examine the effect of aging on SFE (three-liquid acid-base theory method). Measurements were completed every other day over a 10 day period, starting from the day on which Pt NP exposure would begin.

Plant	Surface	Day	θW(°)	θDM(°)	θG(°)	SFE (mJ m^{-2})
Arugula	Abaxial	0	95.87 ± 8.69	48.07 ± 4.81	85.71 ± 10.51	36.47
		2	92.15 ± 5.48	57.06 ± 8.68	88.21 ± 7.89	34.84
		4	92.67 ± 5.79	56.75 ± 9.75	85.83 ± 6.50	31.54
		6	91.13 ± 7.45	58.69 ± 5.22	87.07 ± 5.96	32.63
		8	94.36 ± 1.51	60.43 ± 5.08	90.75 ± 9.78	33.11
		10	93.52 ± 7.79	61.26 ± 8.54	91.86 ± 5.43	35.08
	Adaxial	0	107.48 ± 12.08	51.93 ± 8.39	81.94 ± 7.47	39.12
		2	98.29 ± 11.74	52.20 ± 3.18	94.22 ± 7.69	41.66
		4	95.62 ± 4.89	58.30 ± 6.22	91.86 ± 7.72	35.44
		6	94.96 ±7.30	57.69 ± 5.76	90.04 ± 1.88	34.03
		8	98.27 ± 4.70	55.28 ± 2.63	92.97 ± 4.14	36.92
		10	95.62 ± 5.24	56.02 ± 5.07	93.62 ±4.95	40.69
Escarole	Abaxial	0	44.68 ± 17.97	39.96 ± 4.42	77.93 ± 8.08	143.91
		2	44.38 ± 8.29	36.91 ± 3.72	77.28 ± 3.50	145.10
		4	43.40 ± 3.83	38.25 ± 4.60	76.36 ± 5.42	141.3
		6	43.92 ± 8.43	38.04 ± 4.44	76.85 ± 4.48	142.88
		8	43.80 ± 7.48	37.2 ± 3.66	76.62 ± 10.38	143.15
		10	45.34 ± 12.21	37.32 ± 5.05	77.82 ± 5.85	145.46
	Adaxial	0	44.47 ± 8.31	49.30 ± 8.20	65.53 ± 11.75	67.07
		2	66.60 ± 4.15	56.97 ± 5.66	82.30 ± 7.81	68.81
		4	68. 18 ± 12.44	55.74 ±6.85	83.36 ± 4.00	70.6
		6	64.01 ± 7.06	61.61 ± 3.23	81.69 ± 3.21	65.92
		8	65.97 ± 8.18	52.10 ± 7.76	79.31 ± 5.66	66.08
		10	63.86 ± 4.62	51.37 ± 10.75	78.94 ± 4.18	71.18

All data are mean ± standard deviation (SD; n = 5 per liquid).

Table S3. Characterization of stomata on arugula and escarole foliar surfaces.

		Arugula		Escarole	
Foliar exposure	**Parameter**	**Abaxial surface**	**Adaxial surface**	**Abaxial surface**	**Adaxial surface**
Control	Stomata/mm^2	107 ± 2.32	85.6 ± 15.9	98.6 ± 7.59	69.5 ± 9.94
	Proportion of open stomata (%)	63.5 ± 11.2	60.6 ± 16.0	11.4 ± 12.0	16.7 ± 9.18
500 mg Pt NPs/L	Stomata/mm^2	104 ± 4.05	86.0 ± 11.7	96.3 ± 4.63	68.1 ± 10.4
	Proportion of open stomata (%)	0*	0*	29.2 ± 13.4*	23.4 ± 16.8

All data are mean ± SD (n = 10).

*Significant difference from the control according to the Mann-Whitney test ($p < 0.05$).

Table S4. Dry weight (DW) leaf masses of arugula and escarole at harvest.

Plant	Exposure	Pt NP treatment	DW leaf mass (g)
Arugula	Control	0 mg/L	5.47 ± 0.21
	Root	50 mg/L (20 mL)	6.61 ± 0.93*
	Foliar	5 mg/L	3.72 ± 0.57
		50 mg/L	4.30 ± 1.25
		500 mg/L	2.82 ± 0.16*
Escarole	Control	0 mg/L	5.02 ± 1.43
	Root	50 mg/L (20 mL)	4.81 ± 1.71
	Foliar	5 mg/L	5.91 ± 0.35
		50 mg/L	4.98 ± 0.35
		500 mg/L	4.49 ± 0.45

All data are mean ± SD (n = 3, 5 plants per replicate).

*Significant difference from the control according to the Mann-Whitney test ($p < 0.05$).

Table S5. Contact angle values from ultrapure water (W), diiodomethane (DM), and glycerol (G) on abaxial and adaxial arugula and escarole foliar surfaces before and following each day of foliar exposure to 5, 50, and 500 mg Pt NPs/L dispersion.

Plant	Surface	Exposure, day	θW(°)	θDM(°)	θG(°)
Arugula	Abaxial	Control, 0	95.87 ± 8.69	48.07 ± 4.81	85.71 ± 10.51
		5 mg/L, 1	92.67 ± 6.91	48.91 ± 4.83	89.30 ± 12.04
		5 mg/L, 2	96.08 ± 6.60	49.46 ± 2.97	88.98 ± 1.97
		5 mg/L, 3	99.24 ± 2.49	60.77 ± 7.57	94.41 ± 10.72
		5 mg/L, 4	101.26 ± 3.74	55.92 ± 5.80	89.23 ± 1.72
		5 mg/L, 5	99.44 ± 1.54	54.28 ± 11.00	91.15 ± 14.72
		50 mg/L, 1	102.41 ± 4.88	48.62 ± 2.86	89.46 ± 1.49
		50 mg/L, 2	97.61 ± 3.88	47.48 ± 2.62	85.46 ± 5.56
		50 mg/L, 3	98.42 ± 3.09	49.88 ± 2.38	89.89 ± 1.03
		50 mg/L, 4	97.89 ± 5.33	49.57 ± 1.95	90.22 ± 0.83
		50 mg/L, 5	101.35 ± 11.88	49.81 ± 2.21	92.16± 2.64
		500 mg/L, 1	92.06 ± 19.62	51.67 ± 4.74	93.41 ± 11.35
		500 mg/L, 2	69.62 ± 13.79	42.83 ± 11.22	88.56 ± 6.34
		500 mg/L, 3	80.74 ± 6.91	36.92 ± 3.48	83.61 ± 8.49
		500 mg/L, 4	91.18 ± 5.45	59.42 ± 3.51	89.59 ± 3.84
		500 mg/L, 5	74.67 ± 9.98	34.96 ± 10.11	101.28 ± 31.40
Arugula	Adaxial	Control, 0	107.48 ± 12.09	51.93 ± 8.39	81.94 ± 7.47
		5 mg/L, 1	100.73 ± 3.07	49.13 ± 3.69	79.59 ± 3.09
		5 mg/L, 2	104.78 ± 9.94	53.53 ± 6.53	80.35 ± 2.38
		5 mg/L, 3	100.14 ± 2.48	52.19 ± 7.97	88.10 ± 17.61
		5 mg/L, 4	101.14 ± 3.37	50.48 ± 4.99	80.35 ± 1.46
		5 mg/L, 5	95.32 ± 7.42	47.64 ± 2.42	78.64 ± 1.51
		50 mg/L, 1	103.80 ± 8.18	47.12 ± 4.49	91.08 ± 0.62
		50 mg/L, 2	100.88 ± 2.77	40.78 ± 7.29	85.72 ± 5.41
		50 mg/L, 3	108.79 ± 9.22	45.95 ± 2.75	92.74 ± 0.78
		50 mg/L, 4	105.89 ± 8.15	43.36 ± 2.60	91.60 ± 3.59
		50 mg/L, 5	102.64 ± 6.76	43.04 ± 3.07	94.30 ± 1.47
		500 mg/L, 1	94.94 ± 7.84	38.39 ± 7.34	97.52 ± 3.69
		500 mg/L, 2	89.69 ± 11.68	54.24 ± 8.58	98.38 ± 6.43
		500 mg/L, 3	83.89 ± 10.32	36.39 ± 7.40	87.96 ± 7.79
		500 mg/L, 4	95.33 ± 13.17	63.85 ± 9.36	102.74 ± 7.50
		500 mg/L, 5	92.88 ± 18.63	61.04 ± 25.11	92.65 ± 15.31
Escarole	Abaxial	Control, 0	44.68 ± 17.97	39.96 ± 4.42	77.93 ± 8.08
		5 mg/L, 1	51.96 ± 11.28	37.82 ± 3.62	73.36 ± 3.08
		5 mg/L, 2	45.98 ± 7.90	43.76 ± 10.71	74.82 ± 1.36
		5 mg/L, 3	40.94 ± 7.28	38.51 ± 3.49	70.44 ± 7.43
		5 mg/L, 4	42.63 ± 8.75	36.96 ± 3.45	72.68 ± 2.11
		5 mg/L, 5	42.33 ± 5.36	43.16 ± 9.46	70.99 ± 2.08

		50 mg/L, 1	42.75 ± 6.01	38.26 ± 4.06	79.84 ± 2.72
		50 mg/L, 2	37.92 ± 4.97	46.08 ± 7.75	76.81 ± 3.63
		50 mg/L, 3	44.24 ± 8.66	49.81 ± 4.39	78.56 ± 3.23
		50 mg/L, 4	47.07 ± 8.50	43.08 ± 6.74	73.14 ± 12.84
		50 mg/L, 5	46.31 ± 11.71	50.41 ± 5.07	71.82 ± 12.29
		500 mg/L, 1	59.57 ± 11.15	48.03 ± 8.52	83.20 ± 5.57
		500 mg/L, 2	38.20 ± 8.97	52.51 ± 6.42	74.29 ± 5.62
		500 mg/L, 3	33.10 ± 5.10	39.41 ± 5.11	68.80 ± 7.40
		500 mg/L, 4	29.00 ± 7.75	48.40 ± 5.15	68.61 ± 11.91
		500 mg/L, 5	59.57 ± 11.15	48.03 ± 8.52	82.82 ± 5.11
Escarole	Adaxial	Control, 0	44.47 ± 8.31	49.30 ± 8.20	65.53 ± 11.75
		5 mg/L, 1	49.80 ± 2.65	44.99 ± 8.37	69.21 ± 6.41
		5 mg/L, 2	46.03 ± 8.54	41.15 ± 9.17	65.60 ± 5.75
		5 mg/L, 3	45.98 ± 8.05	48.99 ± 10.76	66.53 ± 8.60
		5 mg/L, 4	41.37 ± 5.79	43.25 ± 10.00	63.56 ± 5.31
		5 mg/L, 5	49.15 ± 2.87	42.57 ± 10.60	64.36 ± 7.67
		50 mg/L, 1	38.51 ± 2.58	52.82 ± 7.92	69.05 ± 7.98
		50 mg/L, 2	40.51 ± 6.21	41.82 ± 7.54	66.56 ± 6.92
		50 mg/L, 3	37.78 ± 4.41	50.87 ± 10.24	64.29 ± 5.91
		50 mg/L, 4	44.48 ± 7.35	48.58 ± 11.29	67.87 ± 7.46
		50 mg/L, 5	43.71 ± 10.85	50.29 ± 13.17	70.51 ± 5.49
		500 mg/L, 1	48.06 ± 10.05	46.26 ± 3.05	77.60 ± 8.85
		500 mg/L, 2	33.05 ± 6.31	49.51 ± 12.08	81.58 ± 5.34
		500 mg/L, 3	44.47 ± 13.68	47.31 ± 4.62	80.07 ± 8.06
		500 mg/L, 4	40.25 ± 13.71	54.04 ± 5.74	62.91 ± 12.31
		500 mg/L, 5	58.83 ± 15.05	31.37 ± 5.52	83.61 ± 4.38

All data are mean ± SD (n = 5 per liquid).

Table S6. Complete numerical SFE and solubility parameter values for abaxial and adaxial arugula and escarole foliar surfaces before and following each day of foliar exposure to 5, 50, or 500 mg Pt NPs/L. All SFE (γ_s), solubility parameter (δ), and dispersive, non-dispersive, electron-donor, and electron-acceptor force component values (γ_s^d, γ_s^{nd}, γ_s^-, and γ_s^+, respectively) are provided for the two-liquid harmonic mean (HM) and geometric mean (GM) methods and the three-liquid (3L) acid-base theory method. Contact angle measurements were obtained from liquid droplets of ultrapure water (W), diiodomethane (DM), and glycerol (G).

Method	Test liquids	Exposure (mg/L), day	γ_s^d**1** (mJ m^{-2})	γ_s^d**2** (mJ m^{-2})	γ_s^+ (mJ m^{-2})	γ_s^- (mJ m^{-2})	γ_s^{nd}**1** (mJ m^{-2})	γ_s^{nd}**2** (mJ m^{-2})	γ_s (mJ m^{-2})	δ (MJ$^{1/2}$ m$^{-3/2}$)
Arugula abaxial surface										
GM	W, G	Control, 0	17.07	--	--	--	3.51	--	20.58	11.99
		5, 1	6.37	--	--	--	10.30	--	16.67	10.24
		5, 2	11.26	--	--	--	5.58	--	16.85	10.32
		5, 3	7.20	--	--	--	6.37	--	13.57	8.77
		5, 4	19.56	--	--	--	1.47	--	21.01	12.18
		5, 5	12.57	--	--	--	3.78	--	16.34	10.09
		50, 1	21.29	--	--	--	0.97	--	22.26	12.72
		50, 2	20.94	--	--	--	2.05	--	22.98	13.02
		50, 3	13.25	--	--	--	3.89	--	17.13	10.45
		50, 4	11.84	--	--	--	4.61	--	16.45	10.14
		50, 5	13.74	--	--	--	2.79	--	16.53	10.17
		500, 1	1.84	--	--	--	16.22	--	18.06	10.87
		500, 2	5.23	--	--	--	70.00	--	75.23	31.7
		500, 3	1.76	--	--	--	25.5	--	27.26	14.8
		500, 4	4.50	--	--	--	12.99	--	17.50	10.61
		500, 5	19.42	--	--	--	86.97	--	106.39	41.1

Arugula abaxial surface, continued

W, DM	Control, 0	35.02	--	--	--	0.50	--	35.52	18.05
	5, 1	33.76	--	--	--	1.13	--	34.88	17.81
	5, 2	34.18	--	--	--	0.54	--	34.72	17.75
	5, 3	27.42	--	--	--	0.73	--	28.15	15.17
	5, 4	31.07	--	--	--	0.21	--	31.28	16.41
	5, 5	31.77	--	--	--	0.33	--	32.10	16.73
	50, 1	36.17	--	--	--	0	--	36.17	18.30
	50, 2	35.07	--	--	--	0.30	--	35.37	18.00
	50, 3	34.44	--	--	--	0.26	--	34.70	17.74
	50, 4	34.52	--	--	--	0.31	--	34.83	17.79
	50, 5	35.15	--	--	--	0.05	--	35.19	17.93
	500, 1	31.86	--	--	--	1.50	--	33.36	17.22
	500, 2	32.32	--	--	--	9.96	--	42.27	20.57
	500, 3	38.05	--	--	--	3.55	--	41.60	20.32
	500, 4	26.68	--	--	--	2.61	--	29.29	15.62
	500, 5	37.65	--	--	--	5.92	--	43.57	21.04
G, DM	Control, 0	37.10	--	--	--	0.04	--	37.14	18.67
	5, 1	37.55	--	--	--	0.36	--	37.91	18.96
	5, 2	37.05	--	--	--	0.27	--	37.33	18.74
	5, 3	30.07	--	--	--	0.19	--	30.26	16.01
	5, 4	32.33	--	--	--	0.02	--	32.34	16.83
	5, 5	34.10	--	--	--	0.23	--	34.33	17.6
	50, 1	37.81	--	--	--	0.41	--	38.22	19.07
	50, 2	36.63	--	--	--	0.02	--	36.64	18.48
	50, 3	37.02	--	--	--	0.37	--	37.39	18.76
	50, 4	37.34	--	--	--	0.45	--	37.80	18.91
	50, 5	37.74	--	--	--	0.82	--	38.56	19.20
	500, 1	36.72	--	--	--	0.89	--	37.61	18.84

Arugula abaxial surface, continued

		500, 2	41.69	--	--	--	0.76	--	42.44	20.63
		500, 3	44.05	--	--	--	0.31	--	44.36	21.33
		500, 4	29.81	--	--	--	0.01	--	29.81	15.83
		500, 5	51.22	--	--	--	8.36	--	59.58	26.61
HM	W, G	Control, 0	14.89	-23.02	--	--	-45.17	8.78	23.67	13.32
		5, 1	6.89	-22.85	--	--	-45.86	15.89	22.78	12.94
		5, 2	10.7	-22.88	--	--	-45.78	11.07	21.77	12.50
		5, 3	7.51	-22.61	--	--	-45.96	11.95	19.48	11.50
		5, 4	17.51	-22.87	--	--	-45.80	5.46	22.97	13.02
		5, 5	11.89	-22.78	--	--	-46.21	8.82	20.71	12.05
		50, 1	19.14	-22.87	--	--	-45.84	4.45	23.60	13.29
		50, 2	17.86	-23.03	--	--	-45.12	6.76	24.63	13.72
		50, 3	12.33	-22.84	--	--	-45.95	9.01	21.34	12.32
		50, 4	11.22	-23.07	--	--	-46.02	9.90	21.13	12.23
		50, 5	13.01	-22.84	--	--	-46.43	7.41	20.42	11.92
		500, 1	2.46	-22.82	--	--	-46.75	21.93	24.39	13.62
		500, 2	-4.28	-22.73	--	--	-45.83	72.08	67.8	29.32
		500, 3	3.49	-22.65	--	--	-44.91	28.10	31.59	16.53
		500, 4	5.35	-22.84	--	--	-45.93	18.42	23.77	13.36
		500, 5	-9.14	-22.19	--	--	-48.96	161.49	152.35	53.81
	W, DM	Control, 0	33.86	101.68	--	--	-1.56	3.27	37.14	18.67
		5, 1	33.10	149.24	--	--	-1.62	4.59	37.69	18.87
		5, 2	33.19	99.59	--	--	-1.56	3.32	36.51	18.43
		5, 3	27.81	74.51	--	--	-1.54	3.25	31.07	16.33
		5, 4	30.70	62.23	--	--	-1.46	1.97	32.67	16.96
		5, 5	31.22	72.58	--	--	-1.50	2.50	33.71	17.36
		50, 1	35.34	55.34	--	--	-1.32	0.82	36.16	18.30
		50, 2	33.86	85.31	--	--	-1.53	2.66	36.52	18.43

Arugula abaxial surface, continued

		50, 3	33.35	79.13	--	--	-1.51	2.47	35.81	18.17
		50, 4	33.41	83.14	--	--	-1.52	2.64	36.05	18.26
		50, 5	34.15	60.93	--	--	-1.40	1.35	35.50	18.05
		500, 1	31.70	162.98	--	--	-1.63	5.09	36.79	18.53
		500, 2	35.00	-126.35	--	--	-1.75	14.2	49.20	23.05
		500, 3	37.89	-457.08	--	--	-1.70	8.51	46.40	22.06
		500, 4	27.86	187.51	--	--	-1.63	6.28	34.15	17.53
		500, 5	38.5	-180.11	--	--	-1.73	11.07	49.57	23.18
	G, DM	Control, 0	X	X	--	--	X	X	X	X
		5, 1	X	X	--	--	X	X	X	X
		5, 2	X	X	--	--	X	X	X	X
		5, 3	X	X	--	--	X	X	X	X
		5, 4	X	X	--	--	X	X	X	X
		5, 5	X	X	--	--	X	X	X	X
		50, 1	X	X	--	--	X	X	X	X
		50, 2	X	X	--	--	X	X	X	X
		50, 3	X	X	--	--	X	X	X	X
		50, 4	X	X	--	--	X	X	X	X
		50, 5	X	X	--	--	X	X	X	X
		500, 1	X	X	--	--	X	X	X	X
		500, 2	X	X	--	--	X	X	X	X
		500, 3	X	X	--	--	X	X	X	X
		500, 4	X	X	--	--	X	X	X	X
		500, 5	X	X	--	--	X	X	X	X
3L	W, DM, G	Control, 0	32.82		0.79	4.25			36.47	18.42
		5, 1	30.57	--	3.36	12.91	--	--	43.73	21.10
		5, 2	31.38	--	1.93	7.04	--	--	38.74	19.27

		5, 3	25.08	--	1.95	7.94	--	--	32.95	17.07
		5, 4	29.39	--	0.29	1.75	--	--	30.81	16.23
		5, 5	29.32	--	1.36	4.78	--	--	34.43	17.64
		50, 1	33.61	--	0.75	1.36	--	--	35.62	18.09
		50, 2	33.12	--	0.40	2.45	--	--	35.10	17.89
		50, 3	31.64	--	1.66	5.02	--	--	37.41	18.77
		50, 4	31.56	--	2.02	5.97	--	--	38.51	19.18
		50, 5	32.01	--	1.97	3.85	--	--	37.51	18.81
		500, 1	28.05	--	6.23	20.69	--	--	50.76	23.60
		500, 2	27.06	--	19.16	86.22	--	--	108.35	41.67
		500, 3	33.93	--	6.85	31.35	--	--	63.23	27.82
		500, 4	24.66	--	2.08	15.28	--	--	35.93	18.21
		500, 5	28.75	--	42.65	114.20	--	--	168.33	57.99
Method	**Test liquids**	**Exposure (mg/L), day**	γ_s^d**1** **(mJ m^{-2})**	γ_s^d**2** **(mJ m^{-2})**	γ_s^+ **(mJ m^{-2})**	γ_s^- **(mJ m^{-2})**	γ_s^{nd}**1** **(mJ m^{-2})**	γ_s^{nd}**2** **(mJ m^{-2})**	γ_s **(mJ m^{-2})**	δ **(MJ$^{1/2}$ m$^{-3/2}$)**
Arugula adaxial surface										
GM	W, G	Control, 0	57.47	--	--	--	1.93	--	59.41	26.55
		5, 1	45.15	--	--	--	0.06	--	45.21	21.63
		5, 2	54.81	--	--	--	1.09	--	55.90	25.37
		5, 3	19.93	--	--	--	1.64	--	21.57	12.42
		5, 4	43.83	--	--	--	0.05	--	43.87	21.15
		5, 5	33.28	--	--	--	0.73	--	34.01	17.47
		50, 1	20.3	--	--	--	0.87	--	21.18	12.25
		50, 2	27.28	--	--	--	0.52	--	27.80	15.02
		50, 3	26.48	--	--	--	0.01	--	26.49	14.49
		50, 4	23.24	--	--	--	0.30	--	23.55	13.26
		50, 5	11.88	--	--	--	2.99	--	14.87	9.40

Arugula adaxial surface, continued

	500, 1	0.93	--	--	--	16.23	--	17.16	10.46
	500, 2	0.17	--	--	--	29.08	--	29.25	15.61
	500, 3	0.86	--	--	--	25.35	--	26.21	14.37
	500, 4	0.06	--	--	--	22.88	--	22.94	13.01
	500, 5	2.99	--	--	--	13.77	--	16.76	10.28
W, DM	Control, 0	35.11	--	--	--	0.09	--	35.20	17.93
	5, 1	35.45	--	--	--	0.07	--	35.51	18.05
	5, 2	33.43	--	--	--	0	--	33.44	17.25
	5, 3	33.31	--	--	--	0.18	--	33.49	17.27
	5, 4	34.66	--	--	--	0.07	--	34.73	17.75
	5, 5	35.17	--	--	--	0.56	--	35.73	18.13
	50, 1	37.46	--	--	--	0.01	--	37.48	18.79
	50, 2	40.75	--	--	--	0	--	40.75	20.01
	50, 3	39.38	--	--	--	0.42	--	39.80	19.66
	50, 4	40.37	--	--	--	0.20	--	40.57	19.95
	50, 5	39.79	--	--	--	0.02	--	39.81	19.67
	500, 1	40.69	--	--	--	0.24	--	40.93	20.08
	500, 2	29.70	--	--	--	2.44	--	32.14	16.75
	500, 3	39.09	--	--	--	2.41	--	41.50	20.29
	500, 4	24.64	--	--	--	1.90	--	26.54	14.51
	500, 5	25.97	--	--	--	2.28	--	28.25	15.20
G, DM	Control, 0	33.23	--	--	--	0.28	--	33.51	17.28
	5, 1	34.57	--	--	--	0.41	--	34.98	17.85
	5, 2	31.64	--	--	--	0.70	--	32.34	16.83
	5, 3	34.78	--	--	--	0.05	--	34.84	17.79
	5, 4	33.83	--	--	--	0.40	--	34.23	17.56
	5, 5	35.35	--	--	--	0.44	--	35.80	18.16
	50, 1	39.40	--	--	--	0.88	--	40.28	19.84

Arugula adaxial surface, continued

		50, 2	42.20	--	--	--	0.39	--	42.59	20.69
		50, 3	40.77	--	--	--	1.48	--	42.25	20.56
		50, 4	42.27	--	--	--	1.50	--	43.78	21.12
		50, 5	43.36	--	--	--	2.52	--	45.88	21.87
		500, 1	47.66	--	--	--	5.06	--	52.71	24.27
		500, 2	36.20	--	--	--	1.95	--	38.16	19.05
		500, 3	45.80	--	--	--	1.30	--	47.10	22.31
		500, 4	29.90	--	--	--	1.57	--	31.46	16.48
		500, 5	29.40	--	--	--	0.04	--	29.44	15.68
HM	W, G	Control, 0	60.54	-23.21	--	--	-44.46	-3.1	57.45	25.89
		5, 1	38.26	-23.27	--	--	-44.16	0.94	39.20	19.44
		5, 2	52.52	-23.26	--	--	-44.24	-1.78	50.73	23.59
		5, 3	17.58	-22.92	--	--	-45.59	5.87	23.45	13.22
		5, 4	37.35	-23.25	--	--	-44.27	0.94	38.28	19.10
		5, 5	26.18	-23.29	--	--	-44.07	5.08	31.26	16.40
		50, 1	18.73	-22.79	--	--	-46.18	4.09	22.82	12.95
		50, 2	23.39	-23.03	--	--	-45.14	3.74	27.12	14.75
		50, 3	26.26	-22.71	--	--	-46.53	0.43	26.69	14.57
		50, 4	21.89	-22.77	--	--	-46.28	2.40	24.30	13.58
		50, 5	11.67	-22.62	--	--	-46.93	7.60	19.27	11.41
		500, 1	0.85	-22.43	--	--	-47.79	22.93	23.78	13.36
		500, 2	-2.75	-22.37	--	--	-48.05	37.00	34.25	17.57
		500, 3	1.86	-22.90	--	--	-45.65	28.84	30.70	16.18
		500, 4	-3.01	-22.09	--	--	-49.45	32.92	29.91	15.87
		500, 5	3.74	-22.69	--	--	-46.57	19.48	23.22	13.12
	W, DM	Control, 0	X	X	--	--	X	X	X	X
		5, 1	34.33	64.21	--	--	-1.42	1.52	35.85	18.18
		5, 2	X	X	--	--	X	X	X	X

Arugula adaxial surface, continued

	5, 3	32.48	68.01	--	--	-1.47	2.03	34.51	17.67
	5, 4	33.70	62.15	--	--	-1.42	1.49	35.19	17.93
	5, 5	34.01	107.87	--	--	-1.57	3.45	37.45	18.79
	50, 1	37.65	48.06	--	--	-1.11	0.05	37.70	18.88
	50, 2	39.20	61.97	--	--	-1.33	0.77	39.97	19.72
	50, 3	X	X	--	--	X	X	X	X
	50, 4	X	X	--	--	X	X	X	X
	50, 5	39.28	52.74	--	--	-1.18	0.20	39.48	19.54
	500, 1	38.46	111.54	--	--	-1.55	2.87	41.33	20.23
	500, 2	30.30	243.68	--	--	-1.66	6.32	36.61	18.47
	500, 3	38.27	-5,946.37	--	--	-1.69	7.12	45.39	21.70
	500, 4	25.95	109.31	--	--	-1.61	5.13	31.08	16.33
	500, 5	27.17	146.42	--	--	-1.64	5.78	32.95	17.06
G, DM	Control, 0	32.88	45.56	--	--	-1.14	1.62	34.51	17.67
	5, 1	33.94	49.80	--	--	-1.21	2.05	35.99	18.23
	5, 2	31.57	48.87	--	--	-1.26	2.51	34.08	17.50
	5, 3	X	X	--	--	X	X	X	X
	5, 4	33.33	48.46	--	--	-1.20	1.98	35.32	17.93
	5, 5	34.59	51.53	--	--	-1.23	2.16	36.75	18.52
	50, 1	X	X	--	--	X	X	X	X
	50, 2	X	X	--	--	X	X	X	X
	50, 3	X	X	--	--	X	X	X	X
	50, 4	X	X	--	--	X	X	X	X
	50, 5	X	X	--	--	X	X	X	X
	500, 1	X	X	--	--	X	X	X	X
	500, 2	X	X	--	--	X	X	X	X
	500, 3	X	X	--	--	X	X	X	X
	500, 4	X	X	--	--	X	X	X	X

		500, 5	X	X	--	--	X	X	X	X
3L	W, DM, G	Control, 0	35.2	--	1.43	2.69	--	--	39.12	19.41
		5, 1	35.26	--	0.61	0.16	--	--	35.89	18.20
		5, 2	33.87	--	1.69	1.72	--	--	37.28	18.72
		5, 3	31.35	--	0.43	2.01	--	--	33.22	17.17
		5, 4	34.46	--	0.58	0.14	--	--	35.03	17.86
		5, 5	34.59	--	0.10	0.63	--	--	35.08	17.89
		50, 1	34.42	--	1.20	1.35	--	--	36.97	18.60
		50, 2	38.08	--	0.53	0.76	--	--	39.35	19.49
		50, 3	36.14	--	0.92	0.08	--	--	36.69	18.50
		50, 4	36.87	--	1.37	0.62	--	--	38.71	19.26
		50, 5	35.32	--	4.03	4.59	--	--	43.92	21.17
		500, 1	34.29	--	12.98	22.81	--	--	68.70	29.61
		500, 2	25.03	--	12.27	37.50	--	--	67.94	29.36
		500, 3	35.06	--	9.63	32.30	--	--	69.34	29.81
		500, 4	20.83	--	9.70	29.52	--	--	54.67	24.95
		500, 5	23.63	--	2.97	16.60	--	--	37.67	18.87
Method	**Test liquids**	**Exposure (mg/L), day**	γ_s^d**1** **(mJ m^{-2})**	γ_s^d**2** **(mJ m^{-2})**	γ_s^+ **(mJ m^{-2})**	γ_s^- **(mJ m^{-2})**	γ_s^{nd}**1** **(mJ m^{-2})**	γ_s^{nd}**2** **(mJ m^{-2})**	γ_s **(mJ m^{-2})**	δ **(MJ$^{1/2}$ m$^{-3/2}$)**
Escarole abaxial surface										
GM	W, G	Control, 0	17.86	--	--	--	131.89	--	149.74	53.11
		5, 1	3.66	--	--	--	90.02	--	93.68	37.36
		5, 2	10.64	--	--	--	116.02	--	126.66	46.85
		5, 3	8.85	--	--	--	118.65	--	127.50	47.08
		5, 4	15.72	--	--	--	39.12	--	54.84	25.01
		5, 5	8.30	--	--	--	115.53	--	123.84	46.06

Escarole abaxial surface, continued

	500, 1	8.67	--	--	--	92.23	--	100.90	39.50
	500, 2	18.35	--	--	--	141.69	--	160.04	55.83
	500, 3	13.18	--	--	--	137.84	--	151.02	53.45
	500, 4	16.44	--	--	--	148.99	--	165.42	57.23
	500, 5	8.12	--	--	--	91.04	--	99.16	38.99
W, DM	Control, 0	29.35	--	--	--	26.83	--	56.17	25.46
	5, 1	31.59	--	--	--	20.82	--	52.41	24.17
	5, 2	27.58	--	--	--	27.10	--	54.68	24.95
	5, 3	29.53	--	--	--	29.10	--	58.63	26.29
	5, 4	11.87	--	--	--	43.49	--	55.36	25.18
	5, 5	27.37	--	--	--	29.64	--	57.02	25.75
	50, 1	29.91	--	--	--	27.71	--	57.62	25.95
	50, 2	25.28	--	--	--	34.00	--	59.28	26.51
	50, 3	24.09	--	--	--	30.69	--	54.78	24.98
	50, 4	28.10	--	--	--	26.04	--	54.14	24.76
	50, 5	24.05	--	--	--	29.29	--	53.33	24.49
	500, 1	27.46	--	--	--	18.08	--	45.54	21.75
	500, 2	21.89	--	--	--	36.53	--	58.42	26.22
	500, 3	28.10	--	--	--	34.82	--	62.92	27.72
	500, 4	23.13	--	--	--	41.11	--	64.23	28.15
	500, 5	27.46	--	--	--	18.08	--	45.54	21.75
G, DM	Control, 0	40.33	--	--	--	0.10	--	40.42	19.89
	5, 1	40.31	--	--	--	0.58	--	37.73	20.06
	5, 2	36.91	--	--	--	0.82	--	40.35	18.89
	5, 3	39.04	--	--	--	1.32	--	58.55	19.87
	5, 4	11.52	--	--	--	47.03	--	38.02	26.26
	5, 5	36.21	--	--	--	1.82	--	42.01	19.00
	50, 1	42.01	--	--	--	0	--	36.55	20.47

Escarole abaxial surface, continued

		50, 2	35.91	--	--	--	0.64	--	34.47	18.44
		50, 3	33.80	--	--	--	0.66	--	38.04	17.65
		50, 4	36.89	--	--	--	1.15	--	34.40	19.00
		50, 5	31.57	--	--	--	2.82	--	34.40	17.62
		500, 1	36.39	--	--	--	0.01	--	36.40	18.39
		500, 2	30.76	--	--	--	2.30	--	33.06	17.11
		500, 3	38.01	--	--	--	1.93		39.95	19.72
		500, 4	32.11	--	--	--	3.75		35.86	18.18
		500, 5	36.28	--	--	--	0.03		36.31	18.35
HM	W, G	Control, 0	-4.61	-23.17	--	--	-44.30	134.67	130.06	47.79
		5, 1	-1.03	-23.32	--	--	-43.71	75.87	74.84	31.57
		5, 2	-3.01	-23.26	--	--	-43.91	105.08	102.08	39.85
		5, 3	-1.87	-23.36	--	--	-43.45	101.98	100.10	39.27
		5, 4	18.66	-23.92	--	--	-41.21	37.28	55.94	25.38
		5, 5	-1.84	-23.36	--	--	-43.49	99.07	97.23	38.42
		50, 1	-5.69	-23.11	--	--	-44.56	170.75	165.05	57.14
		50, 2	-5.09	-23.19	--	--	-44.18	169.42	164.33	56.95
		50, 3	-4.95	-23.15	--	--	-44.38	143.70	138.75	50.16
		50, 4	-2.01	-23.31	--	--	-43.71	91.95	89.95	36.24
		50, 5	-1.52	-23.34	--	--	-43.57	88.88	87.36	35.45
		500, 1	-4.16	-23.03	--	--	-44.97	90.06	85.90	35.01
		500, 2	-4.01	-23.26	--	--	-43.88	140.42	136.42	49.53
		500, 3	-2.32	-23.39	--	--	-43.32	122.95	120.63	45.16
		500, 4	-2.74	-23.39	--	--	-43.32	138.23	135.49	49.28
		500, 5	-3.98	-23.05	--	--	-44.91	87.95	83.98	34.42
	W, DM	Control, 0	35.98	-64.28	--	--	-1.78	26.79	62.78	27.67
		5, 1	36.95	-72.07	--	--	-1.78	22.69	59.64	26.63
		5, 2	34.33	-65.43	--	--	-1.78	26.68	61.00	27.08

Escarole abaxial surface, continued

	5, 3	36.58	-61.41	--	--	-1.79	28.51	65.09	28.44
	5, 4	21.14	-62.63	--	--	-1.78	35.29	56.43	25.55
	5, 5	34.57	-62.40	--	--	-1.78	28.50	63.08	27.77
	50, 1	36.70	-62.72	--	--	-1.78	27.55	64.25	28.16
	50, 2	33.25	-59.49	--	--	-1.79	31.29	64.53	28.25
	50, 3	31.58	-63.91	--	--	-1.78	28.64	60.22	26.82
	50, 4	34.64	-66.46	--	--	-1.78	25.99	60.63	26.96
	50, 5	31.31	-65.73	--	--	-1.78	27.63	58.94	26.39
	500, 1	32.50	-85.61	--	--	-1.77	20.01	52.51	24.20
	500, 2	30.30	-59.65	--	--	-1.79	32.43	62.73	27.66
	500, 3	36.16	-57.00	--	--	-1.79	32.49	68.65	29.59
	500, 4	32.16	-55.32	--	--	-1.79	36.07	68.23	29.46
	500, 5	32.50	-85.61	--	--	-1.77	20.01	52.51	24.20
G, DM	Control, 0	38.91	51.82	--	--	-1.09	1.28	40.19	19.80
	5, 1	38.79	62.46	--	--	-1.30	2.70	41.50	20.29
	5, 2	35.99	59.55	--	--	-1.32	2.99	38.98	19.36
	5, 3	38.03	70.17	--	--	-1.40	3.86	41.88	20.43
	5, 4	21.15	322.93	--	--	-1.68	32.68	53.84	24.66
	5, 5	35.81	69.28	--	--	-1.42	4.35	40.16	19.80
	50, 1	41.92	45.95	--	--	-0.66	0.08	42.00	20.47
	50, 2	35.08	55.29	--	--	-1.28	2.60	37.69	18.87
	50, 3	33.34	52.00	--	--	-1.27	2.55	35.89	18.19
	50, 4	36.10	63.52	--	--	-1.37	3.51	39.61	19.59
	50, 5	32.27	67.40	--	--	-1.45	5.20	37.47	18.79
	500, 1	36.53	41.60	--	--	-0.76	0.31	36.84	18.55
	500, 2	31.39	61.54	--	--	-1.43	4.62	36.02	18.24
	500, 3	37.43	74.87	--	--	-1.44	4.58	42.01	20.48
	500, 4	33.06	76.02	--	--	-1.49	6.09	39.16	19.42

		500, 5	36.11	42.61	--	--	-0.85	0.52	36.63	18.48
3L	W, DM, G	Control, 0	24.84	--	22.71	156.04	--	--	143.91	51.55
		5, 1	28.14	--	12.13	104.61	--	--	99.38	39.06
		5, 2	24.19	--	15.51	134.74	--	--	115.63	43.75
		5, 3	26.26	--	14.30	136.84	--	--	114.74	43.50
		5, 4	16.27	--	9.93	31.71	--	--	51.76	23.94
		5, 5	24.55	--	12.60	132.39	--	--	106.25	41.06
		50, 1	24.73	--	28.34	174.95	--	--	165.56	57.27
		50, 2	21.47	--	22.47	178.22	--	--	148.03	52.66
		50, 3	20.62	--	19.55	158.64	--	--	132.00	48.32
		50, 4	25.03	--	12.91	122.90	--	--	104.70	40.61
		50, 5	22.00	--	9.28	118.72	--	--	88.38	35.76
		500, 1	23.50	--	16.74	109.57	--	--	109.15	41.90
		500, 2	19.31	--	15.47	162.37	--	--	119.54	44.86
		500, 3	24.96	--	15.65	158.35	--	--	124.53	46.25
		500, 4	20.84	--	13.74	169.00	--	--	117.22	44.20
		500, 5	23.58	--	16.18	107.98	--	--	107.17	41.33
Method	**Test liquids**	**Exposure (mg/L), day**	γ_s^d**1** **(mJ m^{-2})**	γ_s^d**2** **(mJ m^{-2})**	γ_s^+ **(mJ m^{-2})**	γ_s^- **(mJ m^{-2})**	γ_s^{nd}**1** **(mJ m^{-2})**	γ_s^{nd}**2** **(mJ m^{-2})**	γ_s **(mJ m^{-2})**	δ **(MJ$^{1/2}$ m$^{-3/2}$)**
Escarole adaxial surface										
GM	W, G	Control, 0	1.70	--	--	--	91.88	--	93.58	37.33
		5, 1	1.67	--	--	--	85.24	--	86.92	35.32
		5, 2	1.15	--	--	--	87.19	--	88.34	35.75
		5, 3	1.68	--	--	--	89.98	--	91.66	36.76
		5, 4	1.74	--	--	--	95.76	--	97.50	38.50
		5, 5	0.08	--	--	--	74.22	--	74.30	31.40

Escarole adaxial surface, continued

	50, 1	8.94	--	--	--	121.90	--	130.84	48.00
	50, 2	4.53	--	--	--	107.42	--	111.96	42.71
	50, 3	3.96	--	--	--	108.72	--	112.69	42.91
	50, 4	3.39	--	--	--	98.75	--	102.14	39.87
	50, 5	6.66	--	--	--	109.59	--	116.24	43.93
	500, 1	12.99	--	--	--	117.94	--	130.94	48.03
	500, 2	45.41	--	--	--	189.75	--	235.16	74.51
	500, 3	22.92	--	--	--	140.76	--	163.67	56.78
	500, 4	1.79	--	--	--	97.24	--	99.02	38.95
	500, 5	10.16	--	--	--	96.41	--	106.57	41.16
W, DM	Control, 0	24.40	--	--	--	30.30	--	54.70	24.96
	5, 1	27.51	--	--	--	24.58	--	52.09	24.06
	5, 2	28.94	--	--	--	26.20	--	55.14	25.11
	5, 3	24.78	--	--	--	28.99	--	53.77	24.64
	5, 4	27.20	--	--	--	30.39	--	57.58	25.94
	5, 5	28.69	--	--	--	24.30	--	52.98	24.37
	50, 1	21.76	--	--	--	36.43	--	58.19	26.14
	50, 2	27.81	--	--	--	30.52	--	58.33	26.19
	50, 3	22.72	--	--	--	36.11	--	58.83	26.36
	50, 4	24.79	--	--	--	30.01	--	54.80	24.99
	50, 5	23.76	--	--	--	31.30	--	55.06	25.08
	500, 1	26.56	--	--	--	26.36	--	52.92	24.34
	500, 2	22.93	--	--	--	38.92	--	61.85	27.37
	500, 3	25.47	--	--	--	29.53	--	55.01	25.06
	500, 4	21.30	--	--	--	35.64	--	56.94	25.72
	500, 5	35.95	--	--	--	14.56	--	50.50	23.51
G, DM	Control, 0	30.73	--	--	--	5.54	--	36.27	18.34
	5, 1	34.54	--	--	--	2.74	--	37.29	18.72

Escarole adaxial surface, continued

		5, 2	36.05	--	--	--	3.46	--	39.51	19.55
		5, 3	31.19	--	--	--	4.91	--	36.10	18.28
		5, 4	34.19	--	--	--	4.89	--	39.09	19.40
		5, 5	34.83	--	--	--	4.33	--	39.17	19.43
		50, 1	29.22	--	--	--	4.71	--	33.93	17.44
		50, 2	35.89	--	--	--	3.19	--	39.07	19.39
		50, 3	29.39	--	--	--	6.74	--	36.13	18.28
		50, 4	31.80	--	--	--	4.14	--	35.94	18.21
		50, 5	31.32	--	--	--	3.35	--	34.66	17.73
		500, 1	36.01	--	--	--	0.51	--	36.52	18.43
		500, 2	34.87	--	--	--	0.17	--	35.04	17.87
		500, 3	35.99	--	--	--	0.22	--	36.21	18.32
		500, 4	26.95	--	--	--	8.79	--	35.74	18.14
		500, 5	47.39	--	--	--	0.68	--	48.07	22.65
HM	W, G	Control, 0	1.28	-23.49	--	--	-42.96	72.74	74.02	31.31
		5, 1	0.62	-23.42	--	--	-43.28	69.1	69.72	29.94
		5, 2	1.62	-23.49	--	--	-42.96	69.03	70.64	30.24
		5, 3	1.11	-23.47	--	--	-43.05	71.66	72.76	32.14
		5, 4	1.61	-23.52	--	--	-42.81	75.02	76.63	27.45
		5, 5	3.16	-23.52	--	--	-42.83	58.94	62.10	39.91
		50, 1	-1.64	-23.39	--	--	-43.32	103.93	102.29	35.27
		50, 2	-0.09	-23.45	--	--	-43.08	86.84	86.74	35.36
		50, 3	0.51	-23.50	--	--	-42.89	86.52	87.03	33.16
		50, 4	0.07	-23.43	--	--	-43.18	79.84	79.90	36.53
		50, 5	-1.40	-23.37	--	--	-43.45	92.32	90.92	41.81
		500, 1	-3.90	-23.19	--	--	-44.24	112.72	108.82	101.84
		500, 2	-7.43	-23.04	--	--	-44.83	364.13	356.69	54.16
		500, 3	-5.55	-23.11	--	--	-44.58	159.22	153.67	32.46

Escarole adaxial surface, continued

	500, 4	1.70	-23.53	--	--	-42.76	75.95	77.65	36.76
	500, 5	-4.52	-23.02	--	--	-45.04	96.20	91.67	26.83
W, DM	Control, 0	31.81	-64.10	--	--	-1.78	28.43	60.24	26.29
	5, 1	33.80	-69.37	--	--	-1.78	24.82	58.62	27.33
	5, 2	35.48	-65.47	--	--	-1.78	26.26	61.73	26.59
	5, 3	31.96	-65.43	--	--	-1.78	27.55	59.51	27.93
	5, 4	34.53	-61.71	--	--	-1.79	29.02	63.55	26.64
	5, 5	34.88	-23.52	--	--	-1.78	24.81	59.68	27.58
	50, 1	30.16	-59.84	--	--	-1.79	32.33	62.49	28.20
	50, 2	35.15	-61.12	--	--	-1.79	29.23	64.39	27.87
	50, 3	31.06	-59.41	--	--	-1.79	32.30	63.36	26.89
	50, 4	32.14	-64.11	--	--	-1.78	28.29	60.43	26.88
	50, 5	31.35	-63.47	--	--	-1.78	29.02	60.38	26.47
	500, 1	35.14	53.59	--	--	-1.78	25.96	59.18	28.75
	500, 2	31.67	-56.98	--	--	-1.79	34.40	66.07	27.01
	500, 3	32.72	-64.10	--	--	-1.78	28.07	60.79	27.17
	500, 4	29.60	-60.94	--	--	-1.79	31.67	61.27	26.10
	500, 5	39.61	-83.93	--	--	-1.77	18.47	58.08	19.73
G, DM	Control, 0	32.47	85.65	--	--	-1.53	7.51	39.98	19.75
	5, 1	34.77	74.07	--	--	-1.46	5.28	40.05	20.63
	5, 2	36.37	84.94	--	--	-1.49	6.05	42.42	19.63
	5, 3	32.67	82.38	--	--	-1.52	7.04	39.70	20.64
	5, 4	35.28	92.17	--	--	-1.53	7.19	42.47	20.62
	5, 5	35.64	89.27	--	--	-1.52	6.76	42.40	18.87
	50, 1	30.91	75.01	--	--	-1.51	6.76	37.67	20.44
	50, 2	36.12	81.86	--	--	-1.49	5.79	41.90	19.74
	50, 3	31.66	89.98	--	--	-1.55	8.34	40.01	19.50
	50, 4	32.93	78.22	--	--	-1.50	6.42	39.36	18.97

		50, 5	32.24	70.82	--	--	-1.47	5.69	37.93	18.79
		500, 1	35.14	53.59	--	--	-1.25	2.34	37.48	18.10
		500, 2	34.31	45.80	--	--	-1.08	1.34	35.64	
		500, 3	35.17	48.50	--	--	-1.13	1.57	36.73	18.51
		500, 4	30.09	95.15	--	--	-1.57	9.64	39.73	19.64
		500, 5	X	X	--	--	X	X	X	X
3L	W, DM, G	Control, 0	23.34	--	4.72	101.17	--	--	67.07	29.08
		5, 1	25.56	--	6.80	95.9	--	--	76.62	32.13
		5, 2	27.15	--	6.13	97.45	--	--	76.04	31.95
		5, 3	23.57	--	5.04	99.46	--	--	68.34	29.49
		5, 4	25.78	--	5.66	106.11	--	--	74.78	31.55
		5, 5	27.45	--	3.85	81.76	--	--	62.94	27.73
		50, 1	20.17	--	8.92	136.52	--	--	89.97	36.25
		50, 2	25.64	--	9.01	121.19	--	--	91.74	36.78
		50, 3	21.76	--	5.50	119.63	--	--	73.05	31.00
		50, 4	23.22	--	6.78	110.23	--	--	77.89	32.53
		50, 5	21.84	--	9.11	123.57	--	--	88.95	35.94
		500, 1	22.99	--	17.20	137.82	--	--	120.37	45.09
		500, 2	18.53	--	32.63	224.48	--	--	189.70	63.43
		500, 3	21.41	--	23.11	165.93	--	--	145.27	51.92
		500, 4	20.97	--	3.16	105.15	--	--	57.46	25.89
		500, 5	29.87	--	24.8	118.05	--	--	138.08	49.98

All data are mean ± SD (n = 5 per liquid).

Table S7. Pt concentrations in arugula and escarole leaf and root segments.

Plant	Exposure	Pt NP Treatment	Leaf Pt Concentration (ng/g DW)	Root Pt Concentration (ng/g DW)
Arugula	Control	0 mg/L	2.59 ± 1.05	1.92 ± 0.794
	Root	50 mg/L (20 mL)	175 ± 56.2	9.12 ± 1.01
	Foliar	5 mg/L	18,400 ± 5,120	2.37 ± 0.0656
		50 mg/L	123,000 ± 39,700	17.4 ± 11.5
		500 mg/L	588,000 ± 143,000	78.2 ± 16.5
Escarole	Control	0 mg/L	2.19 ± 0.883	2.16 ± 0.858
	Root	50 mg/L (20 mL)	14.7 ± 2.97	157 ± 69.6
	Foliar	5 mg/L	562 ± 100	15.0 ± 10.6
		50 mg/L	3,940 ± 903	67.8 ± 34.1
		500 mg/L	410,000 ± 11,600	266 ± 84.6

All data are mean ± standard error (SE; n = 3, 5 plants per replicate).

Table S8. Total quantities of Pt in whole arugula and escarole plants (leaves and roots), and in leaves and roots.

Plant	Exposure	Pt NP treatment	Replicate	Total Pt in whole plant (ng)	Pt in leaves (ng)	Pt in roots* (ng)
Arugula	Foliar	5 mg/L	1	60,102	60,100	2.43
			2	64,102	64,100	2.30
			3	75,502	75,500	1.52
		50 mg/L	1	303,035	303,000	35.4
			2	712,008	712,000	8.29
			3	567,022	567,000	22.0
		500 mg/L	1	1,980,036	1,980,000	36.1
			2	1,730,044	1,730,000	43.9
			3	1,250,072	1,250,000	72.3
	Root	50 mg/L (20 mL)	1	1,317	1,310	6.99
			2	1,136	1,130	5.75
			3	932	924	7.75
Escarole	Foliar	5 mg/L	1	3,382	3,350	31.9
			2	3,910	3,870	40.1
			3	2,726	2,720	6.07
		50 mg/L	1	24,408	24,300	108
			2	13,620	13,500	120
			3	22,008	21,800	208
		500 mg/L	1	220,303	220,000	303
			2	206,361	206,000	361
			3	224,460	224,000	460
	Root	50 mg/L (20 mL)	1	399	37.9	361
			2	444	76.2	368
			3	258	103	155

All data represent means from triplicate measurements for each replicate (n = 3, 5 plants per replicate).

*Although it was not possible to remove all root tissue from the soil media, care was taken to remove as much as possible.

Table S9. Soil pH values at harvest.

Plant	Exposure	Pt NP Treatment	pH
Arugula	Control	0 mg/L	6.86 ± 0.12
	Root	50 mg/L (20 mL)	6.98 ± 0.32
	Foliar	5 mg/L	6.91 ± 0.19
		50 mg/L	6.74 ±0.05
		500 mg/L	6.91 ± 0.10
Escarole	Control	0 mg/L	6.94 ± 0.24
	Root	50 mg/L (20 mL)	6.89 ± 0.02
	Foliar	5 mg/L	6.99 ± 0.17
		50 mg/L	6.83 ± 0.07
		500 mg/L	6.98 ± 0.22

All data are mean ± SD (n = 3).

Table S10. Proportion of open stomata (%) on abaxial and adaxial arugula surfaces with Pt NP foliar exposure (control, 50 and 500 mg/L).

		Proportion of open stomata (%)	
Foliar exposure (mg Pt NPs/L)	**Areas with many visible Pt NPs?****	**Abaxial surface**	**Adaxial surface**
Control	No	63.5 ± 11.2	60.6 ± 16.0
50	Yes	0*	0*
	No	34.2 ± 16.7*	43.0 ±13.9*
500	Yes	0*	0*
	No	0*	0*

All data are mean ± SD (n = 10).

*Significant difference from the control according to the Mann-Whitney test ($p < 0.05$).

**The boundaries between areas where droplets of Pt NP dispersion were applied and areas where droplets were not applied is very clear since the droplets did not spread out over the arugula leaf surfaces.

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