Electronic Supplementary Material (ESI) for Environmental Science: Nano.

SUPPORTING INFORMATION

Application of Ionic Mesoporous Silica in Selective Recovery of Tungstate Ions through Column Adsorption and Subsequent Photocatalytic Degradation of an Organic Dye

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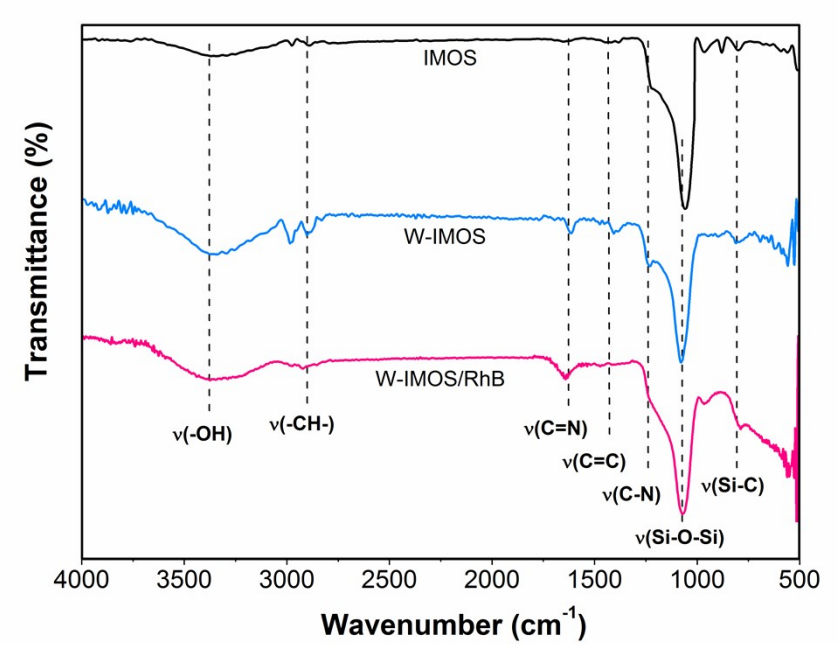


Figure S1. FT-IR spectra of IMOS nanoparticles obtained before and after tungstate adsorption and photocatalytic degradation of RhB molecules.

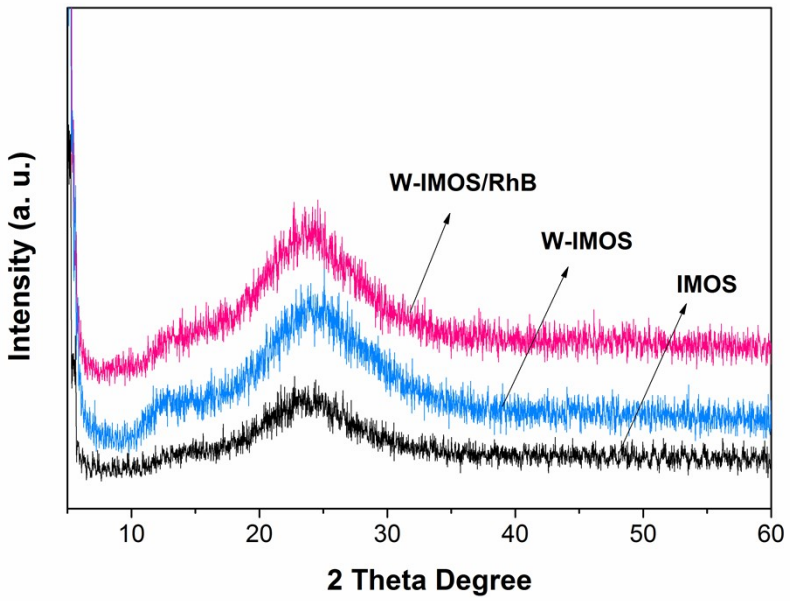


Figure S2. Wide-angle XRD spectra of IMOS nanoparticles obtained before and after tungstate adsorption (W-IMOS) and photocatalytic degradation of RhB molecules (W-IMOS/RhB).

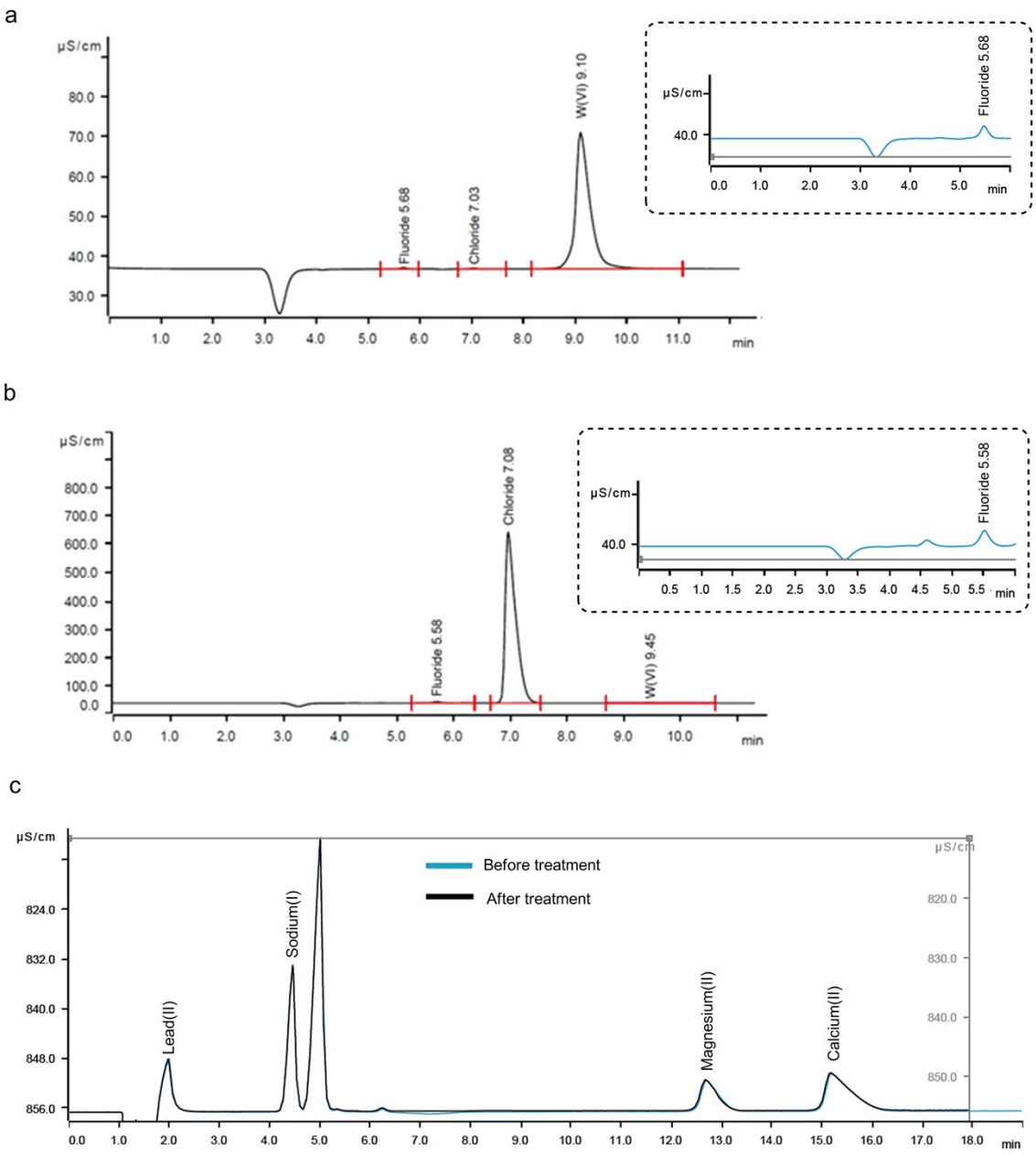


Figure S3. Ion chromatograms obtained of wastewater (a) before, and (b) after the treatment using IMOS nanomaterial illustrating the adsorption of W(VI) via anion-exchange mechanism. Insets are the magnified chromatograms depicting the peak intensity of fluoride (F^-) which remain unchanged before and after the wastewater treatment, and thus, substantiate the selective removal of W(VI). (C) Compared Ion chromatograms of wastewater depicting the available cations before and after the treatment. It confirms the selective adsorption of W(VI) as there is no difference in the peak intensity of cations before and after the treatment using IMOS nanomaterial.

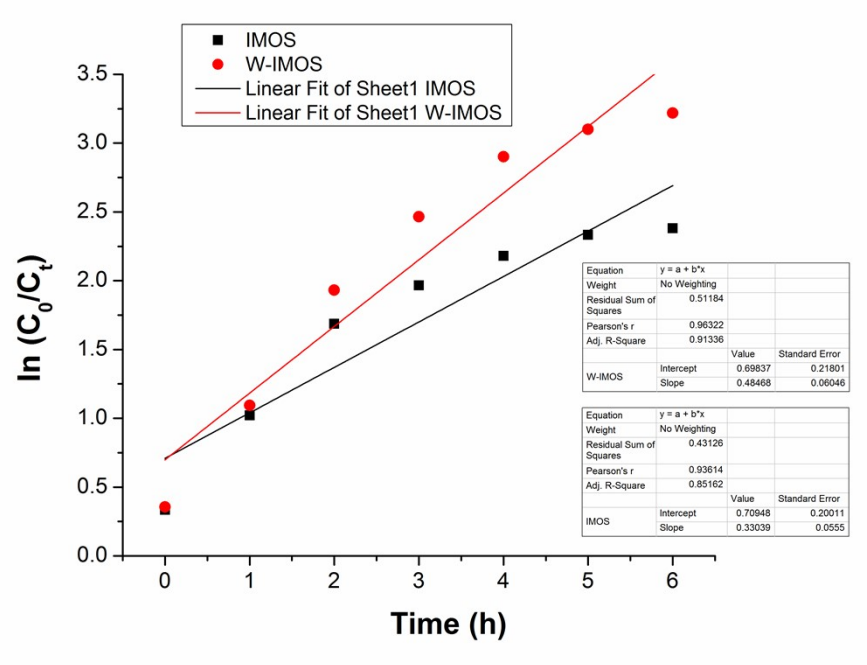


Figure S4. First order kinetic plot for the photo-degradation of RhB molecules in aqueous solutions using IMOS and W-IMOS nanoparticles.

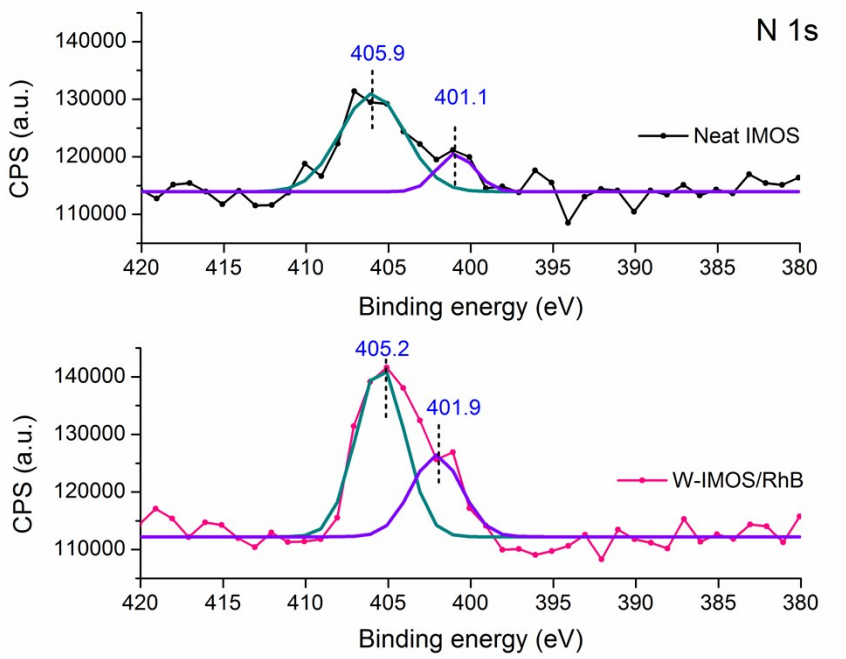
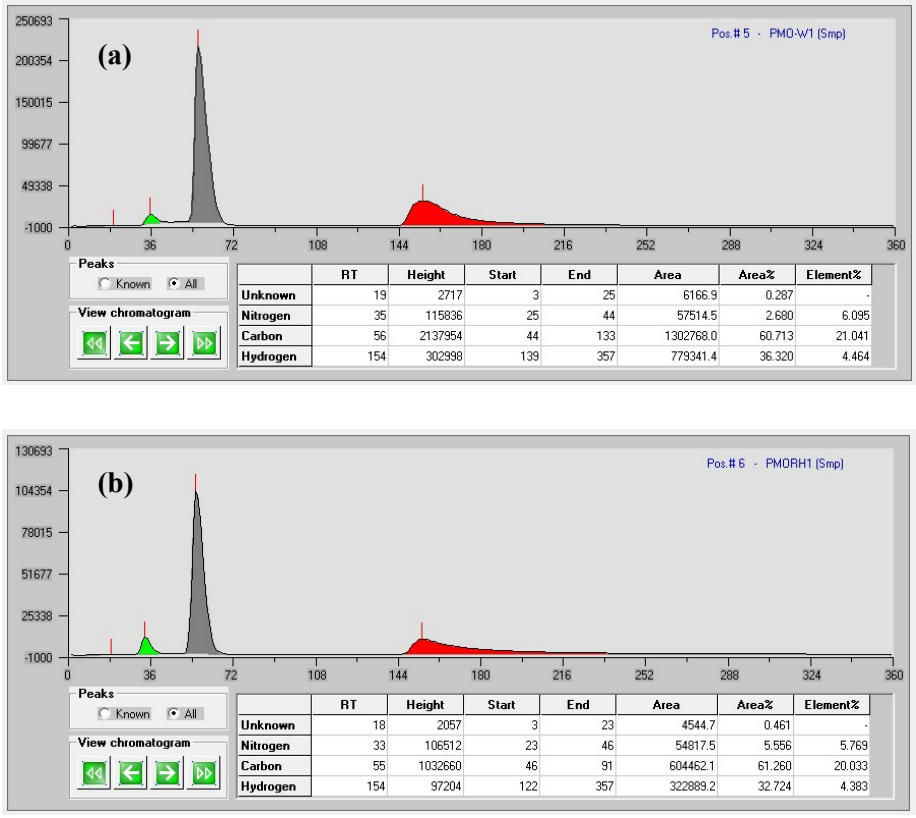


Figure S5. XPS spectra of N1s from IMOS before and after the successive adsorption of W(VI) and photocatalytic degradation of RhB dye.



	RT	Height	Start	End	Area	Area%	Element%
Unknown	19	2717	3	25	6166.9	0.287	-
Nitrogen	35	115836	25	44	57514.5	2.680	6.095
Carbon	56	2137954	44	133	1302768.0	60.713	21.041
Hydrogen	154	302998	139	357	779341.4	36.320	4.464

	RT	Height	Start	End	Area	Area%	Element%
Unknown	18	2057	3	23	4544.7	0.461	-
Nitrogen	33	106512	23	46	54817.5	5.556	5.769
Carbon	55	1032660	46	91	604462.1	61.260	20.033
Hydrogen	154	97204	122	357	322889.2	32.724	4.383

Figure S6. Chromatograms of W-IMOS nanoparticles obtained using CHN analyzer (a) before, and (b) after the photocatalytic degradation of RhB.

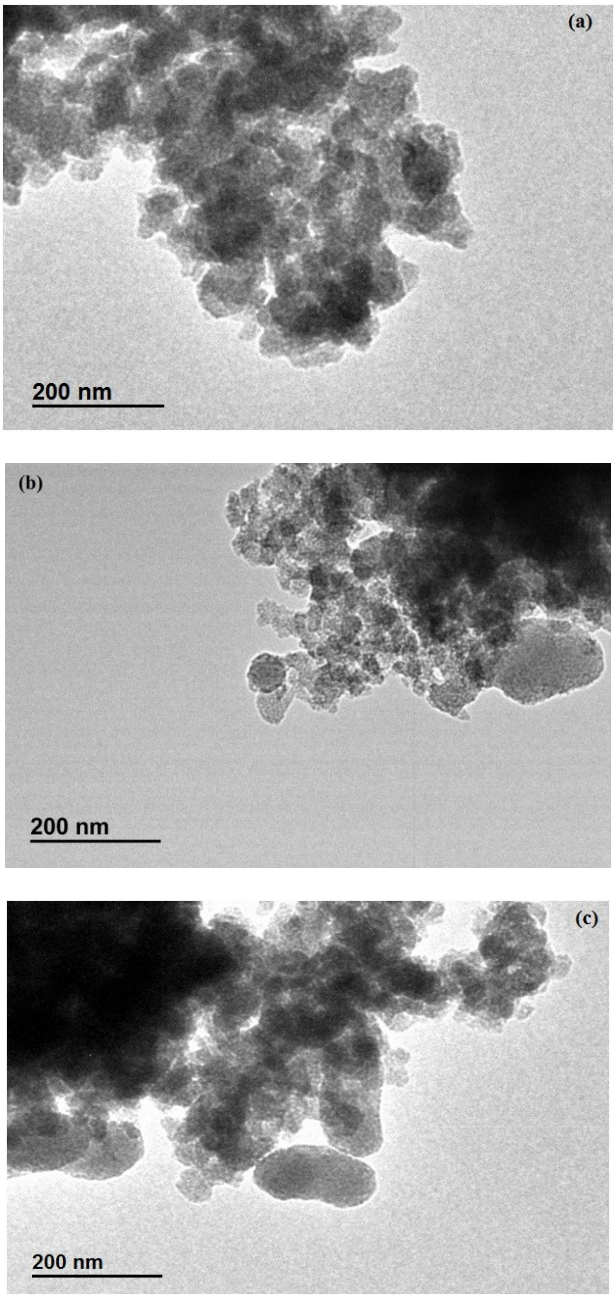


Figure S7. TEM images of IMOS nanoparticles (a) before, and (b) after tungsten immobilization from e-waste recycling unit wastewater, and (c) photocatalytic degradation of RhB.

Table S1. Chemical analysis of e-waste recycling unit wastewater using Ion chromatography.

Types of ions	**Anions**			**Cations**								
	F^-	Cl^-	WO_4^{2-}	Pb^{2+}	NH_4^+	Na^+	K^+	Mg^{2+}	Ca^{2+}	Cu^{2+}	Zn^{2+}	Mn^{2+}
Concentration ($mg\ L^{-1}$)	10.00	38.97	563.63	130.00	0.03	5.28	0.51	4.13	5.04	5.4	0.14	0.07

Table S2. Comparison of present IMOS with other sorbents for the separation of W(VI) by continuous mode adsorption process.

Types of sorbents	**Feed phase conc.** (mg L^{-1})	**Liquor type**	**pH**	**Bed depth** (cm)	**Flow rate** (mL min^{-1})	Q_o**(exp)** (mg g^{-1})	**Ref.**
BPQAM	400	Aqueous	6.0	–	2.5	65.0	10
Amberlite IRA 900	500	Aqueous	7.0	25.0	8.0	130.0	14
Resin D403	730	Molybdate solution	9.6	102.0	0.5	–	30
	800		9.5			–	
IMOS	563	Wastewater	6.2	3.0	3.0	123.2	This study