

Supplementary Materials

Characterization of the Physical, Chemical, and Adsorption Properties of Coal-Fly-Ash–Hydroxyapatite Composites

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Table S1. Types of vibrations, bands, and intensities for the FT-IR spectra of CFA–HAp2 before adsorption (black), CFA–HAp2 after Cu(II) adsorption (red), and CFA–HAp2 Cu(II) desorption (blue).

No. on Figure 7	Region [cm ^{−1}]	Band	Intensity
CFA–HAp2			
1	3405	OH _{st} stretching	medium
2	1641	NH _{de} deformation vibrations	strong
3	1564	NH _{de} deformation vibrations	medium
4	1395	NH ₃ asymmetric	medium
5	1302	PO _{st} stretching	medium
6	1030	P–O _{st} stretching	strong
7	563	O–P–O bending vibrations	strong
CFA–HAp2 After Cu(II) Adsorption			
8	3428	OH _{st} stretching	medium
9	2925	OH _{st} stretching	weak
10	1634	NH _{de} deformation vibrations	medium
11	1548	NH _{de} deformation vibrations	medium
12	1458	CO ₃ ^{2−} stretching	weak
13	1383	NH ₃ asymmetric	weak
14	1031	PO _{st} stretching	strong
15	962	P–O _{st} stretching	weak
16	565	O–P–O bending vibrations	strong
CFA–HAp2 After Cu(II) Desorption			
17	3425	OH _{st} stretching	medium
18	1633	NH _{de} deformation vibrations	medium
19	1548	NH _{de} deformation vibrations	medium
20	1458	CO ₃ ^{2−} stretching	weak
21	1384	NH ₃ asymmetric	weak
22	1033	P–O _{st} stretching	strong
23	565	O–P–O bending vibrations	strong

Table S2. Types of vibrations, bands, and intensities for the FT-IR spectra of CFA–HAp2 before adsorption (black) and CFA–HAp2 after the adsorption of RB (red) and for RB dye alone (blue).

No. on Figure 8	Region [cm ⁻¹]	Band	Intensity
CFA–HAp2			
1	3405	OH _{stretching}	medium
2	1641	NH _{deformation vibrations}	strong
3	1564	NH _{deformation vibrations}	medium
4	1395	NH _{3 asymmetric}	medium
5	1302	PO _{stretching}	medium
6	1030	P–O _{stretching}	strong
7	563	O–P–O _{bending vibrations}	strong
CFA–HAp2 After RB Adsorption			
8	3417	OH _{stretching}	medium
9	2924	C–H _{stretching}	strong
10	1640	NH _{deformation vibrations}	strong
11	1538	NH _{deformation vibrations}	medium
12	1450	CH _{3 asymmetric}	medium
13	1301	C–O _{stretching}	medium
14	1032	P–O _{stretching}	strong
15	779	C–Cl _{stretching}	strong
16	563	O–P–O _{bending vibrations}	strong
Rhodamine B			
17	3383	NH _{stretching}	strong/medium
18	2975	C–H _{stretching}	weak
19	1588	NH _{deformation vibrations}	medium
20	1412	C–N _{deformation vibrations}	medium
21	1076	C–O–C _{stretching, asymmetric}	strong
22	682	C–Cl _{stretching}	strong