

Supplementary Materials



Figure S1. Digital photos of exfoliated MoS₂ suspension in water (left) and layered in water after centrifuging 15 minutes for 4,000 rpm (right).

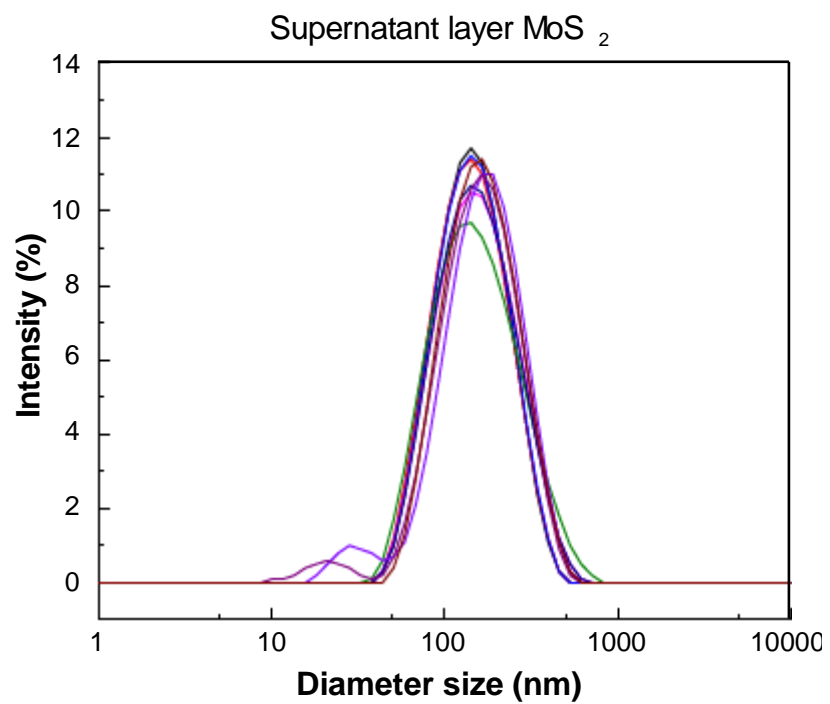


Figure S2. The intensity-averaged particle size (hydrodynamics diameter) distribution of supernatant layer (**Figure S2** right image) from centrifuged exfoliated MoS₂ solution (16.0 mg/mL).

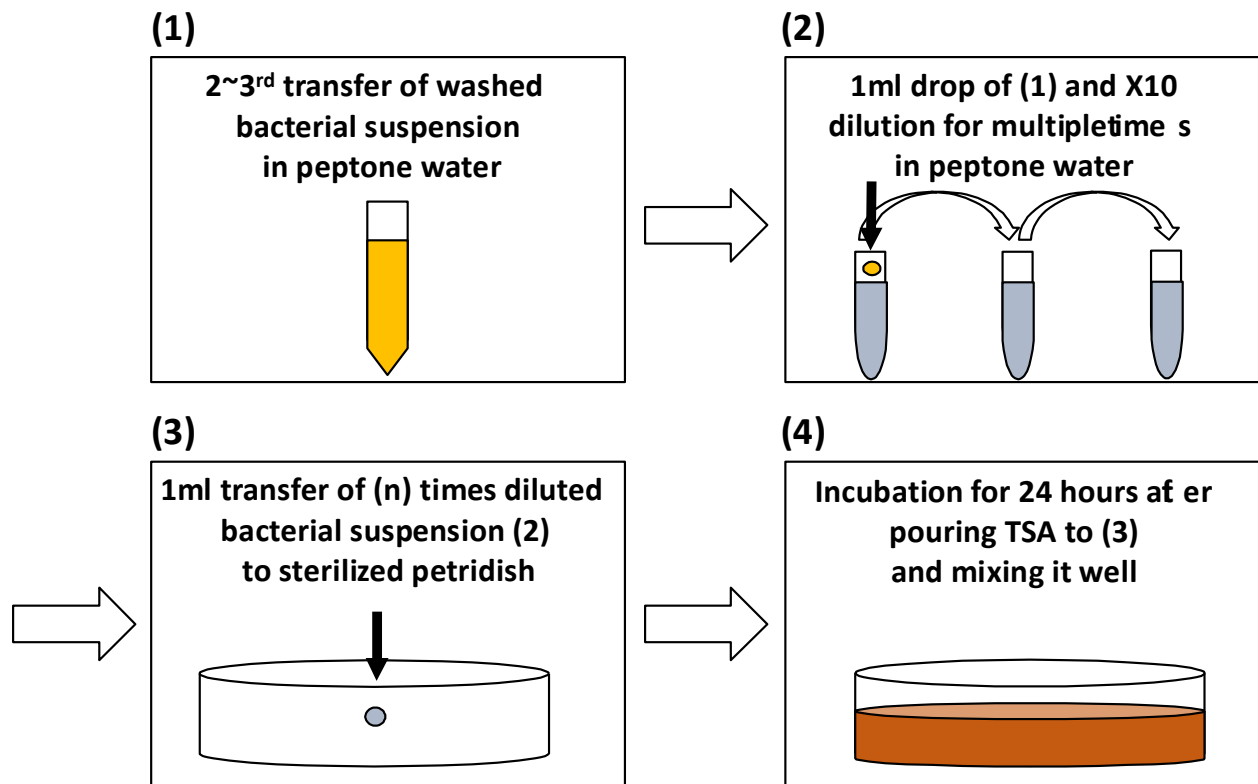


Figure S3. Schematic protocol for preparing the sample for the plate counting methodology. After (4), the number of grown colonies (CFU/mL) are counted within range below 200 and will be multiplied with $10n$ times.

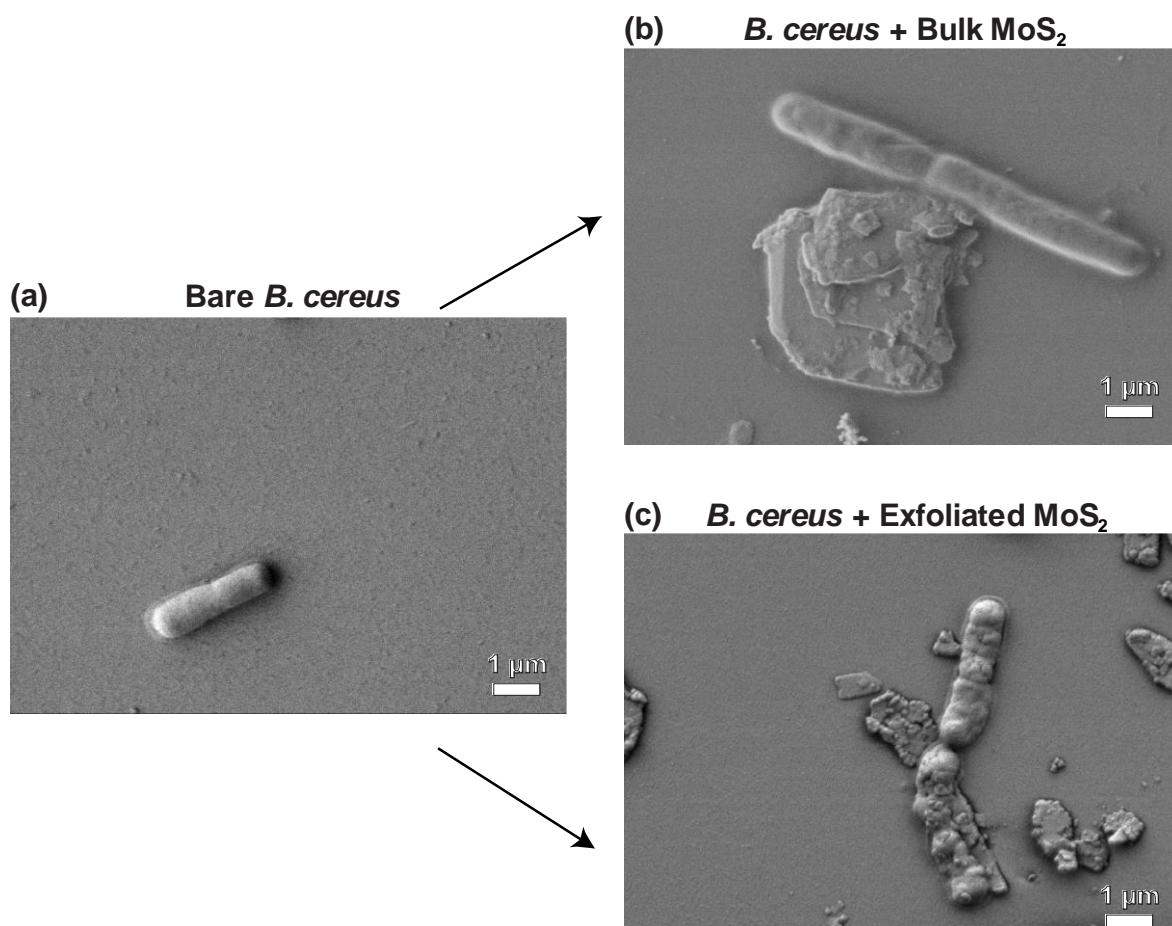


Figure S4. More SEM image showing interactions between soil bacteria and MoS_2 particles (4.0 mg/mL for 12 hours) after they are dried on a silicon wafer surface (a) Bare *Bacillus cereus* (b) *Bacillus cereus* mixed with bulk MoS_2 (c) *Bacillus cereus* mixed with exfoliated MoS_2

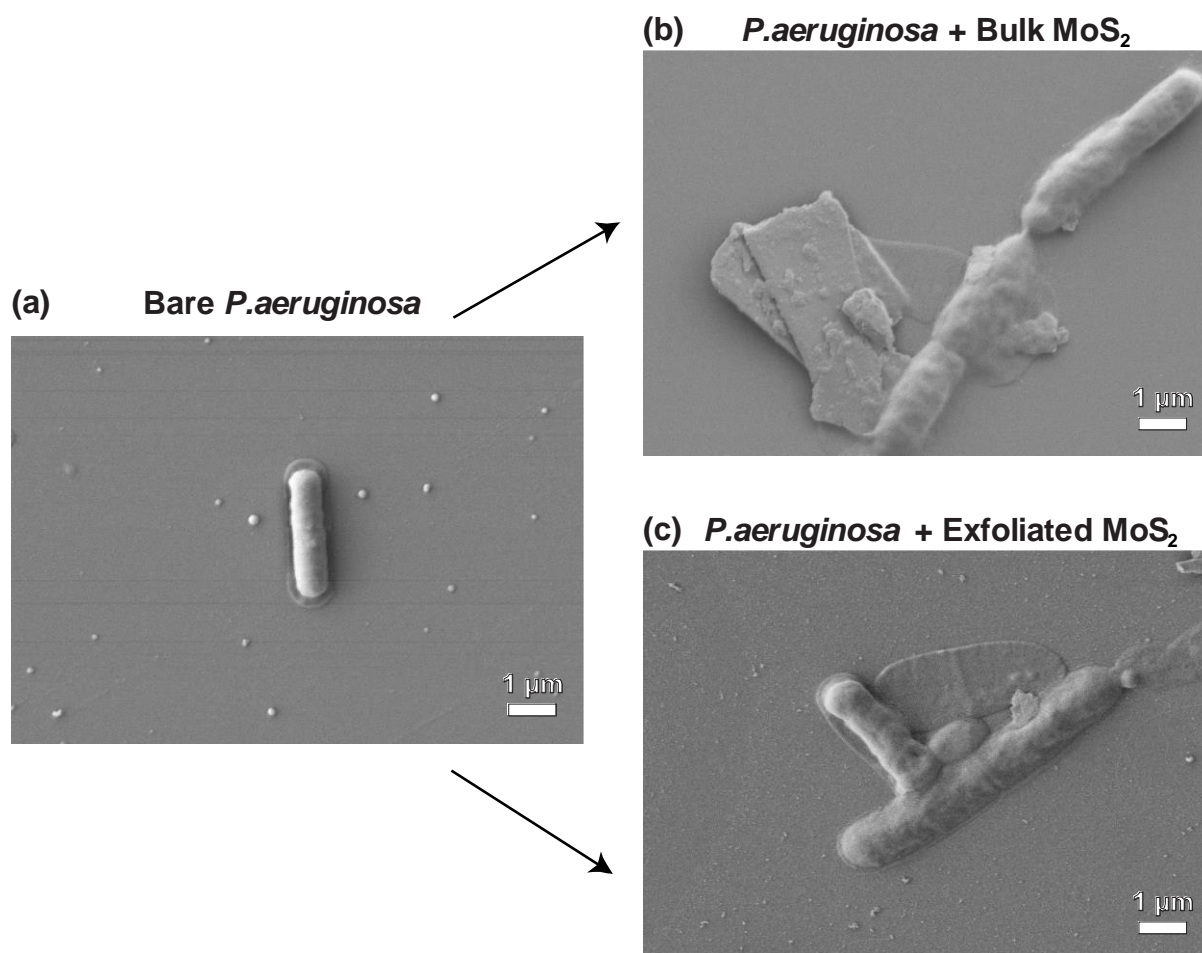


Figure S5. More SEM image showing interactions between soil bacteria and MoS₂ particles (4.0 mg/mL for 12 hours) after they are dried on a silicon wafer surface (a) Bare *Pseudomonas aeruginosa* (b) *Pseudomonas aeruginosa* mixed with bulk MoS₂ (c) *Pseudomonas aeruginosa* mixed with exfoliated MoS₂

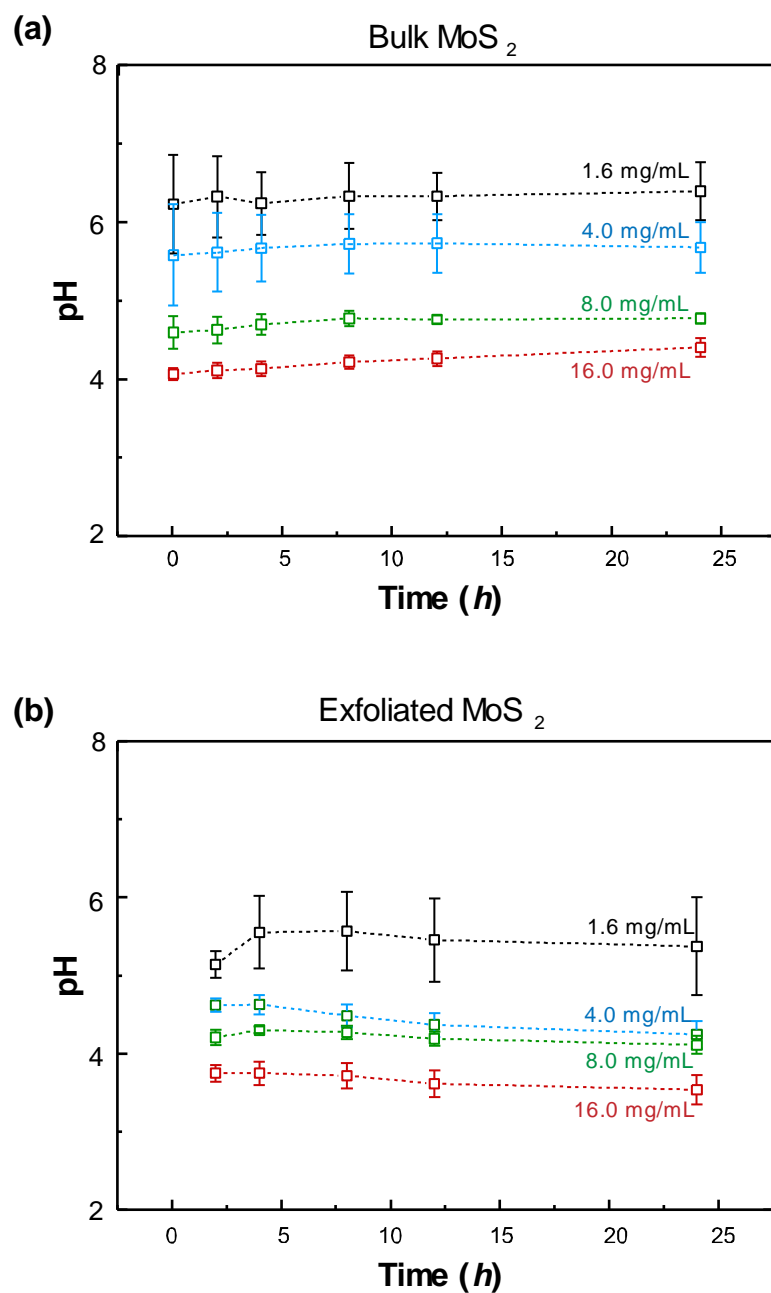


Figure S6. PH measurement for MoS₂ in ultrapurified water stirred with magnetic bar in 24-hour timeline (a) for bulk MoS₂ (b) 1 hour exfoliated MoS₂. The error bars represent standard deviation from the mean.

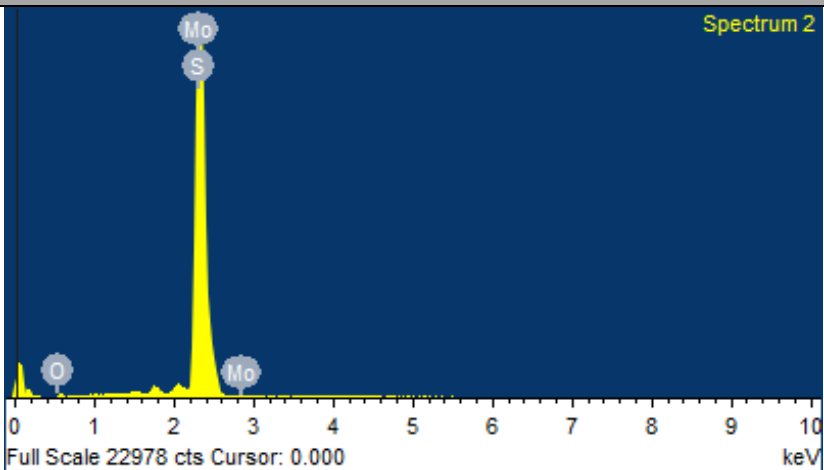
Table S1. Starting material (MoS₂) information: **(a)** is a product specification offered from the company. **(b)** is bulk MoS₂ EDX result, **(c)** is exfoliated MoS₂ EDX result with freeze dried powder from the sample solution. This X-ray spectroscopy data was measured with Field Emission Scanning Electron Microscope (FE-SEM, JEOL JSM-7500F, Jeol USA, Peabody, MA, USA).

(a)

41827 Molybdenum(IV) sulfide, 99% (metals basis)	
Product Number	41827
CAS number	1317-33-5
MDL number	MFCD00003470
Molecular formula	MoS ₂
Appearance (Color)	Gray to black
Form	Powder
Total Metal Impurities	≤ 1%
Particle Size	-325 mesh

* This information is available at this link (<https://alfaesar.com/en/prodspec/041827>)

(b)

Element	Weight%	Atomic%	Spectrum
O K	0.00	0.00	
S K	33.51	60.12	
Mo L	66.49	39.88	
Totals	100.00		

(c)

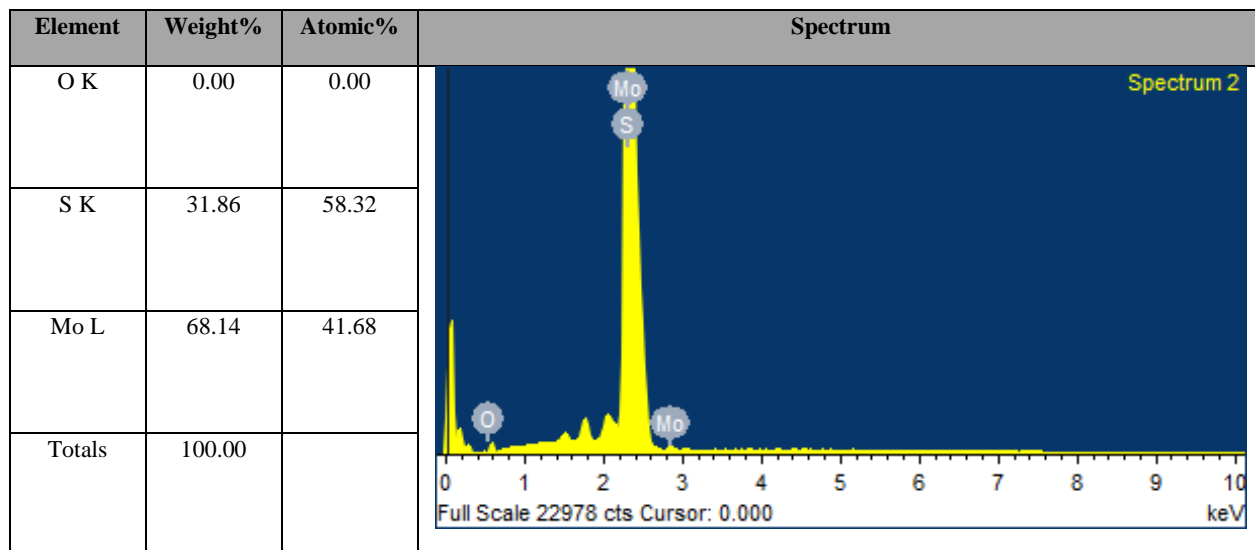


Table S2. Statistical data derived from Figure 3-4. **(a)** P values for comparing the survival average per different concentrations for each timeline. The higher the p value is, it implies that the data group are more similar. **(b)** Decreased amount of survival average from bulk MoS₂ condition to 1 hour exfoliated MoS₂ condition

(a)

P value	<i>B.cereus</i>	<i>P.aeruginosa</i>	Bulk MoS ₂	1 hr exfoliated MoS ₂
	bulk vs 1 hr exfoliated MoS ₂	bulk vs 1 hr exfoliated MoS ₂	<i>B.cereus</i> vs <i>P.aeruginosa</i>	<i>B.cereus</i> vs <i>P.aeruginosa</i>
0hr	Identical; all data start from 1 at 0hr after the normalization			
2hr	0.005449	0.014493	0.006341	0.00989
4hr	0.00048	0.001023	0.000196	0.009816
8hr	0.000625	0.003851	0.003873	0.027004
12hr	0.007226	0.002205	0.017038	0.090325
24hr	0.001784	0.002404	0.039466	0.073406

(b)

Subtraction of normalized survival average at bulk MoS ₂ and exfoliated MoS ₂	Concentration of the MoS ₂	0hr (identical; all data start from 1 at 0hr after the normalization)	2hr	4hr	8hr	12hr	24hr
<i>B.cereus</i>	1.6 mg/mL	0.00	0.00	0.44	0.43	0.61	0.31
	4.0 mg/mL	0.00	0.05	0.52	0.31	0.32	0.07
	8.0 mg/mL	0.00	0.51	0.27	0.05	0.03	0.01
	16.0 mg/mL	0.00	0.30	0.23	0.07	0.04	0.00
<i>P.aeruginosa</i>	1.6 mg/mL	0.00	0.03	0.07	0.16	0.19	0.22
	4.0 mg/mL	0.00	0.39	0.31	0.06	0.00	0.01
	8.0 mg/mL	0.00	0.08	0.05	0.06	0.01	0.01
	16.0 mg/mL	0.00	0.18	0.08	0.07	0.05	0.01

Table S3. Calculated data table from 8hr dose response curve fitting. The \pm values are standard errors calculated by ORIGIN PRO 8.

8hr Dose Response curve fitting data	min	max	$\log_{10}(x_0)$	slope	EC20	EC50	EC80
<i>B.cereus</i> with bulk MoS ₂	0	100	0.26 ± 0.10	3.58 ± 0.65	1.23 ± 0.36	1.81 ± 0.41	2.66 ± 0.46
<i>B.cereus</i> with 1 hr exfoliated MoS ₂			0.16 ± 0.06	4.24 ± 0.32	1.04 ± 0.16	1.45 ± 0.19	2.01 ± 0.23
<i>P.aeruginosa</i> with bulk MoS ₂			0.00 ± 0.19	2.64 ± 0.84	0.59 ± 0.35	1.00 ± 0.43	1.69 ± 0.45
<i>P.aeruginosa</i> with 1 hr exfoliated MoS ₂			-0.23 ± 0.12	3.36 ± 0.60	0.39 ± 0.13	0.59 ± 0.16	0.89 ± 0.19