

Supplementary Information

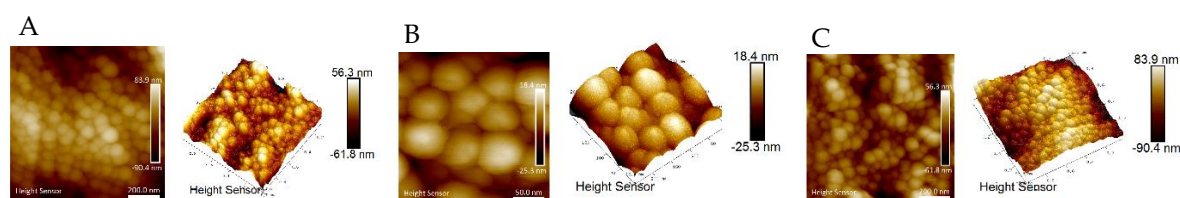
# Tailoring Nanoadsorbent Surfaces: Separation of Rare Earths and Late Transition Metals in Recycling of Magnet Materials

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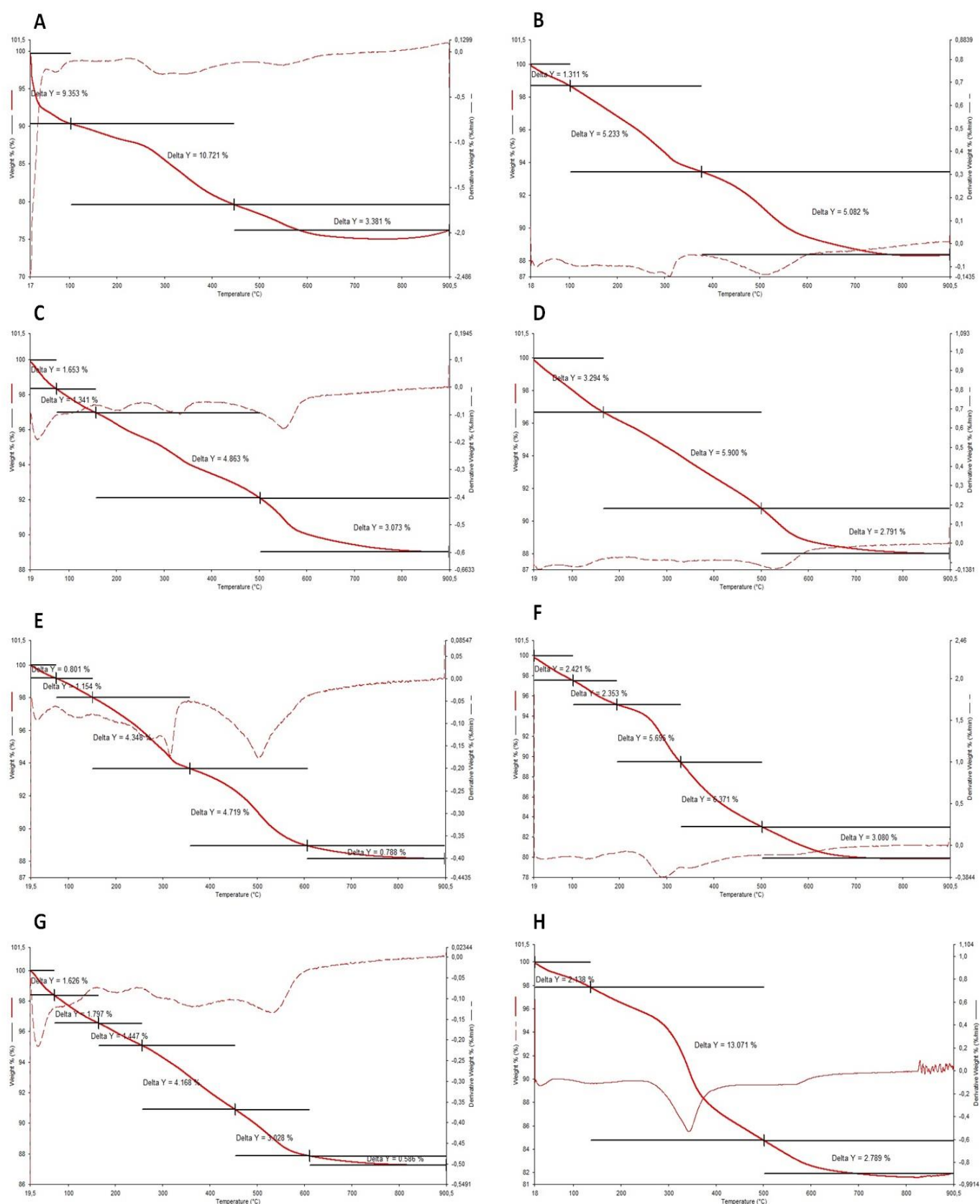
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**Figure S1.** AFM images for acid treated SiO<sub>2</sub> NPs functionalized with L5 (A,B) and L3 ligands (C).



**Figure S2.** TGA analyses of grafted SiO<sub>2</sub> NPs: (A)-L1, (B)-L2, (C)-L3, (D)-L4, (E)-L5, (F)-L3\_acid, (G)-L4\_acid, (H)-L5\_acid.

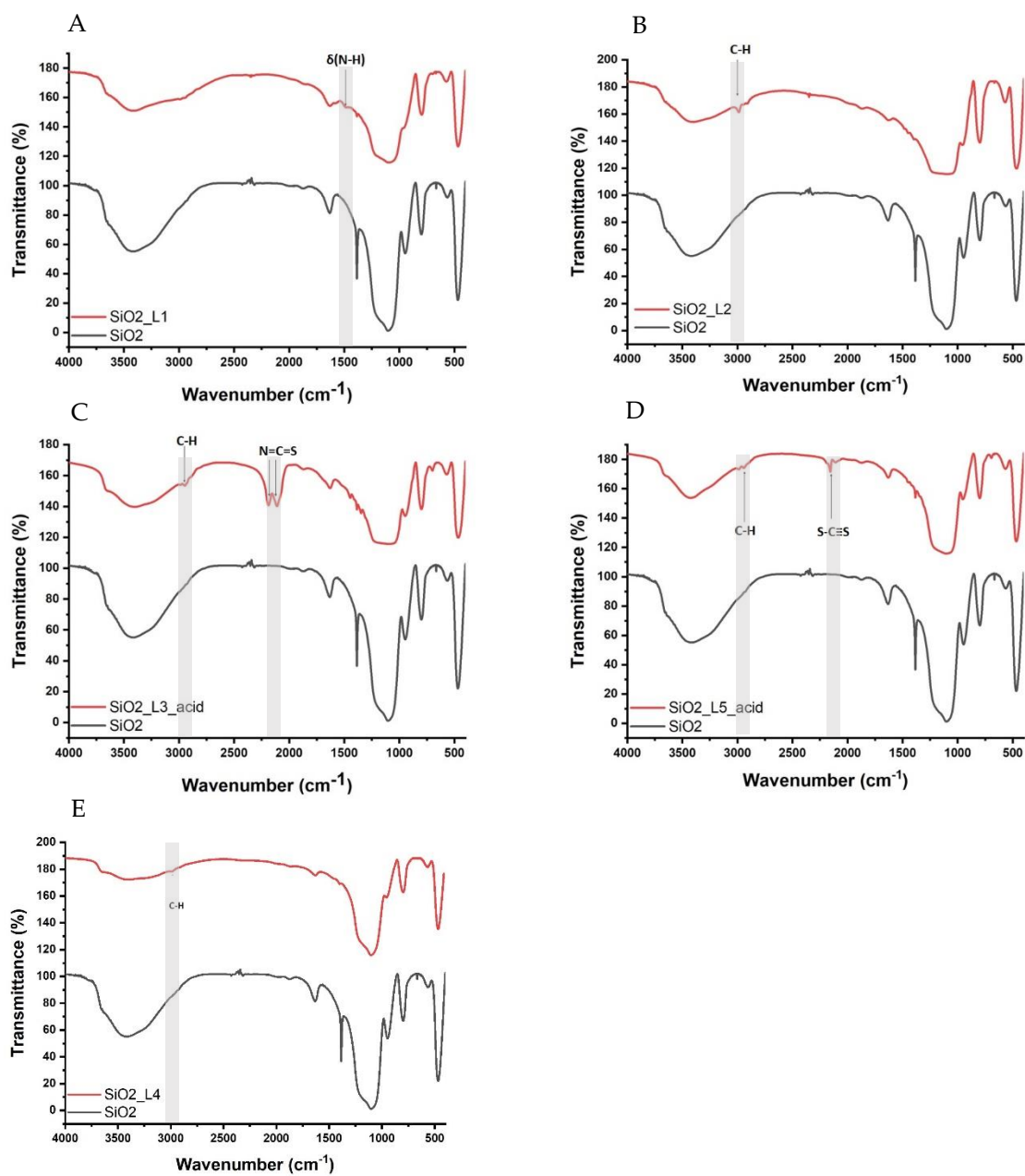
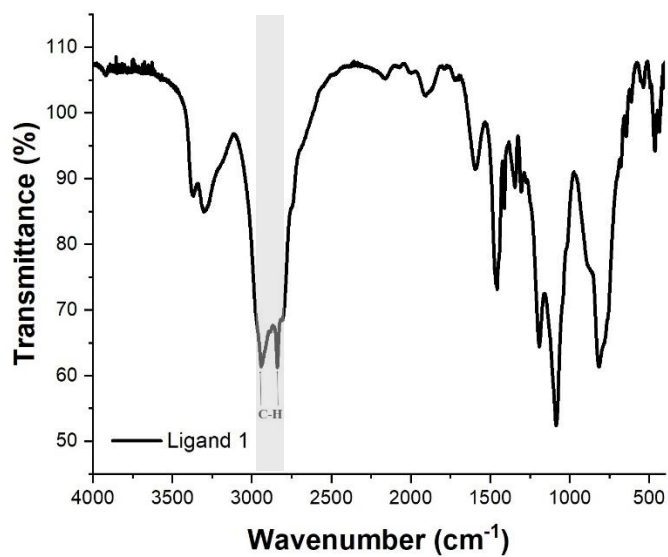


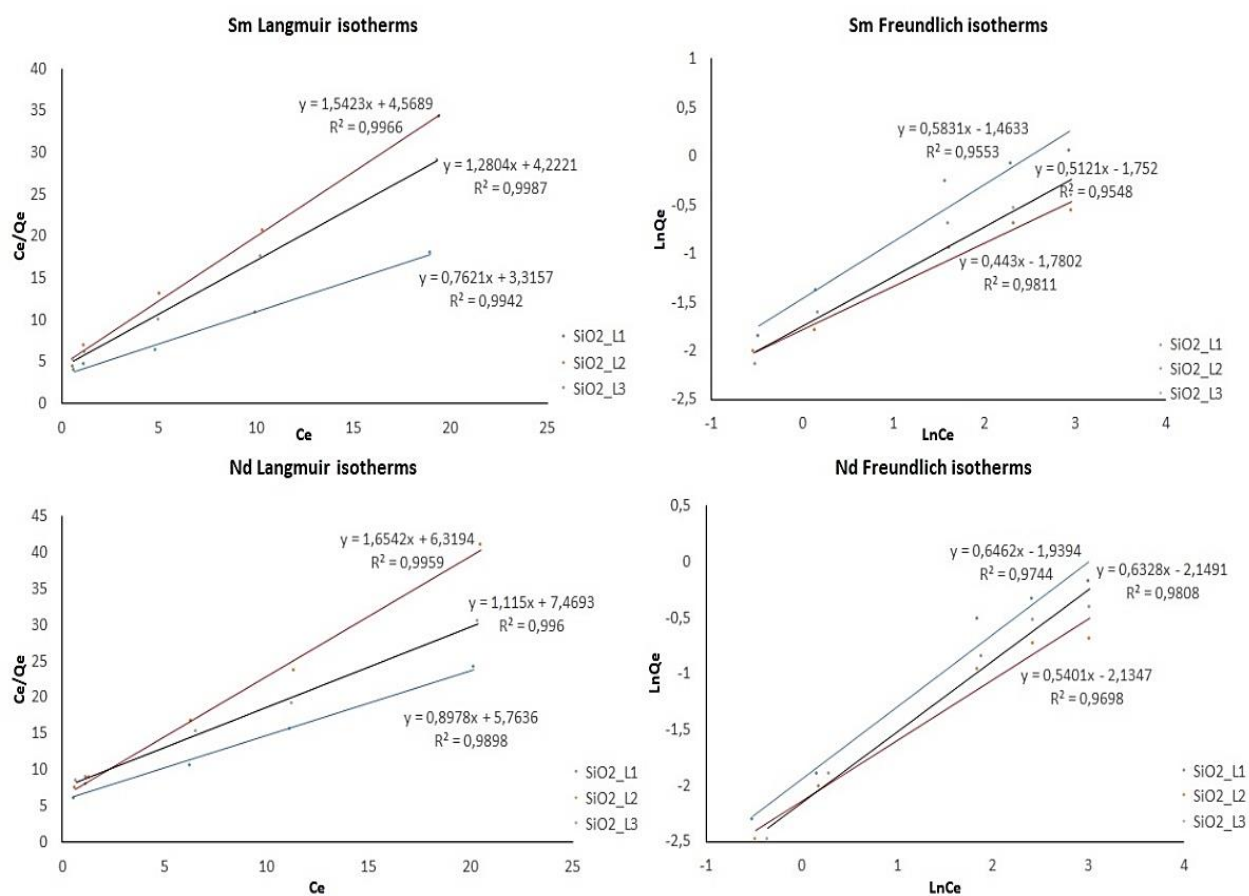
Figure S3. FTIR spectra of synthesized nanoparticles grafted with (A)-L1, (B)-L2, (C)-L3\_acid, (D)-L5\_acid, (E)-L4.



**Figure S4.** FTIR spectra of pure ligand (Ligand 1) before grafting.

**Table S1.** List of parameters obtained from Langmuir and Freundlich linear isotherm models.

Model		L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
		Co <sup>2+</sup>			Ni <sup>2+</sup>			Sm <sup>3+</sup>			Nd <sup>3+</sup>		
Langmuir	<b>q<sub>m</sub></b>	1.90	0.86	0.83	1.82	0.62	0.60	1.31	0.64	0.78	1.12	0.6	0.86
	<b>K<sub>L</sub></b>	0.35	0.14	0.38	0.48	0.37	0.88	0.27	0.36	0.27	0.16	0.26	0.16
	<b>R<sup>2</sup></b>	0.99	0.98	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Freundlich	<b>K<sub>f</sub></b>	0.43	0.09	0.19	0.47	0.13	0.25	0.23	0.16	0.17	0.14	0.12	0.11
	<b>n</b>	2.06	1.40	1.96	2.15	1.90	3.41	1.71	2.27	1.96	1.56	1.85	1.59
	<b>R<sup>2</sup></b>	0.95	0.96	0.91	0.89	0.87	0.92	0.95	0.98	0.95	0.97	0.97	0.98



**Figure S5.** Linear plots of Langmuir and Freundlich isotherm models

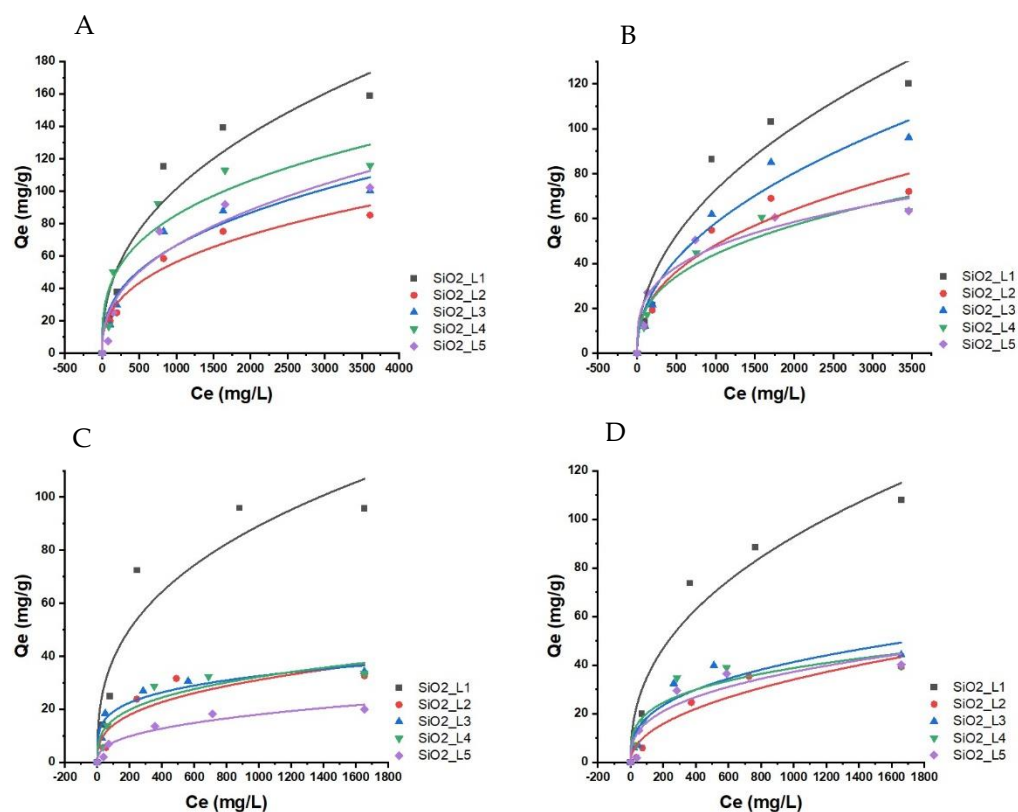


Figure S6. Freundlich adsorption isotherms of (A)-Sm, (B)-Nd, (C)-Ni and (D)-Co ions onto functionalized SiO<sub>2</sub> NPs

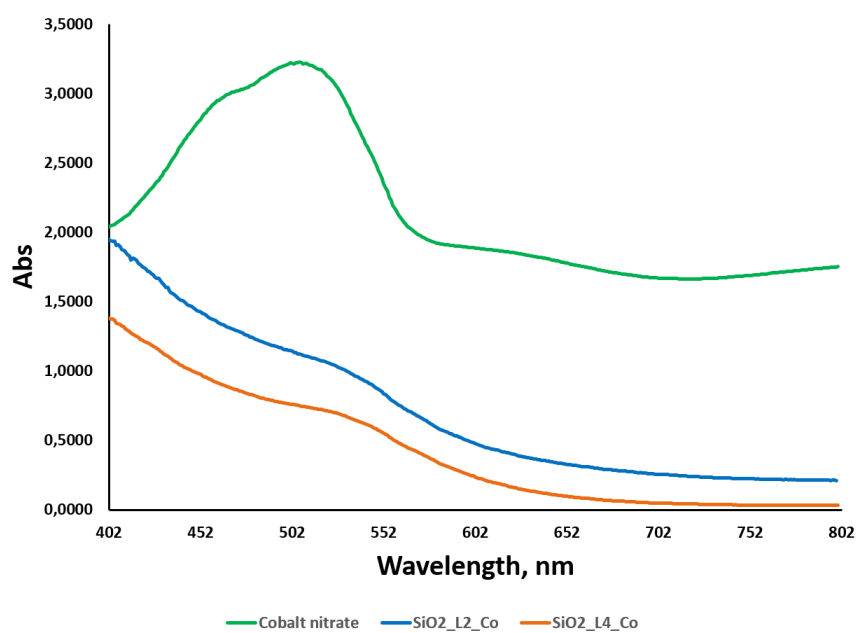
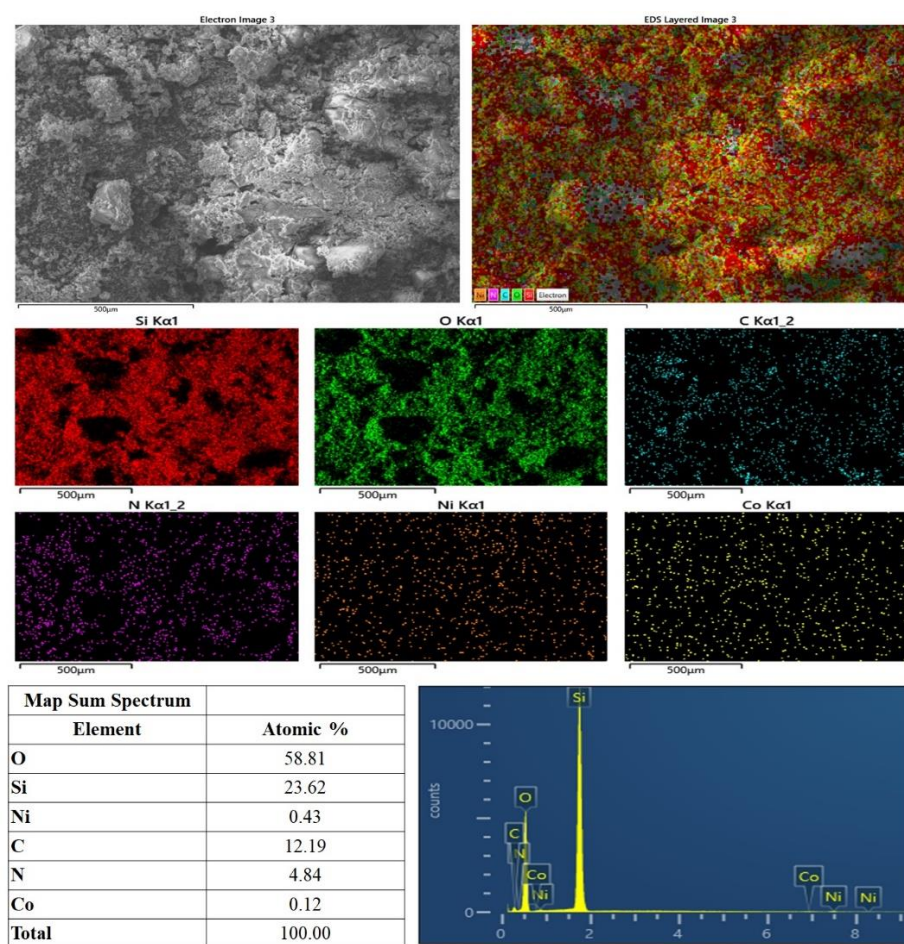


Figure S7. UV-Vis spectra of aqua complex of Co(II) and of adsorbents after uptake of cobalt(II) ions.



**Figure S8.** Example of EDS mapping of  $\text{SiO}_2\text{-L1}$  after adsorption of mixed Co + Sm metal ions. EDS analysis and mapping data for the rest of the samples is available upon request.