

Supplementary Information

A rapid method for extracting microplastics in oily food samples*

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Table S1. Weight change of cellulose nitrate membranes treated with different organic reagents

Organic reagents	Weight change (%) (mean \pm sd)	P value	T value	95% confidence interval of the difference (%)
Hexanes	+0.02 \pm 0.01	0.07	3.50	(-0.01, 0.05)
Dichloromethane	+0.02 \pm 0.04	0.44	0.96	(-0.07, 0.11)
Methylbenzene	-0.02 \pm 0.06	0.60	-0.62	(-0.16, 0.12)
Isopropyl alcohol	+0.04 \pm 0.02	0.09	3.05	(-0.02, 0.09)

Table S2. Weight change of microplastics treated by hexane and dichloromethane (DCM)

MPs	Weight change (%) (mean \pm sd)	P value	T value	95% confidence interval of the difference (%)
Hexane				
PE	+0.36 \pm 0.25 ^d	0.14	2.42	(-0.28, 0.99)
PET	-0.49 \pm 1.20	0.55	-0.71	(-3.48, 2.49)
PP	+0.06 \pm 0.03	0.06	3.93	(-0.01, 0.13)
PS	+0.30 \pm 0.13	0.06	3.93	(-0.03, 0.63)
DCM				
PE	-0.08 \pm 0.21	0.60	-0.63	(-0.60, 0.45)
PET	-0.01 \pm 0.22	0.51	-0.81	(-0.66, 0.45)
PP	+0.11 \pm 0.05	0.06	3.91	(-0.01, 0.22)
PS	+9.73 \pm 0.29	<	58.3	(9.01,10.5)
		0.001		

Table S3. The amount of washing reagent for oils with different weights in food

Oil (g)	Hexane (mL)
< 0.25	13.0
0.25–0.5	15.0
0.5–1.0	30.0
1.0–1.5	35.0

Table S4. Recovery rates of microplastics in food mixed with different types of oil

	Recovery rates					
	400- μ m PET	500- μ m PE	500- μ m PET	500- μ m PP	500- μ m PS	1000- μ m PP
Flour + Animal oil	97% \pm 8%	97% \pm 14%	100% \pm 6%	93% \pm 14%	102% \pm 8%	100% \pm 0
Flour + Vegetable oil	93% \pm 10%	88% \pm 26%	97% \pm 8%	92% \pm 8%	90% \pm 11%	92% \pm 10%
Flour + Mixed oil	90% \pm 9%	98% \pm 13%	98% \pm 12%	93% \pm 15%	92% \pm 8%	97% \pm 5%
Mean + SD	93% \pm 9%	94% \pm 18%	98% \pm 9%	93% \pm 12%	94% \pm 10%	96% \pm 7%

Table S5. The comparison of recoveries in different particle sizes of the same microplastics

MPs	Mean difference	P value	T value	95% confidence interval of the difference
400- μ m PET & 500- μ m PET	-5.0	0.10	-1.70	(-11.0, 0.98)
500- μ m PET & 1000- μ m PP	-3.3	0.31	-1.03	(-9.95, 3.28)

Table S6. The comparison of recoveries in different oil of the same microplastics

MPs	Oil	Mean difference	P value	T value	95% confidence interval of the difference
400- μ m PET	Animal oil & Vegetable oil	3.33	0.55	0.62	(-8.64, 15.3)
	Animal oil & Mixed oil	6.67	0.21	1.35	(-4.35, 17.7)
	Vegetable oil & Mixed oil	3.33	0.56	0.60	(-9.09, 15.8)
500- μ m PET	Animal oil & Vegetable oil	3.33	0.45	0.79	(-6.06, 12.7)
	Animal oil & Mixed oil	1.67	0.77	0.31	(-10.4, 13.8)
	Vegetable oil & Mixed oil	-1.67	0.78	-0.29	(-14.6, 11.3)
500- μ m PE	Animal oil & Vegetable oil	8.33	0.51	0.69	(-18.7, 35.4)
	Animal oil & Mixed oil	-1.67	0.84	-0.21	(-19.0, 15.8)
	Vegetable oil & Mixed oil	-10.0	0.43	-0.83	(-36.9, 16.9)
500- μ m PS	Animal oil & Vegetable oil	11.7	0.06	2.15	(-0.42, 23.8)
	Animal oil & Mixed oil	10.0	0.04	2.30	(0.32, 19.7)
	Vegetable oil & Mixed oil	-1.67	0.77	-0.31	(-13.8, 10.4)
500- μ m PP	Animal oil & Vegetable oil	1.67	0.80	0.26	(-12.5, 15.9)
	Animal oil & Mixed oil	0.00	1.00	< 0.001	(-18.5, 18.5)
	Vegetable oil & Mixed oil	-1.67	0.81	-0.24	(-17.0, 13.6)
1000- μ m PP	Animal oil & Vegetable oil	8.33	0.09	2.08	(-1.98, 18.7)
	Animal oil & Mixed oil	3.33	0.18	1.58	(-2.09, 8.75)
	Vegetable oil & Mixed oil	-5.00	0.30	-1.10	(-15.6, 5.56)

Table S7. Degradation effect of applied digestion and washing procedure on tested microplastics

Type	No. ^a	Color change	Spectral matching index	Other change
400- μm PET	6	– ^b	> 0.90	–
500- μm PE	6	–	> 0.90	–
500- μm PET	6	–	> 0.90	–
500- μm PP	6	–	> 0.90	–
500- μm PS	6	transparent → light yellow	~ 0.60	slight corrosion
1000- μm PP	6	–	> 0.90	–

a: Number of parallel samples

b: No changes was found on microplastics before and after treatment

Table S8. Change of particle size (mean \pm sd) of common polymer types before and after treatment

MPs	Change of particle size (μm)	P value	T value	95% confidence interval of the difference
400- μm PET	-0.17 \pm 76.9	0.99	-0.01	(-29.7, 29.4)
500- μm PET	-12.2 \pm 93.9	0.51	-0.67	(-49.1, 24.6)
500- μm PE	29.2 \pm 96.7	0.06	1.94	(-0.99, 59.3)
500- μm PS	-14.6 \pm 64.0	0.21	-1.27	(-37.7, 8.42)
500- μm PP	-23.6 \pm 101	0.28	-1.08	(-67.4, 20.1)
1000- μm PP	-23.5 \pm 156	0.40	-0.84	(-79.8, 32.7)

Table S9. Change of surface area (mean \pm sd) of common polymer types before and after treatment

MPs	Change of surface area (mm^2)	P value	T value	95% confidence interval of the difference
400- μm PET	0.03 \pm 0.11	0.20	1.29	(-0.01, 0.07)
500- μm PET	-0.03 \pm 0.13	0.26	-1.14	(-0.07, 0.02)
500- μm PE	0.05 \pm 0.15	0.11	1.61	(-0.01, 0.10)
500- μm PS	-0.02 \pm 0.05	0.06	-1.95	(-0.04, 0.0005)
500- μm PP	-0.002 \pm 0.15	0.95	-0.06	(-0.06, 0.06)
1000- μm PP	0.04 \pm 0.23	0.26	1.14	(-0.03, 0.12)

Table S10. 95% confidence interval for the mean of surface area and particle size of common polymer types before and after treatment

MPs	Surface area (mm^2)		Particle size (μm)	
	Before treatment	After treatment	Before treatment	After treatment
400- μm PET	(0.25, 0.32)	(0.24, 0.28)	(418, 460)	(415, 460)
500- μm PET	(0.25, 0.29)	(0.25, 0.34)	(444, 487)	(444, 508)
500- μm PE	(0.47, 0.55)	(0.41, 0.50)	(633, 677)	(604, 649)
500- μm PS	(0.18, 0.20)	(0.19, 0.22)	(449, 480)	(464, 499)
500- μm PP	(0.60, 0.67)	(0.58, 0.69)	(652, 710)	(669, 739)
1000- μm PP	(0.90, 0.99)	(0.84, 0.96)	(891, 948)	(893, 992)

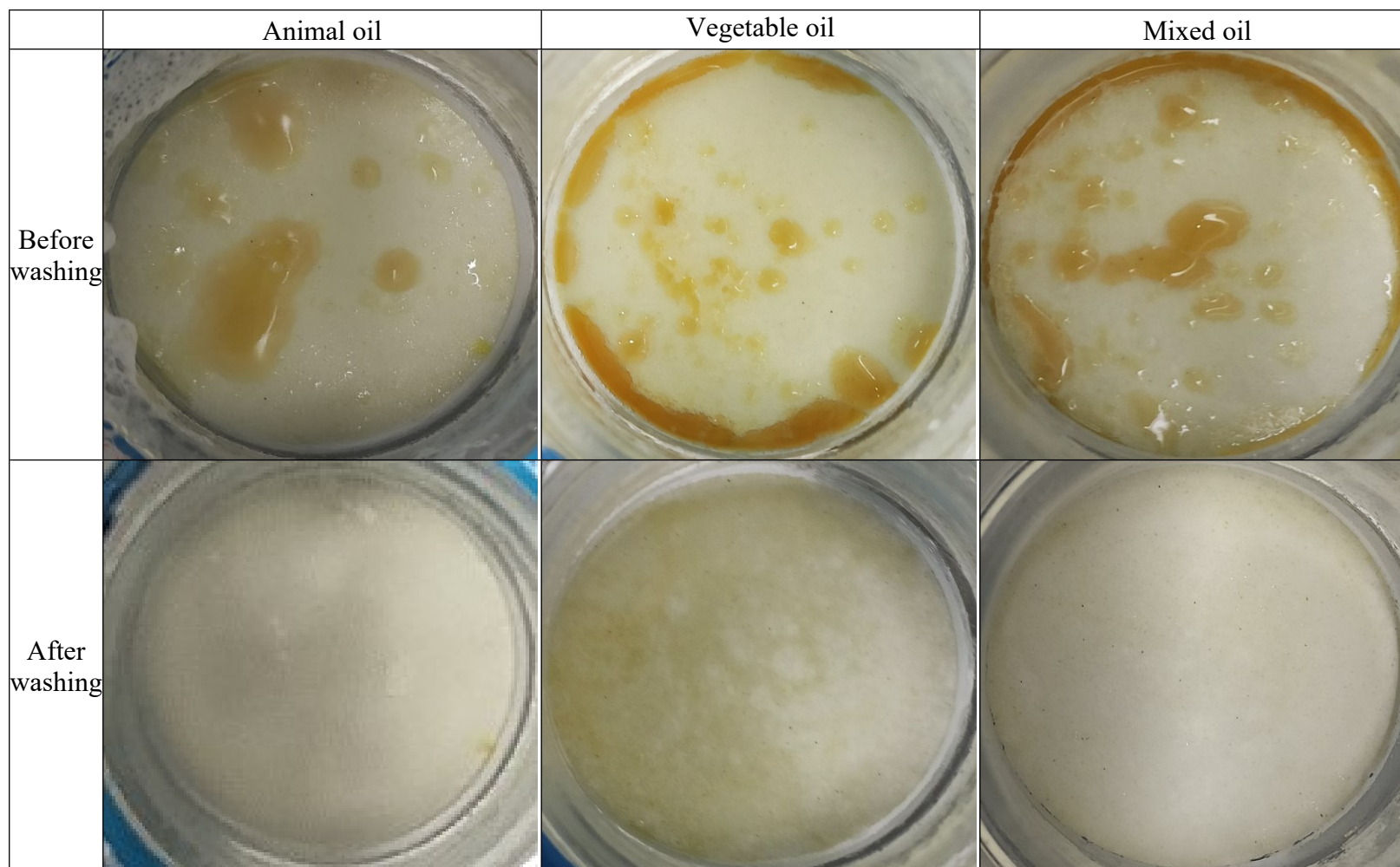


Fig.S1. The comparison of oil on cellulose nitrate membranes before and after hexane washing