Table S1 The interactions and effects of MPs on algae

Algae (cell/mL)	MP	Size	MPs Dose (mg/L)	Interaction	EPS	Effect	References
Chlorella pyrenoidosa (log phase growth)	PS	1, 5 μm	2, 10, 50	PS formed aggregates with *C. pyrenoidosa*.	Yes	1 μm MPs significantly inhibit the growth of *C. pyrenoidosa*, reduced the photosynthetic pigment content, induced oxidative stress and disrupted the cell membrane integrity.	Cao et al., (2022)
P. helgolandica var. tsingtaoensis (~0.5×10^5), *Scenedesmus quadricauda* (~2×10^5)	PS	1, 2, 3, 4, 5 μm	10	Size-dependent cellular internalization of PS in algae (1 and 2 μm entered algae, but not 3-5 μm).	NM	Exposure to 1 and 2 μm PS caused a significant reduction in the density of algae and influenced photosynthesis.	Chen et al., (2020)
Scenedesmus abundans (NM)	PS, PMMA, PLA	2 μm	90000 particles/ mL	MPs formed hetero-aggregates with *S. abundans*.	Yes	MPs exposure increased the secretion of bound and soluble EPS.	Cheng and Wang (2022)
Microcystis panniformis (1.9×10^6), *Scenedesmus sp.* (4.7×10^5), *Tetraselmis sp.*	PMMA, PS	Green PMMA and yellow PS:106-250 μm; purple PMMA and	12.5, 125	*M. panniformis* and *Tetraselmis sp.* presented no distinguishable hetero-aggregation with MPs, but the other two formed.	Yes	MPs inhibited *M. panniformis* and *Scenedesmus sp.* growth, but not *Tetraselmis sp*.	Cunha et al., (2019)

(3.3×10^6) *Gloeocapsa sp.* (NM)		blue PS: <106 μm					
Chlorella Vulgaris (mid-exponential phase)	HDPE	<15 μm	5, 10, 40	HDPE formed hetero-aggregates with *C. Vulgaris.*	Yes	HDPE did not affect *C. Vulgaris* cell growth or morphology, but have an effect on their aggregation.	Demir-Yilmaz et al., (2022)
Microcystis aeruginosa (exponentially growing cell)	PS	0.1, 1, 10, 100 μm	1, 10, 100	The 0.1 and 1 μm PS adhered to the algal cell surface. The 10 and 100 μm PS showed the algal cells adherence to their surfaces.	Yes	PS did not significantly inhibit the growth of *M. aeruginosa*, and did not cause a statistically significant difference in the Chl-a content. Algal cells exposed to the larger-sized PS (10 μm and 100 mg/L), grew faster than control group.	Fan et al., (2022)
Chlorella vulgaris (10^6)	PVC	93.8-197 μm	10-1000	PVC and *C. vulgaris* were more likely to aggregate at high concentrations.	Yes	Increasing PVC concentration gradually weakened the inhibitory effect of PVC on *C. vulgaris*. Aged PVC had stronger inhibition on *C. vulgaris* growth than virgin PVC.	Fu et al., (2019)
Chlamydomonas reinhardtii (4×10^6)	HDPE, PP	400-1000 μm	400	PP formed aggregates with *C. reinhardtii*, but HDPE did not.	Yes	MPs did not affect algal growth over a period of time of 60 days.	Lagarde et al., (2016)

Skeletonema costatum (3×10^5)	PE, PP, PET, PLA, PS	NM	1, 5, 10, 50, 100	The surface of *S. costatum* was wrinkled and deformed to different degrees. MPs formed aggregates on the surface of cell.	NM	5 mg/L PS inhibited the growth of algae, but had no significant effect on the content of Chl a.	Li et al., (2022)
Scenedesmus obliquus (2×10^5)	PS, PS-NH_2	0.1, 0.5, 1, 2 μm	0-100	Larger MPs blocked the light transport, smaller MPs destroyed the cell wall by adsorbing onto algal surface.	NM	All size of MPs inhibited *S. obliquus* growth, but no significant difference among size.	Liu et al., (2019)
Chaetoceros neogracile, *Tisochrysis lutea*, *Heterocapsa triquetra* (NM)	PS	2 μm	0.00396, 0.0396	PS only formed hetero-aggregates with *C. neogracile.*	NM	PS did not affect algal growth or the physiological parameters.	Long et al., (2017)
Chlorella pyrenoidosa (1.5×10^5)	PS	0.1, 1 μm	10, 50, 100	PS caused physical damage to cell surface, cell wall thickening, algae homo-aggregation, and algae-MPs hetero-aggregation.	Yes	PS caused dose-dependent adverse effects on algal growth from the lag to the earlier logarithmic phases, but from the end of the logarithmic to the stationary phase, algae could reduce the adverse effects of PS.	Mao et al., (2018)
Dunaliella tertiolecta (10^5-10^6)	PS	0.05, 0.5, 6 μm	25-250	NM	NM	PS did not affect the photosynthesis of algae, but had a negative impact on algal growth at high concentrations. These adverse	Sjollema et al., (2016)

						effects were increased with decreasing particle size.	
Chlorella sp. L38, *Phaeodactylum tricornutum* MASCC-0025 (NM)	PP, PE, PET, PVC	74 μm	200	The secretion of EPS promoted the adsorption and aggregation between MPs and algal cells.	Yes	For *Chlorella sp.* L38, PE, PET, and PVC promoted its growth, while PP inhibited its growth. For *P. tricornutum* MASCC-0025, all MPs inhibited its growth.	Song et al., (2020)
Chlorella vulgaris (10^6)	PE, PA, PLA, PBS	77.75 μm; 59.88 μm: 57.41 μm; 53.33 μm	10, 100, 1000	*C. vulgaris* formed hetero-aggregates with PE.	Yes	All the four types of MPs at a concentration range of 10–1000 mg/L have inhibitory effects on the cell growth of *C. vulgaris* (growth rate and dry cell weight).	Su et al., (2022)
Chlorella vulgaris (4.68×10^6)	PS	0.5 μm	1-1000	PS were adsorbed and embedded on the algal cell.	NM	Both PS concentration and exposure time affected *C. vulgaris* growth and Chl a content after reaching a certain level. *C. vulgaris* showed bioadaptive responses to PS exposure over time.	Tunali et al., (2020)
Chlamydomonas reinhardtii (10^6)	PVC	50-100 μm	10-200	The carbonyl groups formed on the surface increased zeta potential of aged PVC and affected the interaction between PVC and algae.	NM	Both virgin and aged PVC have negative effects on the growth of *C. reinhardtii*.	Wang et al., (2020a)

Phaeodactylum tricornutum, (1.03×10^4) *Chaetoceros gracilis*, (1.17×10^4), *Thalassiosira sp.* (1.15×10^4)	PVC	1 μm	25-200	Algae could absorb PVC on the surface of cells, wrapping them up in surface caveolae regardless of the presence of microalgae cells walls. PVC were embedded in the diatoms cells and caused physical impairment on the diatoms surface.	NM	PVC has negative effects on the cell densities and chlorophyll content of the three algal species.	Wang et al., (2020b)
Euglena gracilis (10^5)	PS	0.1, 5 μm	0.5-50	PS (0.1 and 5 μm) adhered to the surface of algal cells, caused cell membrane damage, and formed aggregates with *E. gracilis*. Few PS (0.1 μm) entered in *E. gracilis*.	NM	PS (0.1 and 5 μm) damaged chloroplast in microalgae, and had a significant inhibitory effect on the growth of *E. gracilis*.	Xiao et al., (2020)
Chlamydomonas reinhardtii (10^6)	PS	0.1,100 μm	50-500	Algae cells were well-adhered to the PS-MPs surface, and sank to the bottom, PS-NPs and *C. reinhardtii* formed hetero-aggregation. Cell membrane permeability was greatly	Yes	Both PS-MPs and PS-NPs inhibited the growth of *C. reinhardtii*, and the inhibitory effect became more obvious with increasing exposure concentration and time. The photosynthetic system of microalgae was also inhibited.	Yan et al., (2021)

				increased under high concentration of PS-NPs.			
Chlorella pyrenoidosa (7×10^6)	PE1000, PE, PA1000, PA, PS	13,150 μm; 13,150 μm; 150 μm	10-100	NM	NM	MPs inhibited *C. pyrenoidosa* growth, the inhibition effect was PE1000 > PA1000 > PE ≈ PS > PA	Yang et al., (2020)
Skeletonema costatum (5×10^5)	PVC	1, 1000 μm	1-2000	PVC (1 μm) caused physical damage on cell wall, and formed aggregates with *S. costatum*.	NM	PVC (1 μm) inhibited algal growth, but PVC (1000 μm) did not have toxic effects on algae even at 2000 mg/L. Negative effects of PVC on photosynthesis decreased with time.	Zhang et al., (2017)
Karenia mikimotoi (10^6)	PVC	1 μm	5-100	*K. mikimotoi* was wrapped by PVC, and formed hetero-aggregates with PVC.	NM	PVC had dose-dependent adverse effects on *K. mikimotoi* growth, chlorophyll content and photosynthetic efficiency.	Zhao et al., (2019)
Chlorella vulgaris (3.63×10^6)	PS, PS-COOH	20, 50, 500 nm	250	PS-COOH was more likely to cause hetero-aggregation with *C. vulgaris*, and the smaller the particle size, the greater the effect.	Yes	PS-COOH inhibited the growth of *C. vulgaris*, while PS had little effect on the growth of *C. vulgaris*.	Hazeem et al., (2020)
Chlamydomonas reinhardtii (2×10^6)	PS, PS-NH_2,	50, 300, 500 nm	10, 100	PS-NH_2 is more likely to form hetero-aggregates with *C. reinhardtii*.	NM	At the concentration of 10 mg/L, PS with larger sizes of 300 nm and 500 nm had stronger growth inhibition	Li et al., (2023)

	PS-COOH					effect on algae than PS with the concentration of 50 nm. When the concentration was increased to 100 mg/L, the growth inhibition of 50 nm PS was more serious, the PS of 300 nm and 500 nm was not improved. PS-NH_2 also inhibited the growth of algae, while PS-COOH had little effect on the growth of algae.	
Chlorella sp. (log phase growth)	PS, PS-NH_2, PS-COOH	200 nm	1	PS surface formed eco-corona.	Yes	All MPs inhibited *Chlorella sp.* growth, but aged MPs with EPS reduced toxicity and the reducing effect increased with aging time.	Natarajan et al., (2020)
Pseudokirchneriella subcapitata (10^6)	PS, PS-NH_2, PS-COOH	50-500 nm 110 nm 20 nm	1-100	Adsorption of neutral and positively charged PS onto the cell wall of *P. subcapitata* was stronger than that of negatively charged PS.	NM	PS-COOH had little inhibitory effect on the growth of algae, while positively charged PS-NH_2 had a greater inhibitory effect on the growth of algae.	Nolte et al., (2017)
Chlorella pyrenoidosa (6.93×10^6)	PS	80 nm	5-50	PS formed hetero-aggregates with *C. pyrenoidosa*.	NM	PS inhibited *C. pyrenoidosa* growth and photosynthetic.	Yang et al., (2021)