

SUPPLEMENTARY INFORMATION

Innovative Low-Cost Composite Nanoadsorbents Based on Eggshell Waste for Nickel Removal from Aqueous Media

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FIGURES

Figure S1: Nitrogen adsorption-desorption isotherms for FEZ adsorbent, EZ, eggshell, and zeolite.

Figure S2: FT- IR spectra of zeolite (A), eggshell (B), EZ (C), and FEZ (D).

Figure S3: EDX spectra of zeolite (A), and eggshell (B).

Figure S4: SEM Live map (1) and EDX spectra showing the distribution of elements (2) in EZ (A), and FEZ (B).

Figure S5: XRD patterns of zeolite (A), eggshell (B), EZ (C), and FEZ (D).

Figure S6: Plot of the experimental data using the linearized form of (A) Langmuir model, and (B) Freundlich model.

Figure S7: Van't Hoff plot for nickel adsorption on FEZ and EZ.

Figure S8: (A) Pseudo-first-order model fitting diagram, (B) Pseudo-second-order model fitting diagram, and (C) Intraparticle diffusion model fitting diagram.

Figure S9: FT-IR spectra of EZ (A) after adsorption, and (B) before and after adsorption.

Figure S10: FT-IR spectra of FEZ (A) after adsorption, and (B) before and after adsorption.

Figure S11: SEM micrographs of EZ (A, 30 μm ; C, 50 μm) before adsorption, and (B, 30 μm ; D, 50 μm) after adsorption.

Figure S12: SEM micrographs of FEZ (A, 30 μm ; C, 50 μm) before adsorption, and (B, 30 μm ; D-E, 50 μm) after adsorption.

Figure S13: Live maps of EZ (A), and FEZ (B) after adsorption.

Figure S14: EDX spectrum of EZ (A), and FEZ (B) after adsorption.

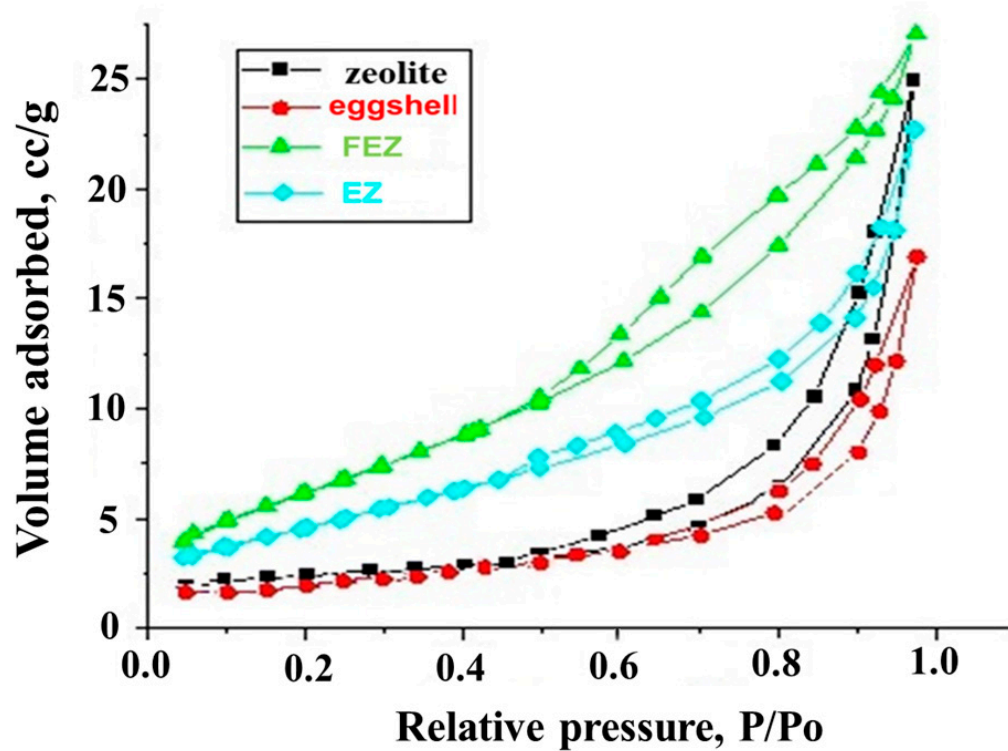


Figure S1

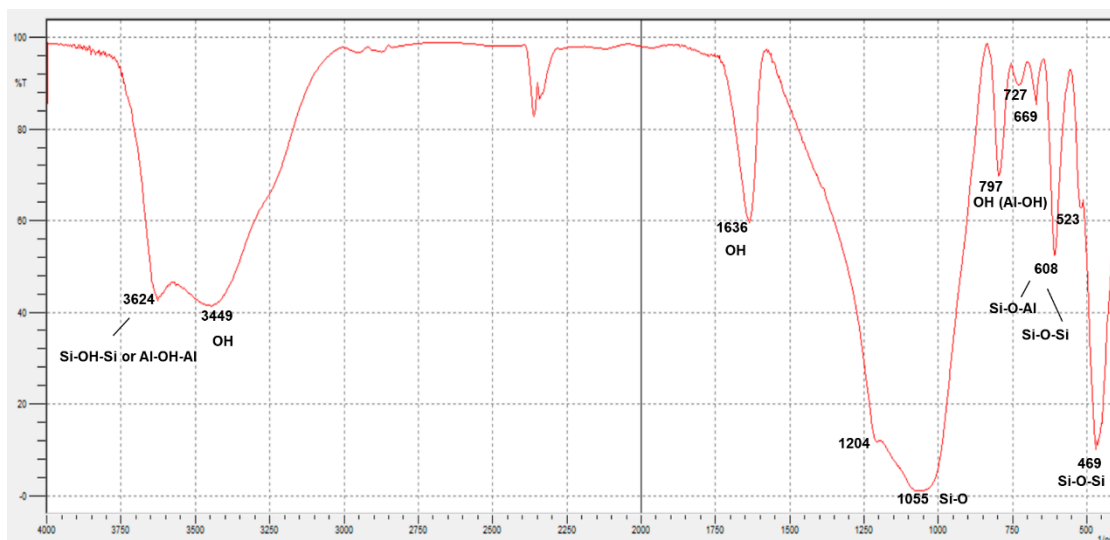


Figure S2A

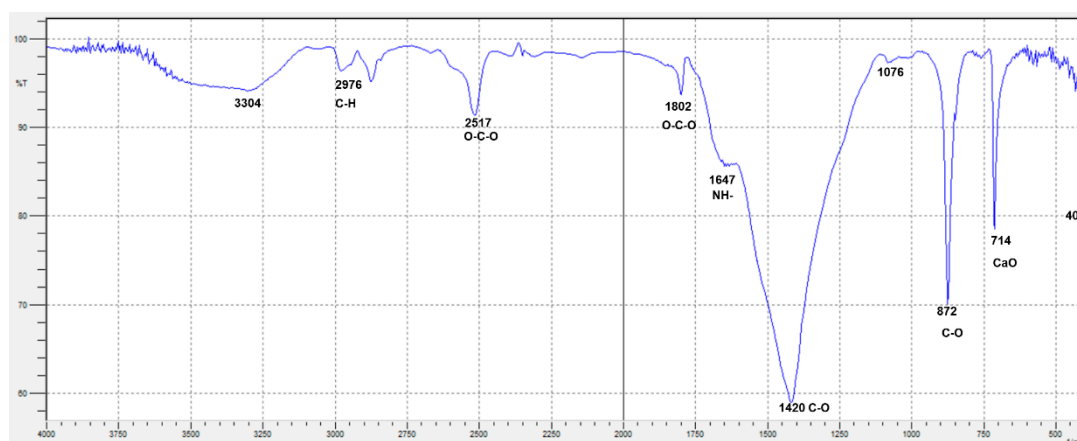


Figure S2B

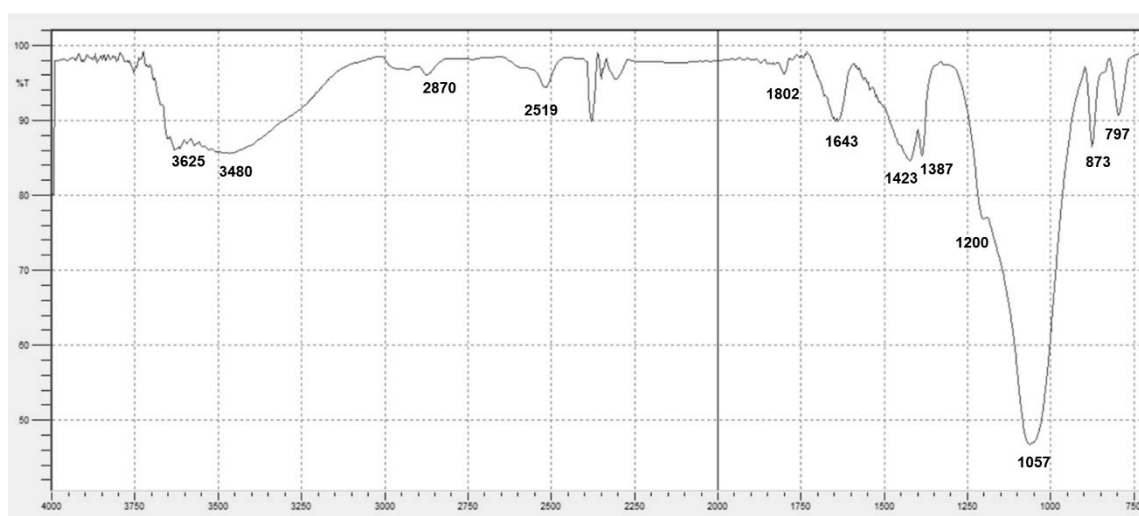


Figure S2C

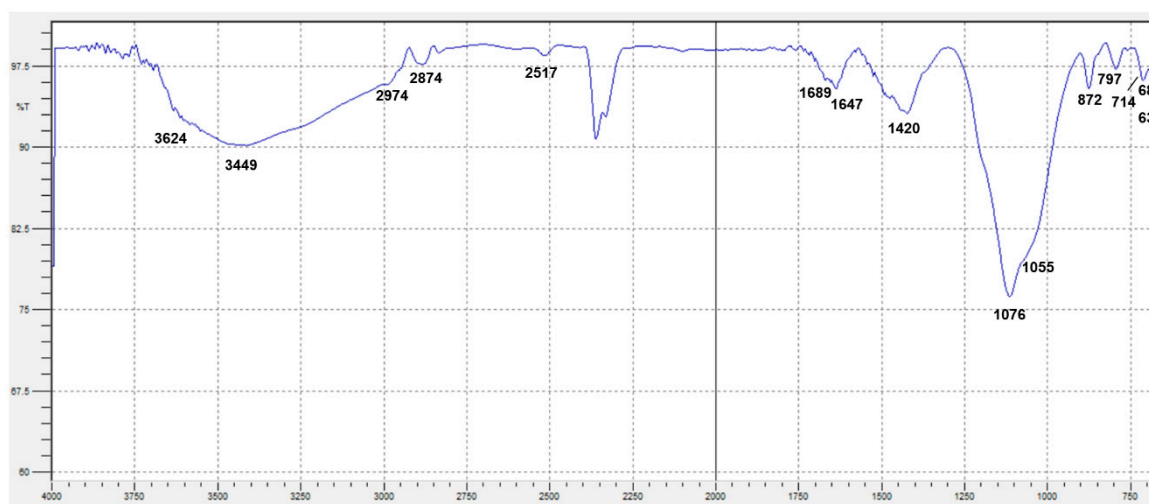
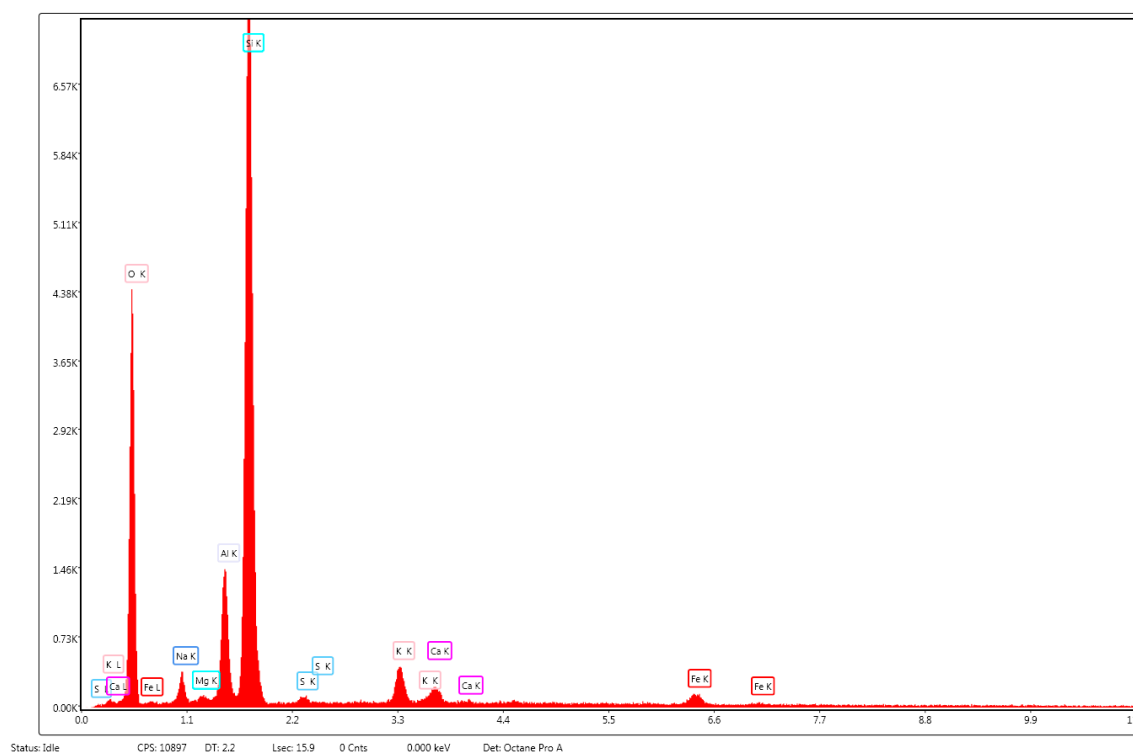
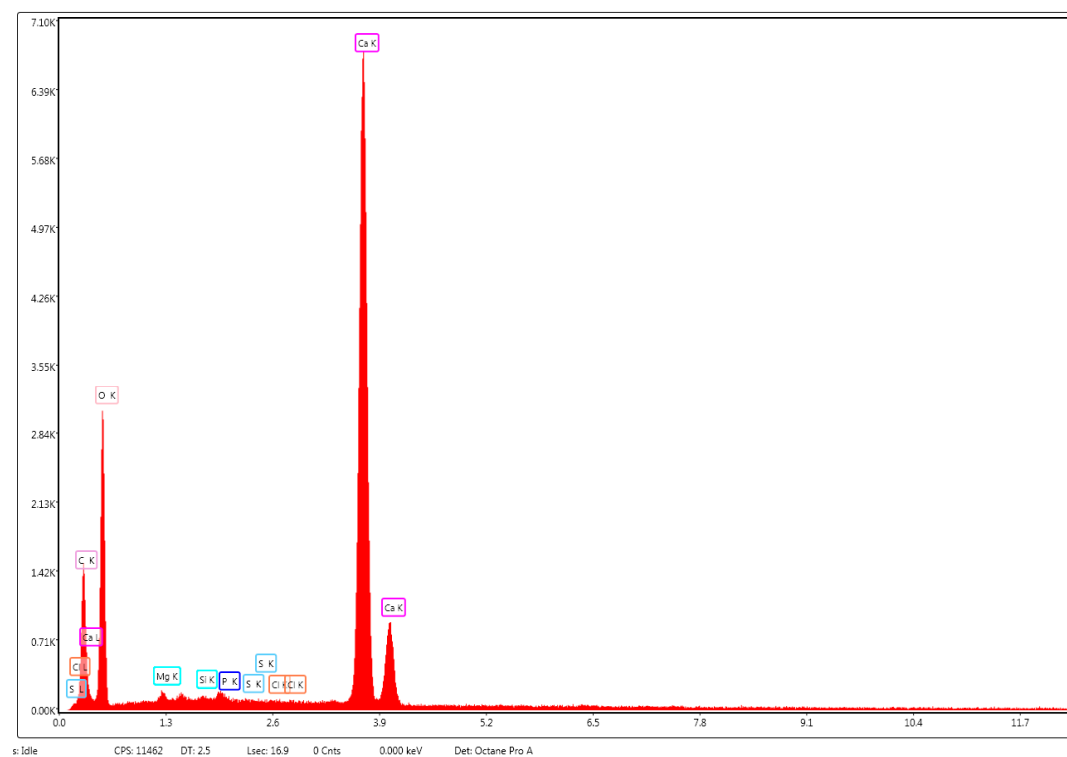


Figure S2D

**Figure S3A****Figure S3B**

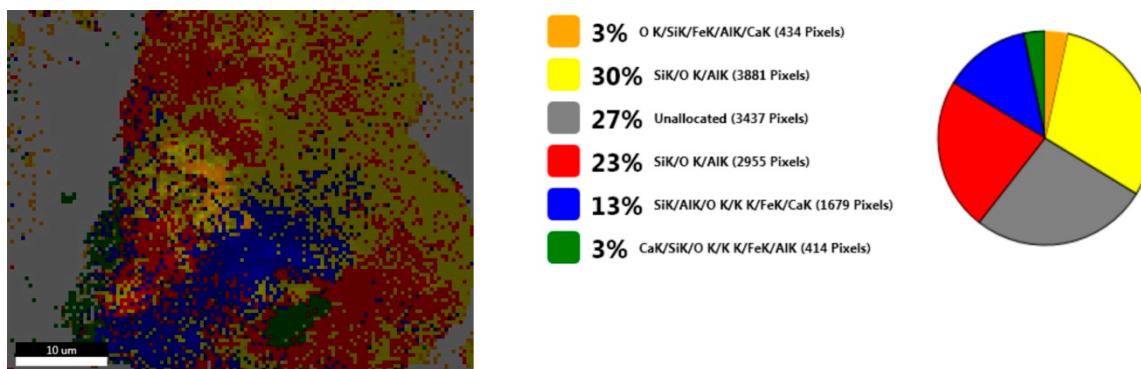


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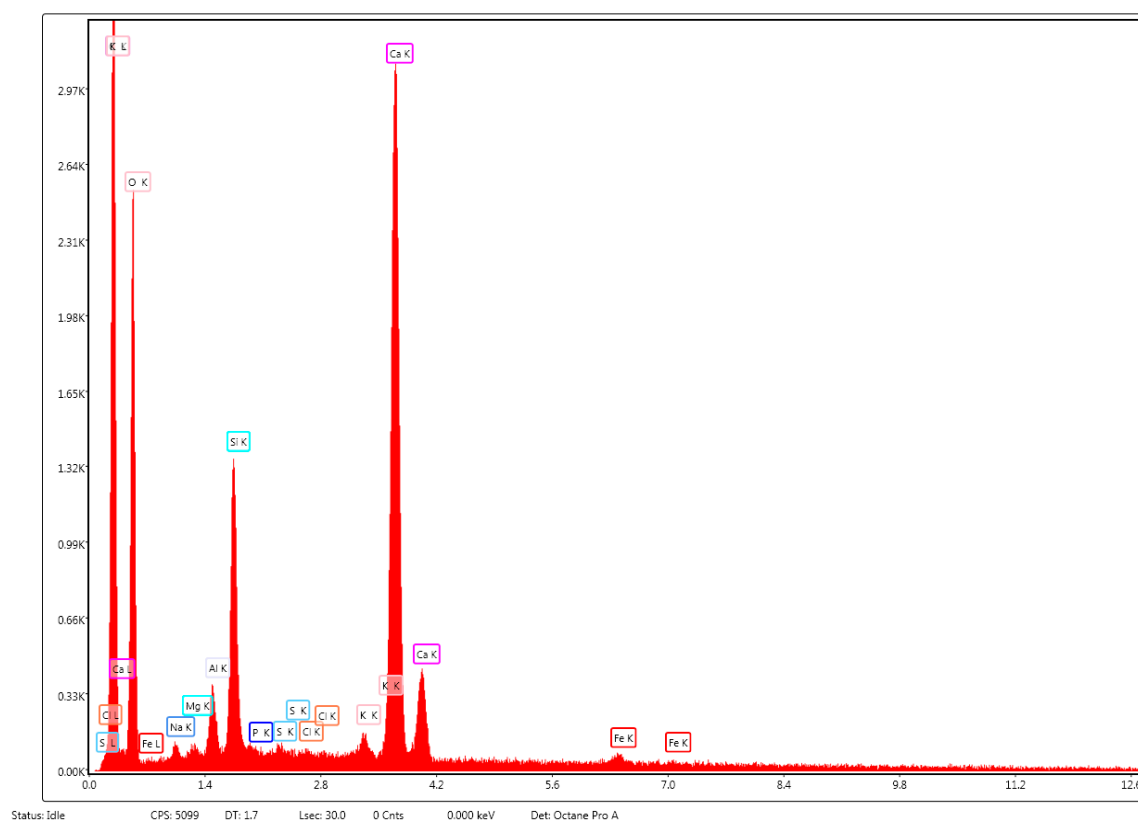


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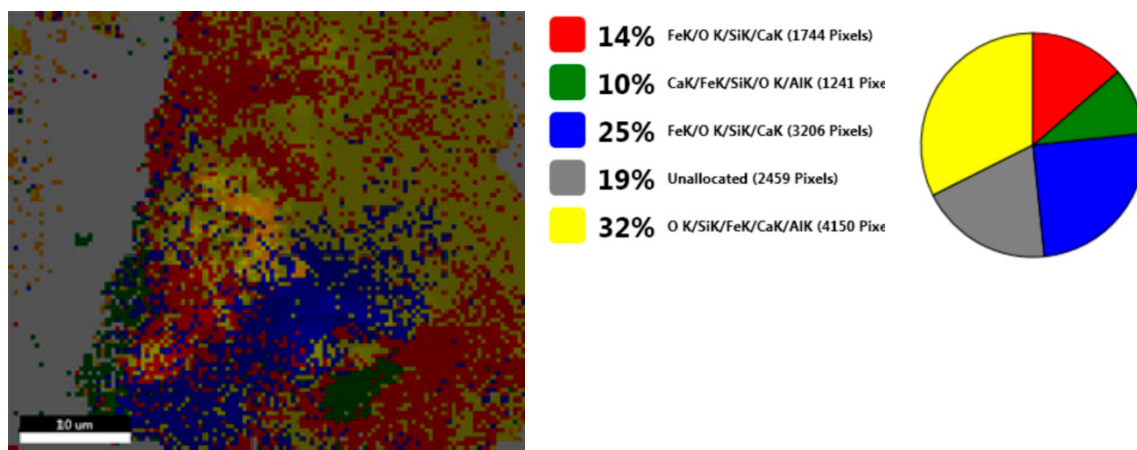


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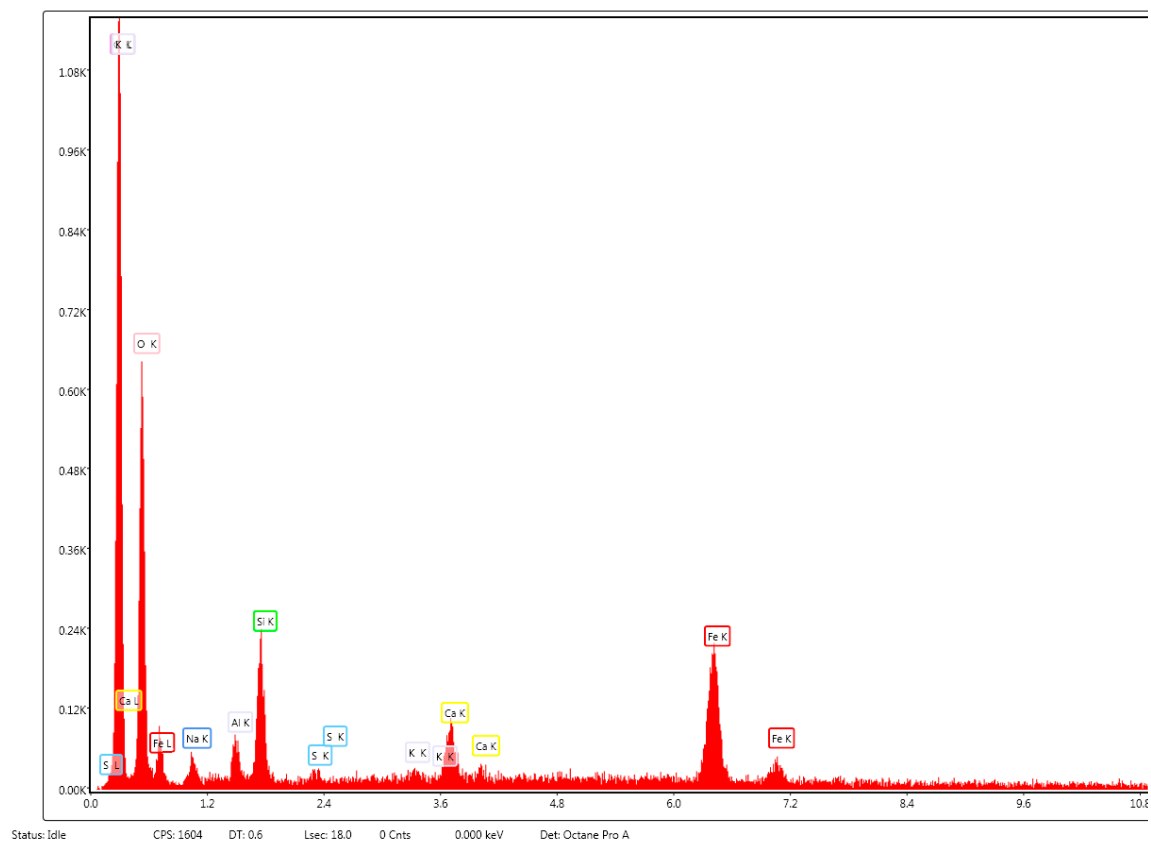
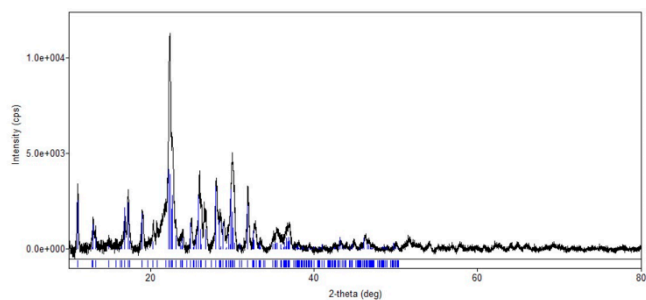
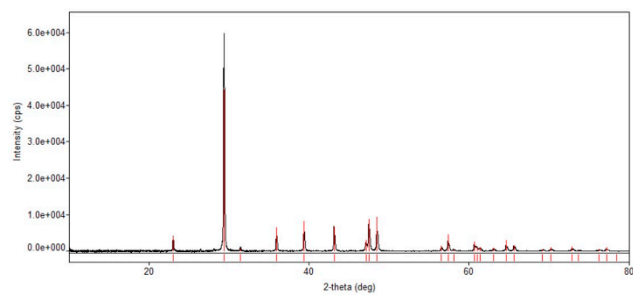
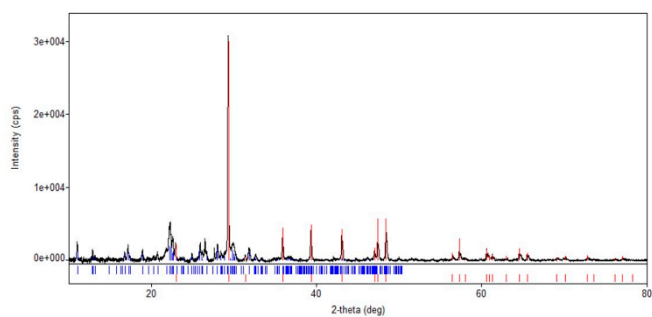
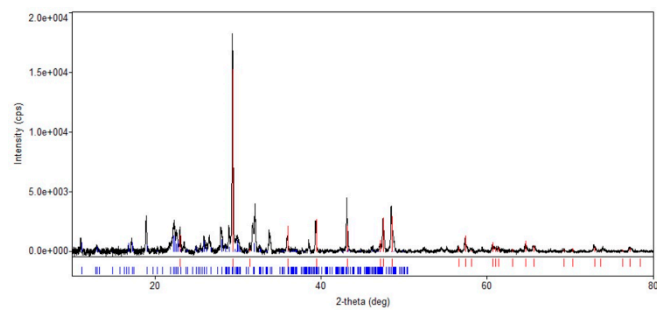
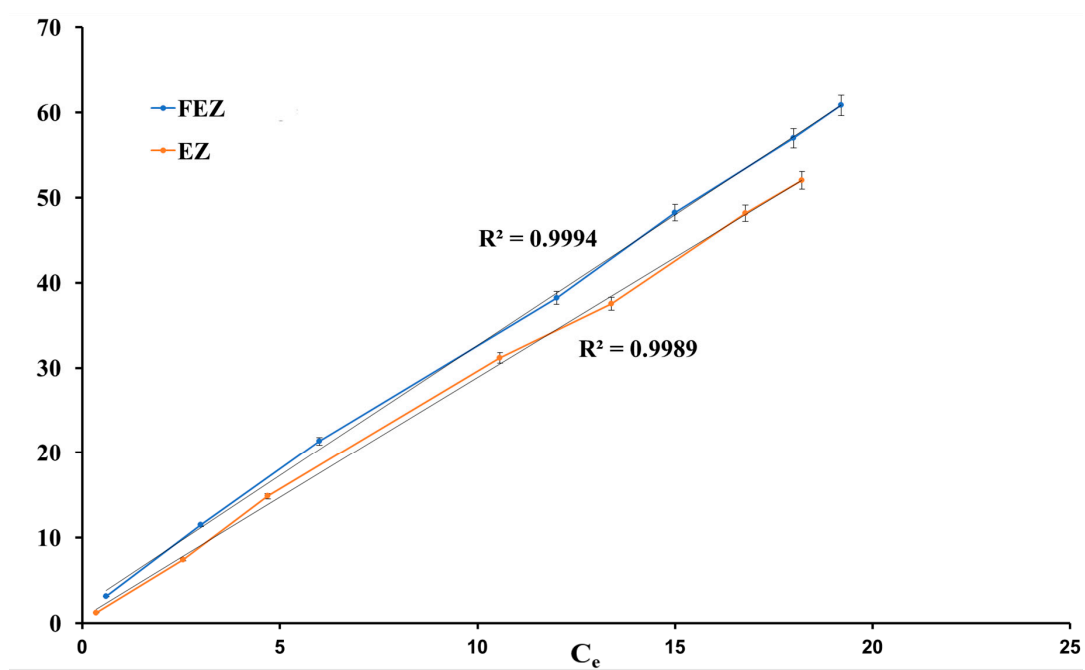
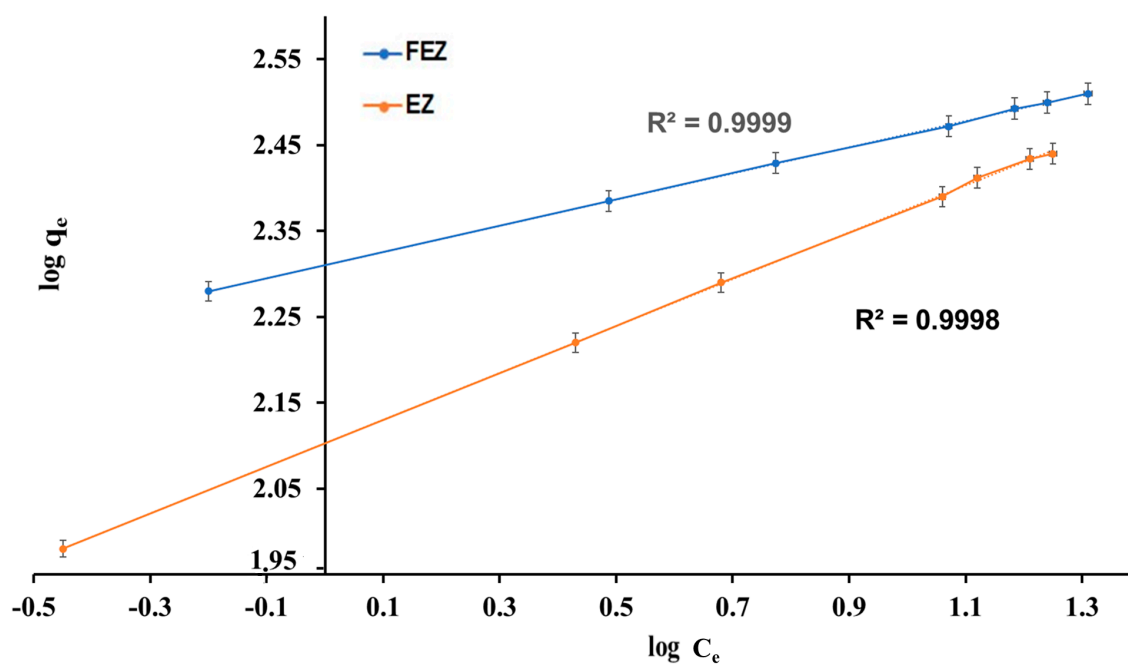


Figure S4B(2)

**A****B****C****D****Figure S5**

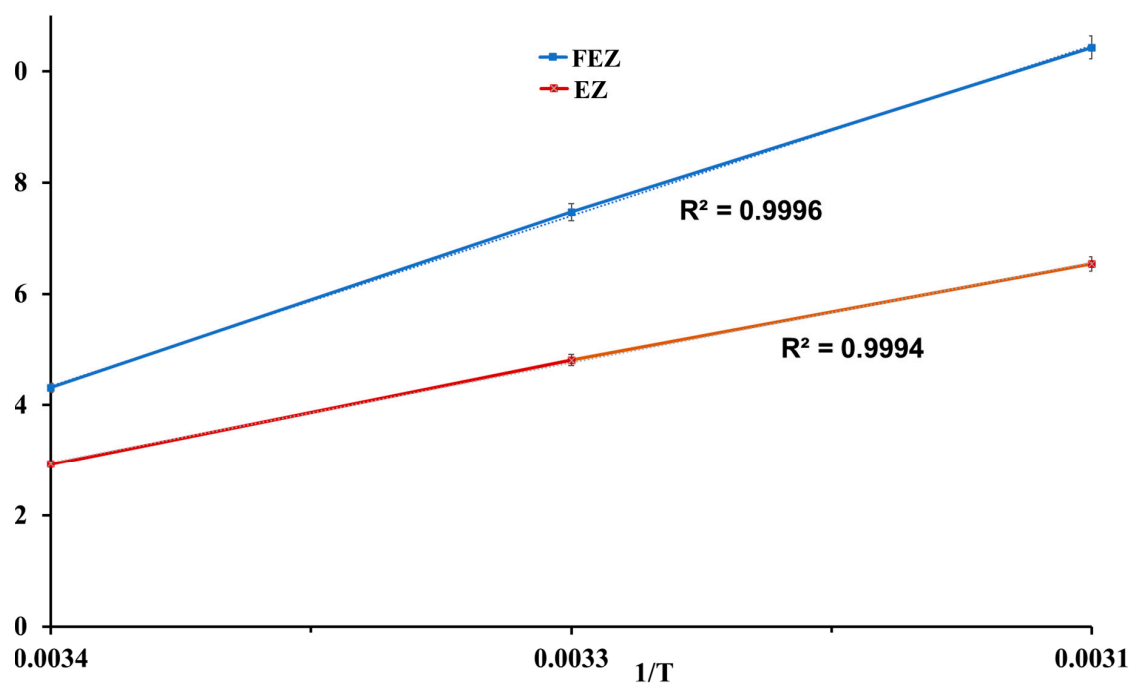


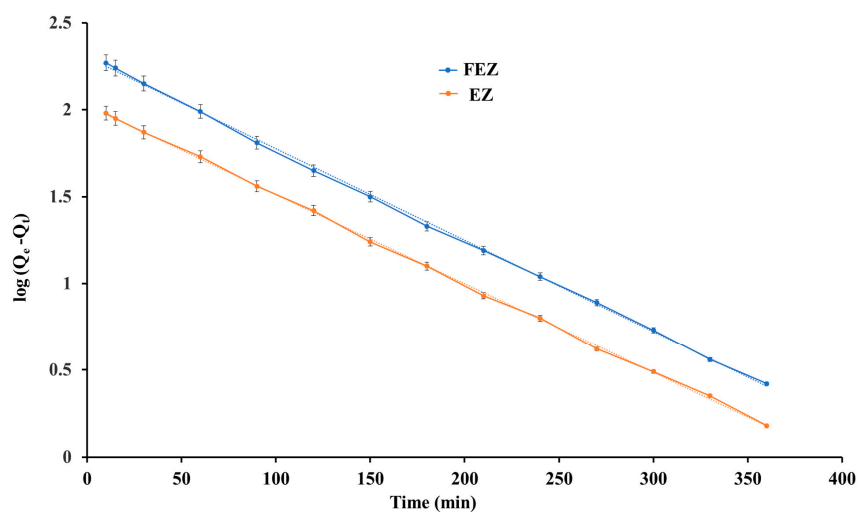
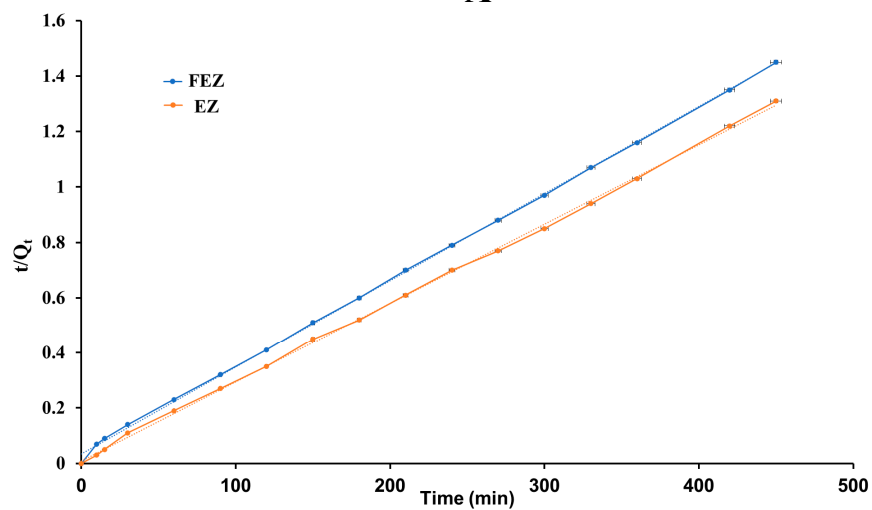
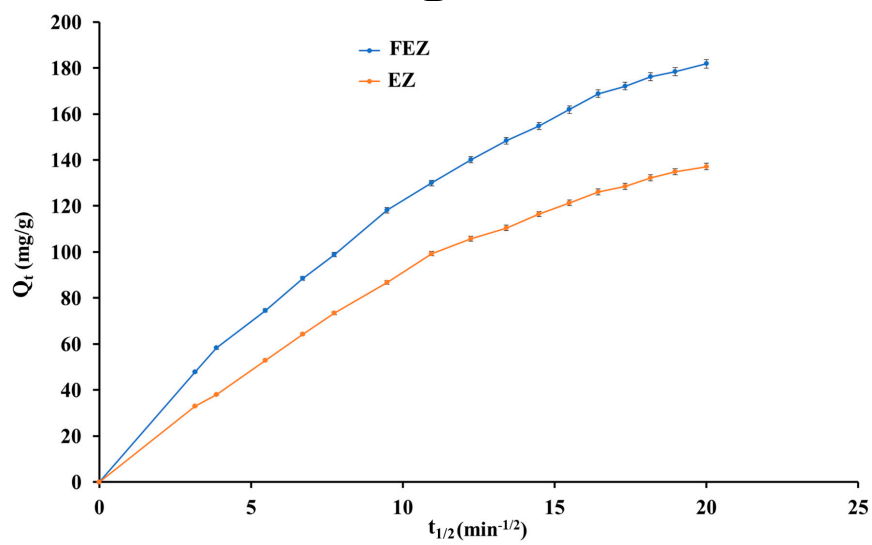
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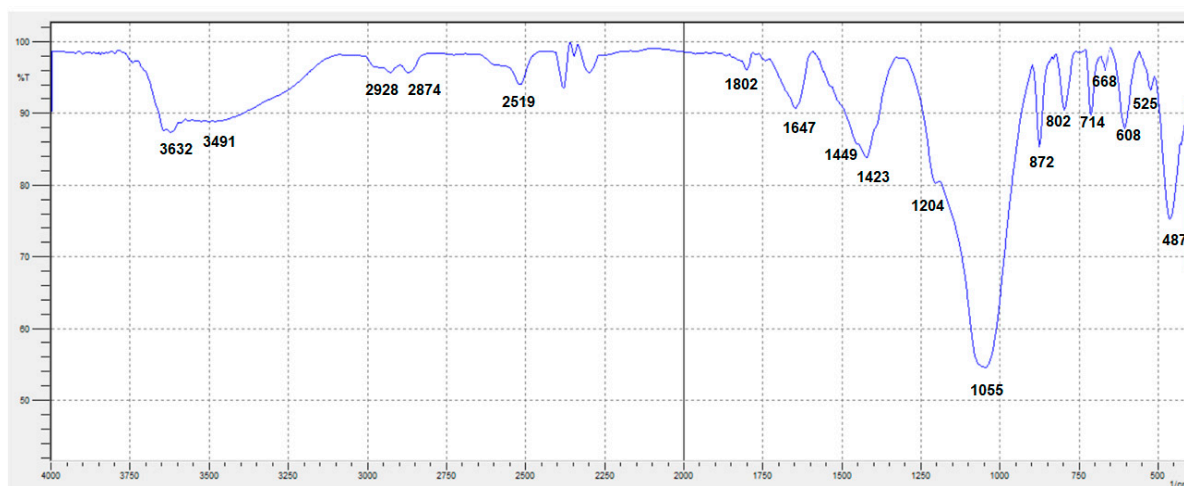
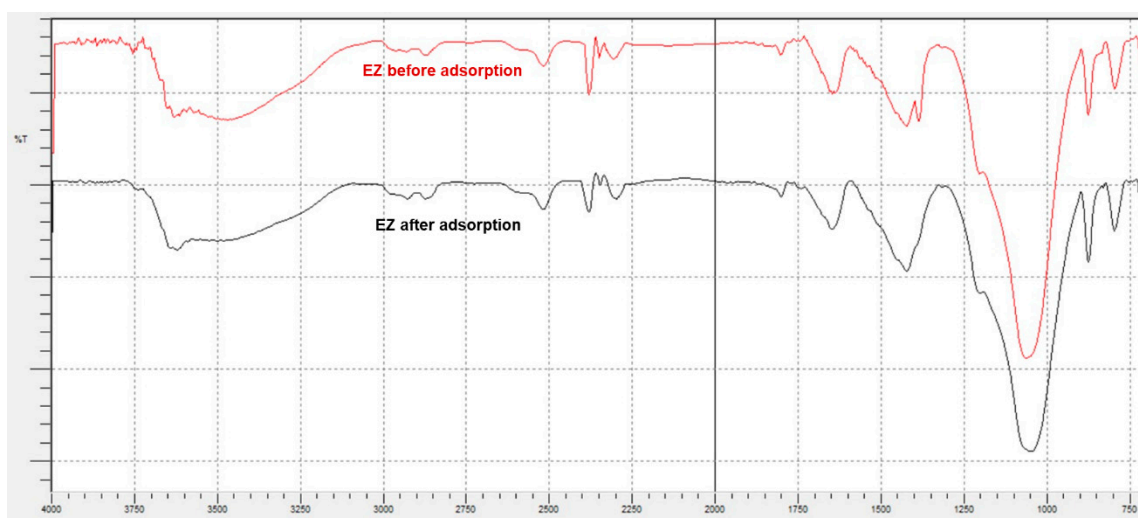


B

Figure S6

**Figure S7**

**A****B****C****Figure S8**

**Figure S9A****Figure S9B**

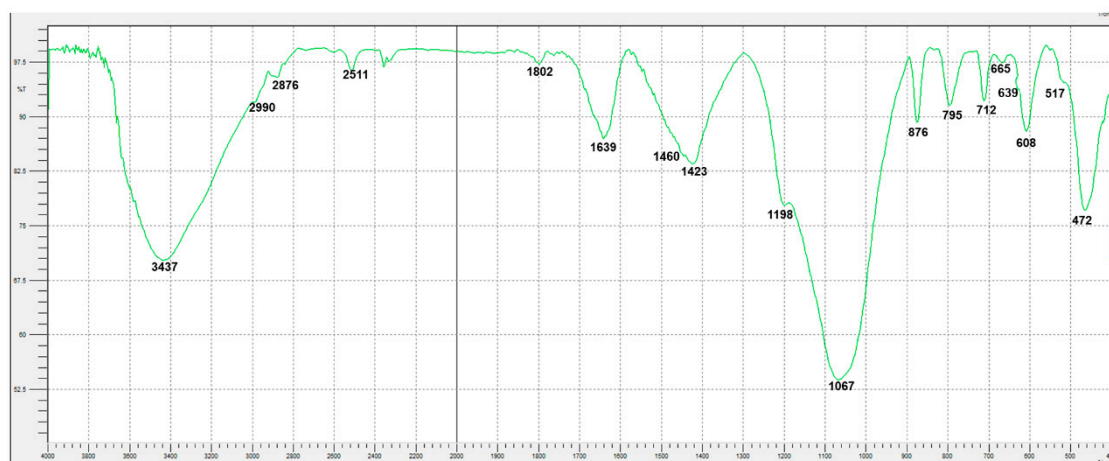


Figure S10A

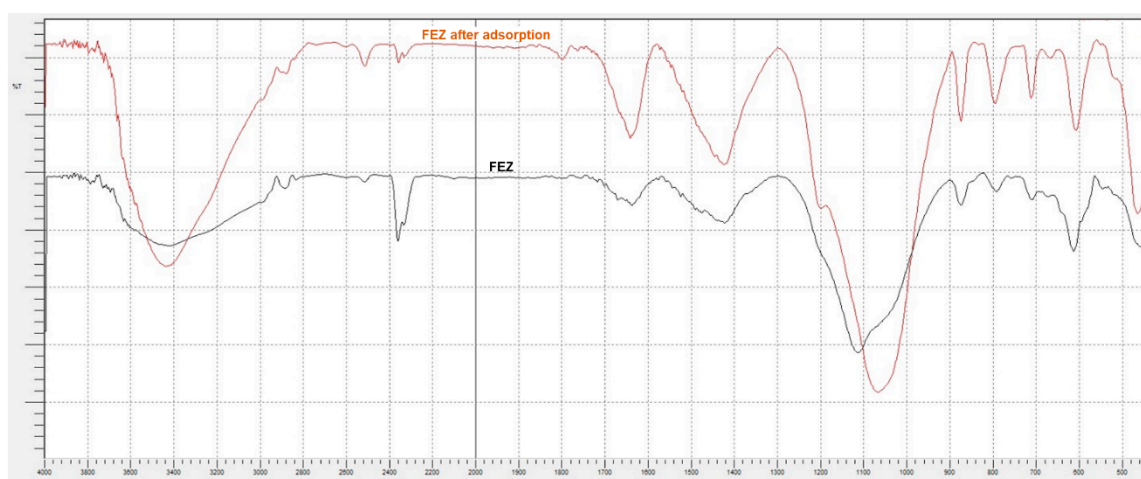
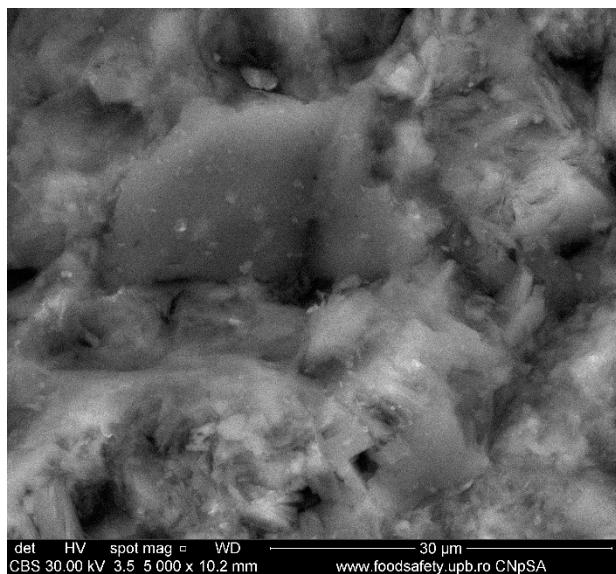
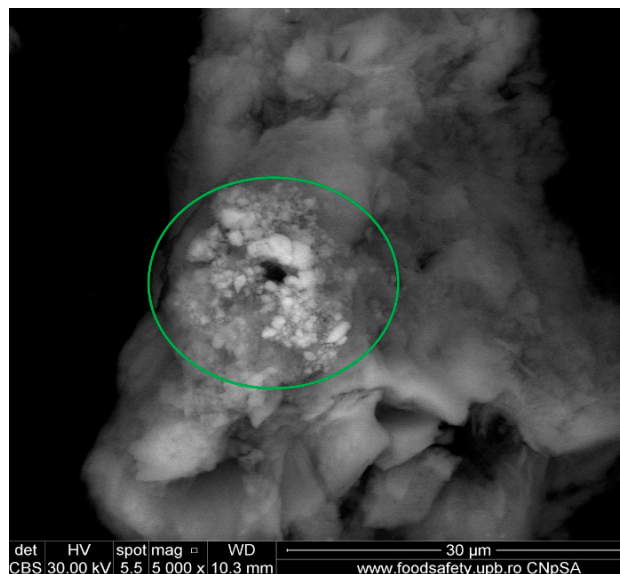
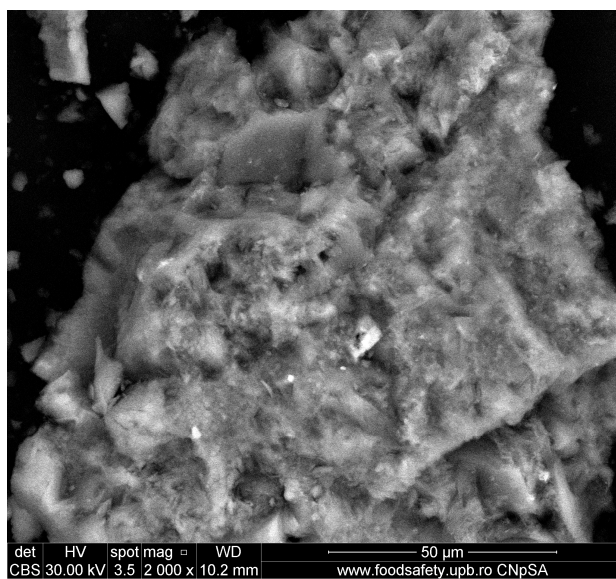
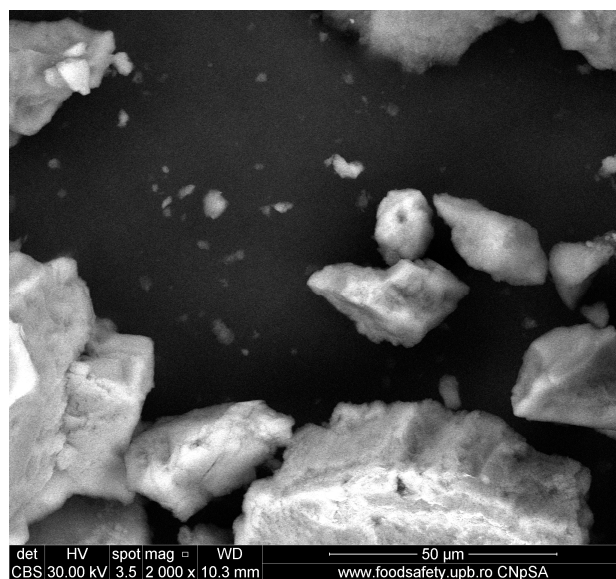
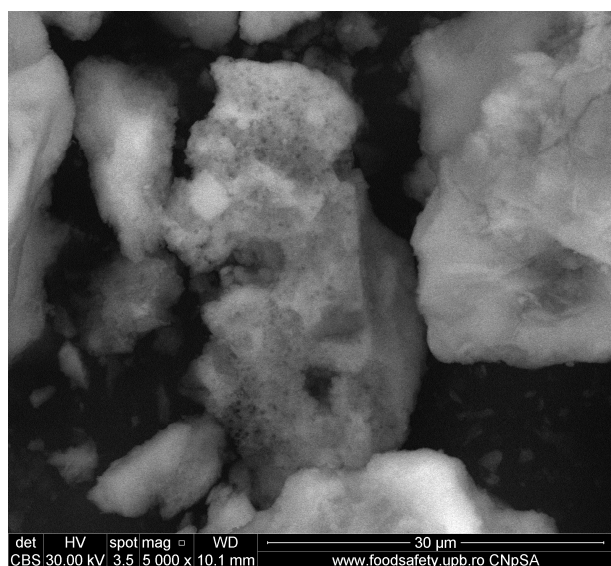
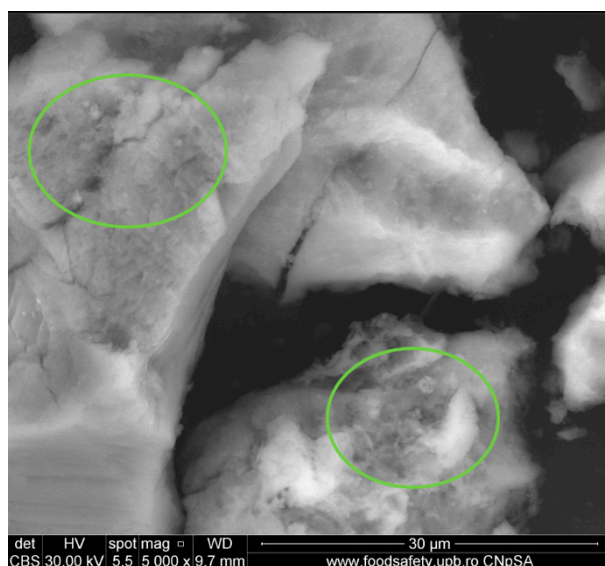
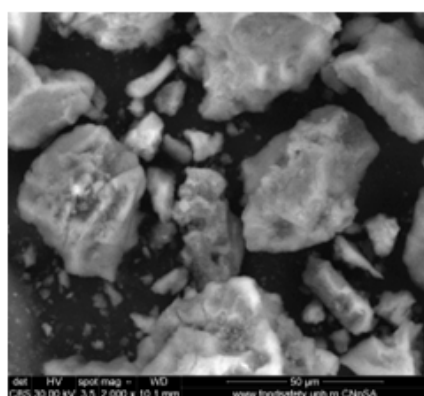
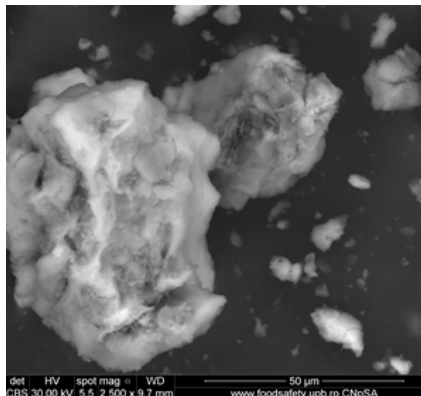
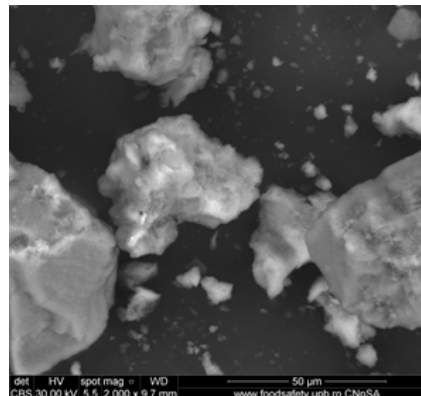
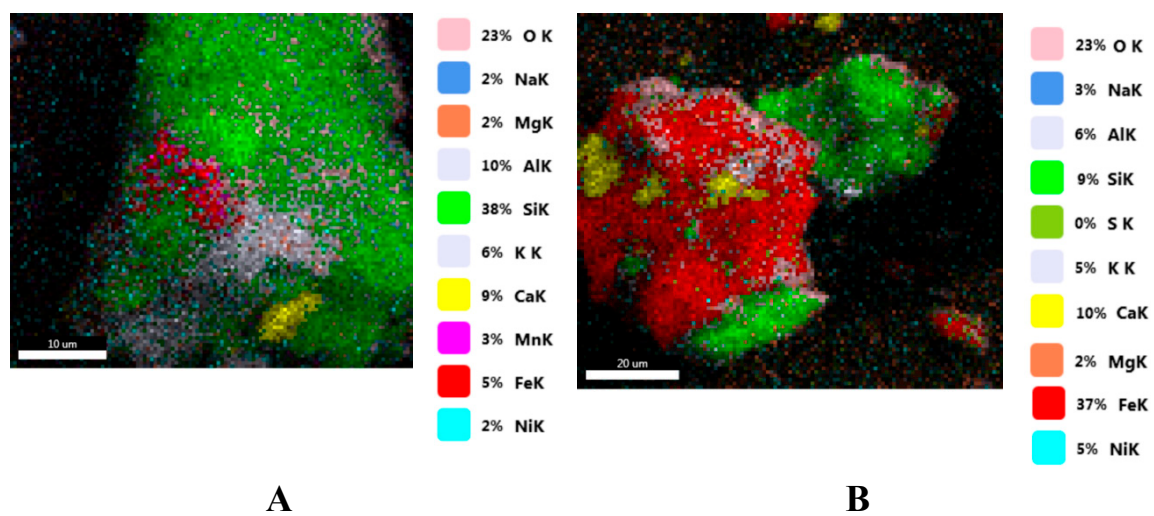
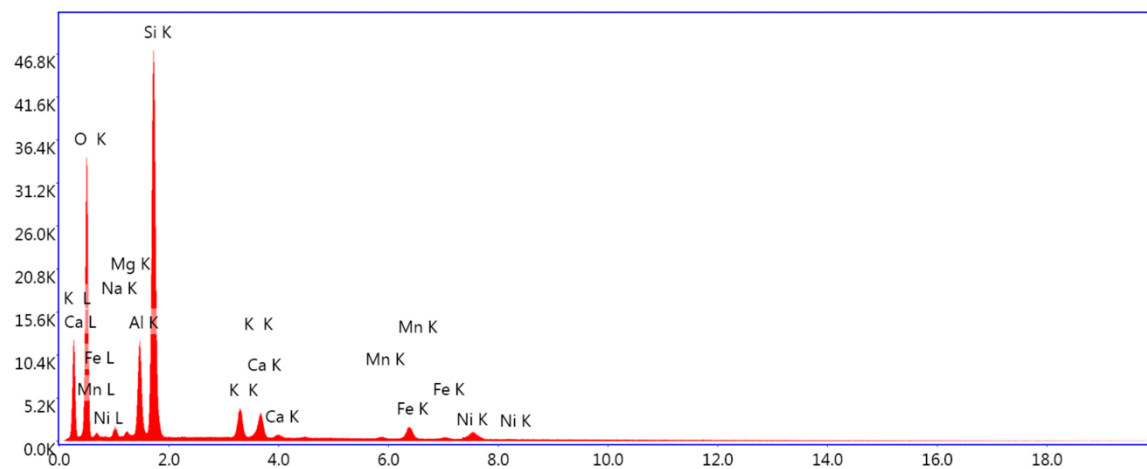
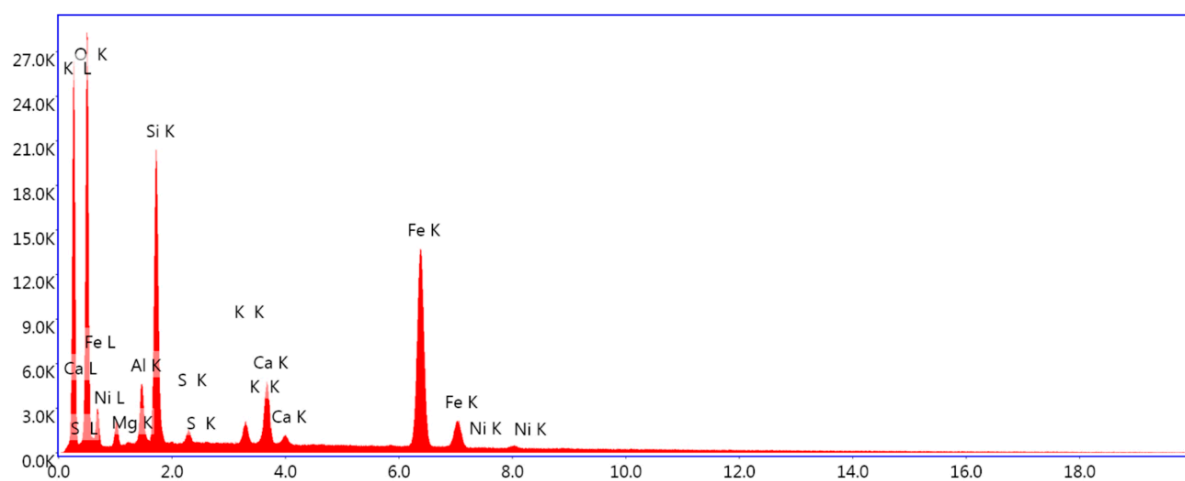


Figure S10B

**A****B****C****D****Figure S11**

**A****B****C****D****E****Figure S12**

**Figure S13**

**Figure S14A****Figure S14B**