

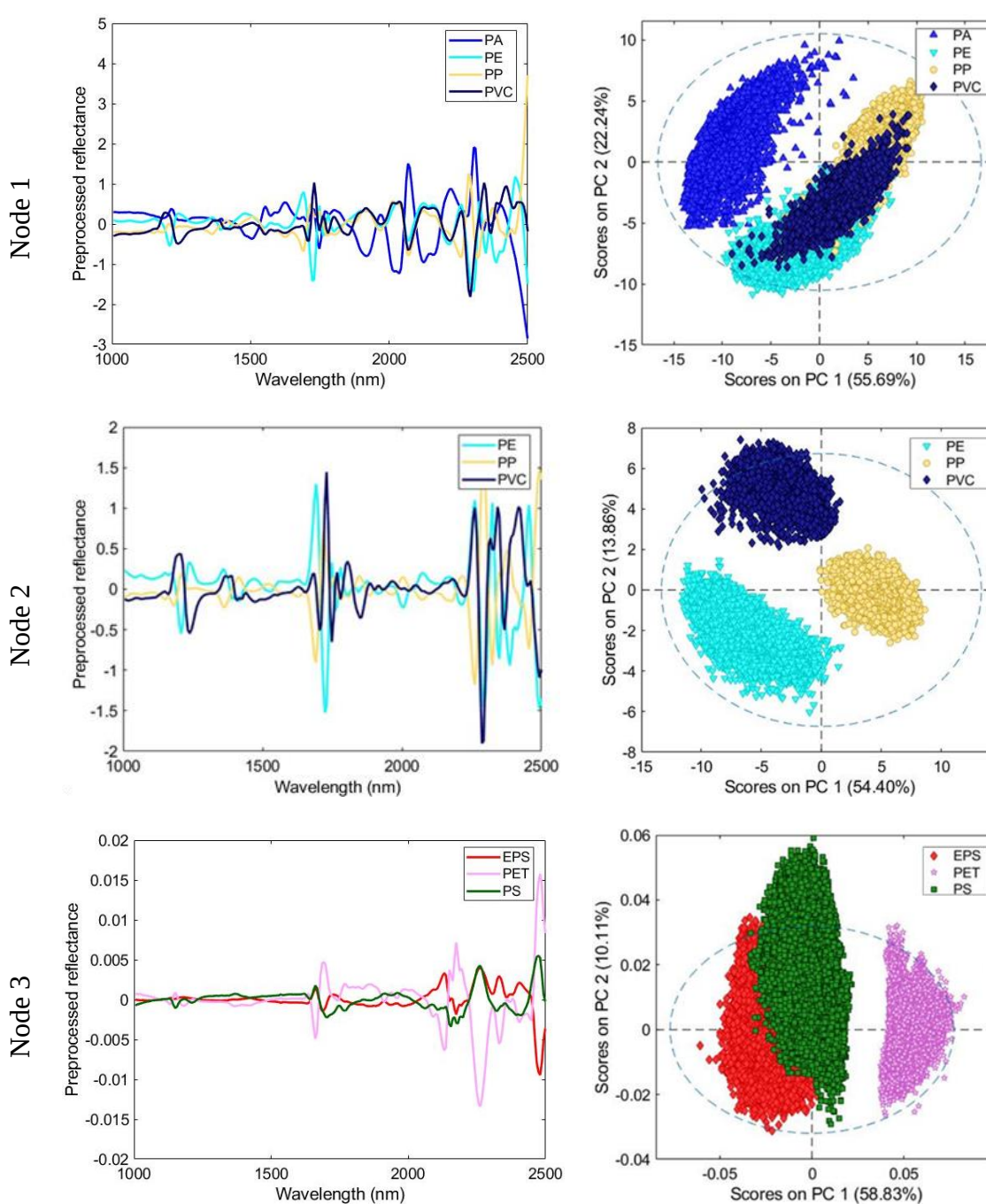
Classification and distribution of freshwater microplastics along the Italian Po river by hyperspectral imaging

Environmental Science and Pollution Research

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Supplementary Material



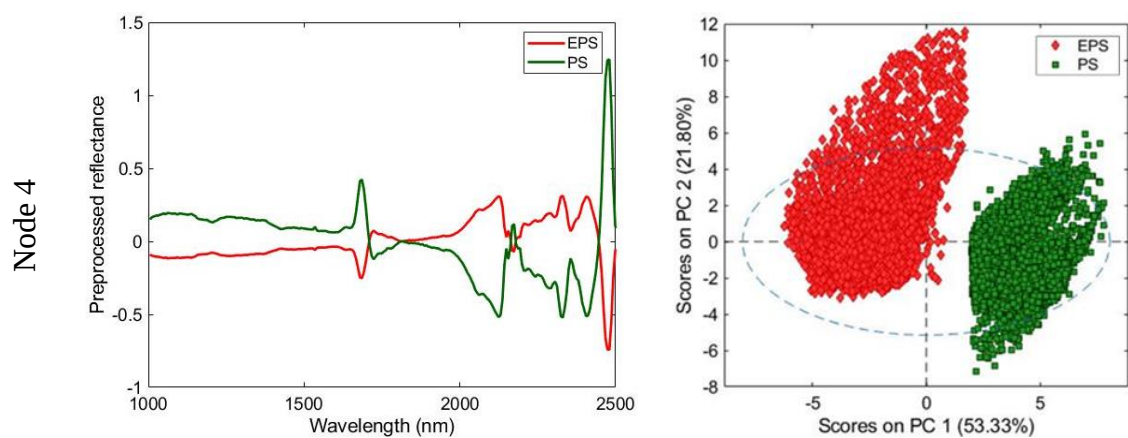


Figure S1. Preprocessed average spectra of polymers and corresponding PCA score plot related to the different rules used for the construction of the HI-PLS-DA model.

Table S1. *Sensitivity* and *Specificity* values in Calibration (Cal) and Cross Validation (CV) for each node of HI-PLS-DA model built for the recognition of microplastics.

Classification rule			Class		
			PA/PP/PE/PVC	PS/PET/EPS	
Node 0					
Distinction between two classes: PA/PP/PE/PVC and PS/PET/EPS	Sensitivity	Calibration	0.998	1.000	
	Specificity		1.000	0.998	
	Sensitivity	Cross validation	0.998	1.000	
	Specificity		1.000	0.998	
			PA	PP/PE/PVC	
Node 1					
Distinction between two classes: PA and PP/PE/PVC	Sensitivity	Calibration	1.000	1.000	
	Specificity		1.000	1.000	
	Sensitivity	Cross validation	1.000	1.000	
	Specificity		1.000	1.000	
			PE	PP	PVC
Node 2					
Distinction between three classes: PE, PP and PVC	Sensitivity	Calibration	0.996	1.000	1.000
	Specificity		1.000	0.999	1.000
	Sensitivity	Cross validation	0.996	1.000	1.000
	Specificity		1.000	0.999	1.000
			PET	PS/EPS	
Node 3					
Distinction between two classes: PET and PS/EPS	Sensitivity	Calibration	1.000	1.000	
	Specificity		1.000	1.000	
	Sensitivity	Cross validation	1.000	1.000	
	Specificity		1.000	1.000	
			PS	EPS	
Node 4					
Distinction between two classes: PS and EPS	Sensitivity	Calibration	0.997	0.998	
	Specificity		0.998	0.997	
	Sensitivity	Cross validation	0.997	0.998	
	Specificity		0.998	0.997	

Table S2. Summary of the main shape and size parameters of the microplastic samples belonging to the different categories obtained by morphological and morphometrical analysis.

		Area (mm²)	Aspect	Perimeter (mm)	Roundness	Feret min (mm)	Feret max (mm)	Feret mean (mm)
Fragment	Min	0.16	1.06	1.30	1.00	0.30	0.52	0.43
	Max	24.58	7.89	21.02	3.46	5.24	7.84	6.02
	Mean	3.16	1.89	6.46	1.45	1.35	2.42	1.96
	St. Dev.	4.68	0.92	4.51	0.41	0.95	1.67	1.32
Filament	Min	0.19	-	4.43	-	-	-	-
	Max	3.58	-	20.50	-	-	-	-
	Mean	1.07	-	10.00	-	-	-	-
	St. Dev.	1.10	-	6.25	-	-	-	-
Granule	Min	0.20	1.01	1.52	1.00	0.39	0.51	0.49
	Max	2.40	1.93	5.48	1.14	1.60	1.88	1.74
	Mean	0.67	1.16	2.72	1.01	0.79	0.94	0.87
	St. Dev.	0.47	0.17	0.87	0.03	0.27	0.29	0.27
Foam	Min	0.26	1.04	1.69	1.00	0.45	0.63	0.56
	Max	14.39	2.75	14.40	2.99	4.05	4.95	4.47
	Mean	2.44	1.56	5.85	1.33	1.40	2.07	1.77
	St. Dev.	2.28	0.49	2.64	0.35	0.67	0.92	0.77
Pellet	Min	0.36	1.02	2.00	1.00	0.60	0.71	0.65
	Max	6.51	1.32	9.30	1.10	2.60	3.38	2.93
	Mean	2.01	1.16	4.83	1.01	1.40	1.67	1.54
	St. Dev.	1.31	0.09	1.44	0.03	0.40	0.53	0.45

Area (mm²): area of the object; *Aspect*: ratio between major axis and minor axis of ellipse equivalent to object. This parameter provides an indication of how much the particles are elongated; *Perimeter* (mm): length of the boundary of the object; *Roundness*: provides an indication of the circularity of the object (for a circle the parameter takes the value 1) and is calculated with the following equation: $(Perimeter)^2/4\pi Area$; *Minimum Feret Diameter* (mm): smallest caliper (Feret) length; *Maximum Feret Diameter* (mm): longest caliper (Feret) length; *Average Feret Diameter* (mm): average caliper (Feret) length.