Supplementary Material

Figure S1. The process of forming large plastics into microplastics **[1]**.

Figure S2. Schematic representation of the six sorption mechanisms **[2]**.

Table S1. Classification of microplastics.

Table S2. Surface area parameters of different adsorbents.

Table S3. Adsorption mechanism of plastic on organic pollutants.

Table S4. Adsorption mechanism of plastics on inorganic pollutants.

Table S5. Adsorption mechanism of plastics on other pollutants.

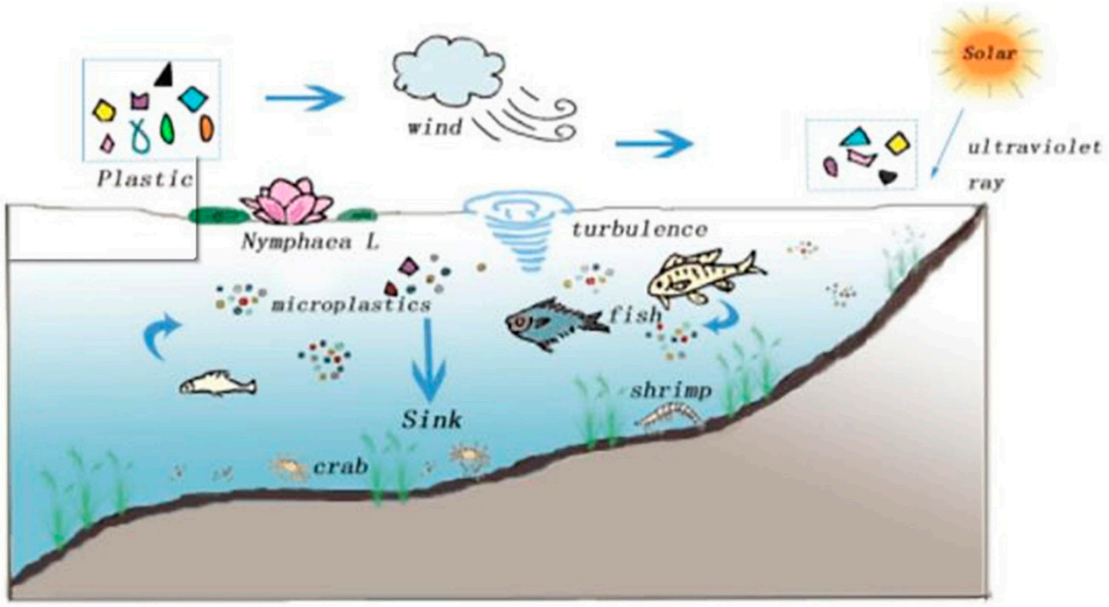

Figure S1. The process of forming large plastics into microplastics **[1].**

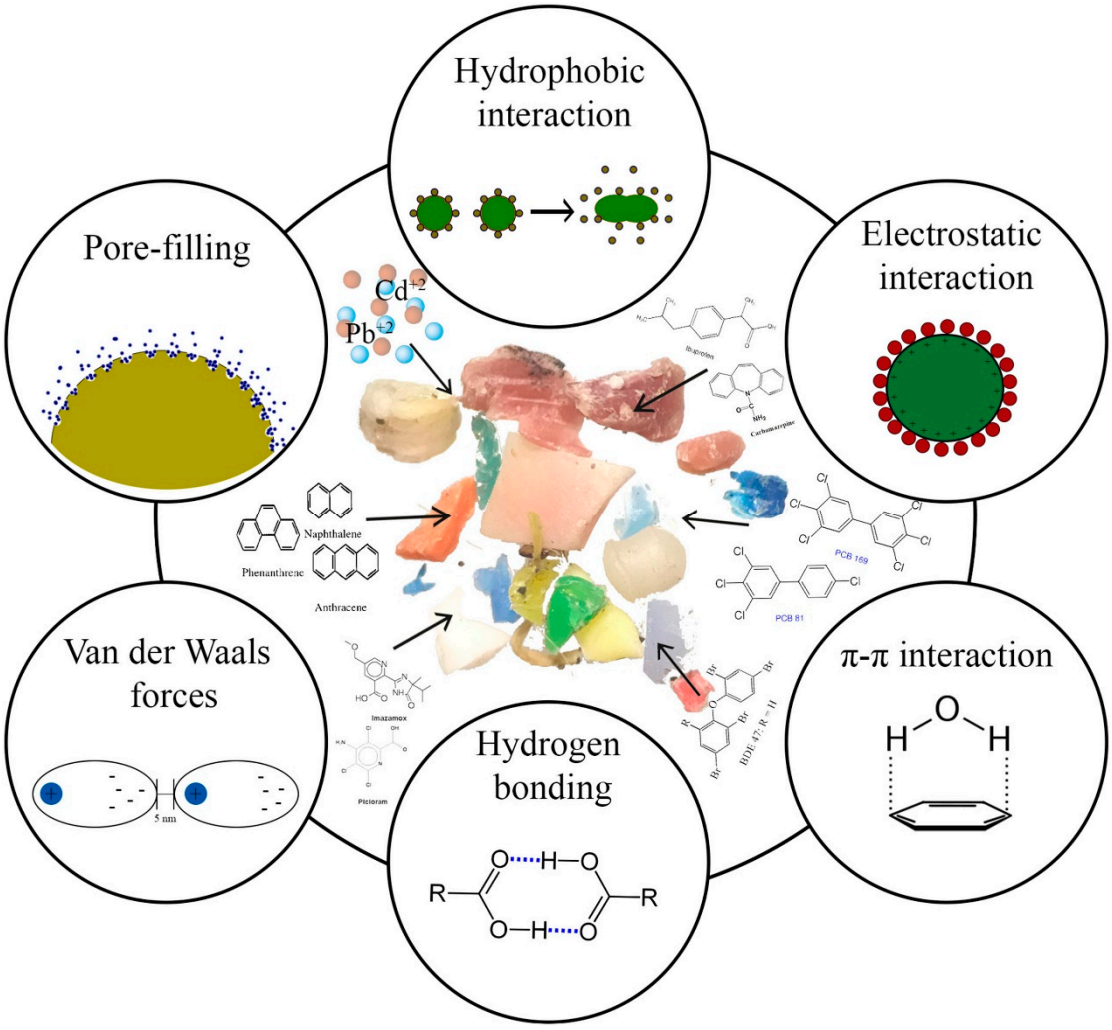

Figure S2. Schematic representation of the six sorption mechanisms **[2].**

Table S1. Classification of microplastics.

Features	Classification	Reference
source	primary plastic (primary plastic), secondary plastic	**[3]**
color	white/translucent, black/brown, blue, red/pink, green	**[3]**
Shape	fibers, filaments, fragments, films, particles	**[4]**
polymer	polyethylene, polyethylene terephthalate, polyester, polypropylene plastic polymer	**[5]**
Source (grade)	foam plastics (polycarbonate polyurethane (PCU) fragments), boat paints (polypropylene PP, polyethylene PE + film PP), fishing nets and lines, and textile production (PET, PES)	**[6]**
particle size	＜0.5 mm, 0.5 mm - 1 mm, 1 mm - 2 mm, 2 mm - 3 mm, 3 mm - 4 mm, 4 mm - 5 mm	**[7]**

Table S2. Surface area parameters of different adsorbents

Adsorbent	surface area/ m^2/g	Reference
HDPE and LDPE	0.164 ± 0.02 and 0.043 ± 0.001	**[8]**
MN 200, Dowex XZ and AuRIX	793, 39.2 and 37.5	**[9]**
FRP particles	2.7	**[10]**
CalP2, CalP3 and CalP4	596, 630 and 759	**[11]**
PE rope of 1, 4 and 10-mm	0.129, 0.042 and 0.027	**[12]**
YWB-7	663.8	**[13]**
PVC	0.595	**[14]**
PE, PP, PES and PA	0.2651 ± 0.01, 0.3553 ± 0.04, 0.1127 ± 0.03 and 0.1170 ± 0.03	**[15]**
Synthetic Resin	27.82	**[16]**
PAN	27.80	**[17]**
PAN	27.80	**[18]**
Resin	47.54, 39.15 and 191.57	**[19]**
IRC748 and NDC702	36.3985 and 14.2367	**[20]**
D152 resin	4.8	**[21]**
Cl-PAni and Ph-PAni NFs	37.6 and 44.1	**[22]**
Electrospun fibrous	10-40	**[23]**
PE, PET, PP, PS and PVC	1.4, 0.35, 2.7, 3.2 and 0.59	**[24]**
grafted polyethylene imine melamine formaldehyde	460	**[25]**
Chloromethylated polystyrene and GQ-08 resin	24.76 and 31.45	**[26]**

Table S3. Adsorption mechanism of organic pollutants.

Adsorbent	Pollutants	The adsorption mechanism	Reference
polyethylene microplastic	aromatic amine	the salting out effect	**[8]**
polymer resin	phenol	the mechanism of adsorption and ion exchange	**[9]**
glass fiber reinforced plastic	polyacrylic acid	electrostatic interaction	**[10]**
porous polycarboxarene	organic micropollutants	hydrophobic interactions	**[11]**
microplastic	phenanthrene	absorption mechanism, the hydrophobicity of organic carbon	**[12]**
acrylate polymer YWB - 7 resin	5 - 2 sulfo sodium isophthalic acid	hydrogen bonding and hydrophobic interaction	**[13]**
micro polyvinyl chloride (PVC) plastic	Fe and single hydroxyl derivatives	hydrophobic interactions	**[14]**
biological membrane reinforced plastic microfiber	perfluorinated octane sulfonic acid (PFOS)	hydrophobic interactions	**[15]**
Micro polystyrene plastics	three three azole fungicide	hydrophobic and electrostatic interactions	**[27]**
plastic cellulose acetate	2, 4 - diallyl (sorbic acid)	group acetylated	**[28]**
microplastic	PFOS, FOSA	hydrophobic interactions	**[29]**
polylipoic acid ester-base coagulant	organic pollutants (pops)	hydrophobic interactions	**[30]**
micro polystyrene plastics	soluble organic matter (DOM)	hydrophobic interactions, π-π electron donor receptor interactions, salting-out effect	**[31]**
micro polystyrene plastics	triclosan	hydrophobic interactions	**[32]**
polyethylene and polyvinyl	sanzheng butyl ester phosphate and phosphate (2-	weak van der Waals force, adsorption selectivity	**[33]**

chloride (PVC) plastic	ethyl chloride)		
in plastic and plastic	the philippines, nitrobenzene and naphthalene	hydrophobic interaction, π-π, crystallinity	**[34]**
anion exchange resin	phenol	ion exchange	**[35]**
microplastic PS + PE	three types of cones sterol fungicide	hydrophobic interaction, van der Waals force	**[36]**
the original rusty water microplastic	ions, organic pollutants	electrostatic force, van der Waals force, space steric hindrance	**[37]**
functionalized polystyrene nano ball	2,4,6-trinitrotoluene (TNT)	p - phosphorus accumulation interaction, hydrogen, and hydrophobic interaction	**[38]**
polystyrene	organic pollutants (pops)	the adsorption affinity	**[39]**
plastic adsorbent	chlorinated methane	the adsorption selectivity	**[40]**
polystyrene microspheres	naphthalene (NAP) and its derivatives	hydrophobic	**[41]**
microplastic	17 beta estradiol	hydrophobic	**[42]**
microplastic	nonpolar organic compounds	hydrophobic interactions	**[43]**
microplastic	fuel aromatics and ether	hydrophobic	**[44]**
microplastic	phenanthrene	hydrophobic	**[12]**
polystyrene	nonionic organic compounds	π-π- aromatic interactions, hydrophobic interactions	**[45]**

Table S4. Adsorption mechanism of inorganic pollutants.

Adsorbent	Pollutants	The adsorption mechanism	Reference
polyacrylonitrile - 2 - amino thiazole resin	Hg, Cd, Pb, Cu, Zn and Ni	the adsorption affinity	**[16]**
polyacrylonitrile - 2 - amino - 2 - thiazole moiety resin	precious metal ions	the adsorption affinity	**[17]**
polyacrylonitrile - amino thiourea resin	Rh(III), Ru(IV), Pd(II), Ir(IV)	the adsorption affinity	**[18]**
methyl glycidyl ester of acrylic resin	Cu(II), Pb(II)	the adsorption affinity	**[19]**
IDA - chelating resin	Cu(II), Pb(II), Cd(II)	the adsorption affinity	**[20]**
D152 resin	Cd(II)	surface adsorption, surface electrical property, and hydrogen bond	**[21]**
phytic acid doped polyaniline nanofibers	water-borne Cu (II)	the adsorption affinity	**[22]**
electrospinning fiber membrane	heavy metal	the adsorption affinity	**[23]**
microplastic	Cd, Co, Cr, Cu, Ni, Pb, and Zn	chemical adsorption	**[24]**
iminodiacetic acid chelating resin	Sc(III), Y(III), La(III), Fe(III), Al(III), Ga(III), In(III)	the adsorption selectivity	**[30]**
micro/nano plastic	metal	the adsorption affinity	**[32]**
folic acid - polyaniline hybrid hydrogel	Cr (VI), Hg (II), Pb (II)	REDOX	**[46]**
folic acid - polyaniline hybrid hydrogel	anionic dye	the adsorption affinity	**[46]**
modification of polyethyleneimine	Cr(III), Fe(III)	chemical adsorption	**[47]**
polyethylimine	Pb and Hg	the adsorption affinity	**[48]**

polystyrene nanofibers	Cd, Ni	normal adsorption	**[49]**
acrylic acid grafted polytetrafluoroethylene fibers	Er(III)	ion exchange resin and metal or complex	**[50]**
new IDA - chelating resin	Cu(II), Pb(II), Cd(II)	ion exchange, chemical interaction	**[51]**
IRN77 cation exchange resin	Co(II), Cr(III), Ni(II)	the adsorption affinity	**[52]**
amines and sulfur chelating resin	Zn (II), Cd (II), Hg (II)	the nature of the chelating groups, the stability of the metal-ligand CO	**[53]**
coal and polyvinyl chloride (PVC) scrap	Hg	carbon chlorine key (modified)	**[54]**
cationic polystyrene balls	paper anion pollutants in water	grafting	**[55]**
crosslinked polystyrene diethanolamine load DiDai type of dendritic polymers grafted	metal ions	hydrogen bonding, adsorption affinity	**[56]**
polytetrafluoroethylene fibers	Cu(II)	the hydroxyl and carbonyl	**[57]**
porous cellulose modified polyethylene imine carrier	Hg	the adsorption affinity	**[58]**
IRN - 77 cation exchange resin	Co(II), Ni(II), Cr(III)	the adsorption affinity	**[59]**
3 - aminopyridine hydrophilic spacer chelating resin	Hg(II), Ag(I), Fe(III), Pb(II), Co(II), Cu(II), Ni(II), Cd(II)	the adsorption selectivity	**[60]**
polystyrene (MPS)	nanometer oxide (CeNPs)	the adsorption affinity	**[61]**
polyacrylic acid - PVC composite adsorbent	cadmium pollution of wastewater	ion exchange	**[62]**
micro polystyrene plastics	heavy metal	physical and chemical adsorption	**[63]**
microplastic	metal pollutants	the adsorption	**[64]**
doped polyaniline	anionic dye	chemical interaction	**[65]**
"X" shape of the cavity 2 d coordination polymer	oxygen anion pollutants	the adsorption affinity	**[66]**
new type of sulfur-containing polyamine chelating resin	precious metal	the adsorption affinity	**[67]**

amination polyacrylonitrile fiber	Pb, Cu	the adsorption affinity	**[68]**
micro polystyrene plastics	As(III)	hydrogen bonding	**[69]**

Table S5. Adsorption mechanism of other pollutants.

Adsorbent	Pollutants	The adsorption mechanism	Reference
grafted polyethylene imine melamine formaldehyde	CO_2	chemical adsorption and physical adsorption	**[25]**
2-amino modified polystyrene pyridine resin, D301 resin, and 330 resin	glyphosate	hydrogen bonding, single anion exchange	**[26]**
porous super hydrophobic foam plastic	oily wastewater	Superhydrophobic and superhydrophilic	**[70]**
carbonized polypropylene	oil	mechanism of carbide	**[71]**
weak base anion exchange resin	benzene sulfonate	ion exchange	**[72]**
polystyrene matrix	protein fiber connection	hydrophobic interactions	**[73]**
polystyrene	thrombin	the adsorption affinity	**[74]**
$La(OH)_3$@SA/PAM	methylene blue, crystal violet, and malachite green	hydrogen bonding, electrostatic interaction	**[75]**
metal ions impregnated polystyrene resin	antibiotics in water pollutants	the surface complexation, cationic bridge interaction, and electrostatic attraction/competition	**[76]**

polyvinyl chloride (PVC)/polystyrene fiber electrostatic spinning	oil pollution	adsorption and capillary action	**[77]**
polyvinyl chloride (PVC) mesoporous membrane	methylene blue	high water flux	**[78]**
micro polystyrene plastics	ator-vastatin (ATV) and amlodipine (AML)	hydrophobic interaction, π-π	**[79]**
PTFE membrane	crude oil	physical adsorption	**[80]**
polymer nanocomposites	harmful pollutants in the water or wastewater	the adsorption affinity	**[81]**
low poly beta cyclodextrin coupling polystyrene	puerarin	hydrogen bonding, hydrophobic effect, van der Waals force, electrostatic and π-π synergy of interaction	**[82]**

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