Table S1 Analysis of surface element components.

|  |  |
| --- | --- |
| Sample | Main element components (atomic %, atomic concentration of surface element) |
| C% | N% | O% | Al% | Si% | Fe% | P% | S% |
| HS | 69.38 | 2.67 | 23.18 | 1.24 | 1.21 | 0.57 | 0.58 | 1.16 |
| Fe(III)-HS | 58.09 | 2.95 | 27.43 | 2.21 | 1.51 | 5.39 | 0.95 | 1.47 |
| Mnt-HS | 18.8 | 0.84 | 53.56 | 6.78 | 18.68 | 0.58 | 0.47 | 0.29 |
| Fe(III)-Mnt-HS | 31.43 | 2.93 | 44.32 | 5.13 | 10.83 | 2.95 | 0.78 | 1.64 |

Table S2 Band assignment of the FTIR spectra of samples

|  |  |  |  |
| --- | --- | --- | --- |
| Wavenumber(cm-1) | Bands | Wavenumber(cm-1) | Bands |
| 3619 | O-H stretching of structural hydroxyl group of Mnt | ~1382 | Symmetric of R-COO– stretching |
| 3421 | O-H stretching of water of Mnt | 1373 | C-H bending in methyl groups |
| 3382 | N–H stretching | 1267 | Amide III band |
| 3352 | O-H stretching of Fhy | 1033~1037 | Si-O-Si stretching of aluminosilicates minerals  |
| 1636 | O-H deformation of water | 562 | Fe-O stretching vibration of magnetite |
| 1576 | Antisymmetric of R-COO- stretching  | 519 | Si-O-Al deformation of Mnt |
| 1547-1554 | Amide II band  | 466 | Si-O-Si bending of Mnt |