Highly active Fenton-like catalyst derived from solid waste-iron tailings using wheat straw pyrolysis

Lihui Gao1; Lizhang Wang1; Shulei Li2\*; Yijun Cao2,3\*

1. School of Environment and Spatial Informatics, China University of Mining and Technology, Xuzhou 221116, China
2. National Engineering Research Center of Coal Preparation and Purification, China University of Mining and Technology, Xuzhou 221116, China
3. School of Chemical Engineering and Technology, Zhengzhou University, Zhengzhou 450001, China

Table S1 Characteristics of wheat straw and iron tailings

|  |  |  |
| --- | --- | --- |
| Proximate analysis | Wheat straw (Raw biomass)  Average wt% |  |
| Volatile matter | 86.09 |  |
| Fixed carbon | 9.27 |  |
| Ash | 4.64 |  |
| XRF analysis | Wheat straw （Raw biomass） | Iron tailings |
| Average wt% | |
| SiO2 | 4.35 | 41.21 |
| Fe2O3 | 0.264 | 29.25 |
| Al2O3 | 0.337 | 9.47 |
| CaO | 0.443 | 7.105 |
| MgO | 0.235 | 5.31 |
| Ba | - | 3.62 |
| K2O | 2.369 | 1.73 |
| Cl | 0.905 | - |
| S | 0.181 | 1.23 |
| Mn | 0.0502 | 0.41 |
| TiO2 | 0.024 | 0.35 |
| Na2O | 0.072 | 0.15 |
| Sr | - | 0.0762 |
| P | 0.0721 | 0.057 |

Table S2 The metal ion concentration in leaching test

|  |  |  |  |
| --- | --- | --- | --- |
| Metals | Concentration (ppb) | | |
| 1st | 2nd | 3rd |
| Li | 7.07 | 1.77 | 3.67 |
| Na | 1051.94 | 468.46 | 1592.07 |
| Mg | 393.97 | 257.27 | 474.06 |
| Al | 84.62 | 34.04 | 86.94 |
| K | 1131.30 | 569.80 | 2299.87 |
| Ca | 4706.97 | 2423.60 | 2993.95 |
| V | 2.07 | 1.13 | 1.29 |
| Cr | 1.10 | 0.40 | 0.82 |
| Mn | 25.50 | 19.29 | 29.91 |
| Fe | 88.78 | 85.07 | 92.67 |
| Ni | 0.82 | 0.24 | 2.05 |
| Cu | 3.27 | 1.29 | 4.17 |
| Zn | 1.27 | 0.28 | 3.47 |
| Ga | 0.08 | 0.10 | 0.15 |
| As | 0.59 | 0.32 | 0.33 |
| Rb | 3.99 | 1.39 | 2.87 |
| Sr | 60.76 | 49.57 | 86.80 |
| Ag | 0.02 | 0.03 | 0.03 |
| Cd | 0.04 | 0.14 | 0.14 |
| Cs | 1.93 | 0.88 | 1.04 |
| Ba | 331.78 | 239.93 | 422.94 |
| Pb | 0.23 | 0.57 | 1.00 |

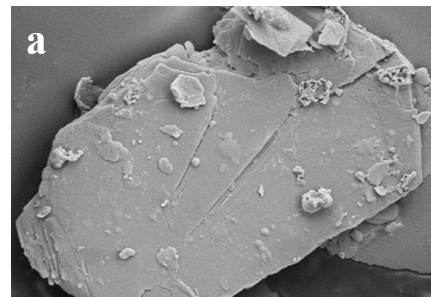
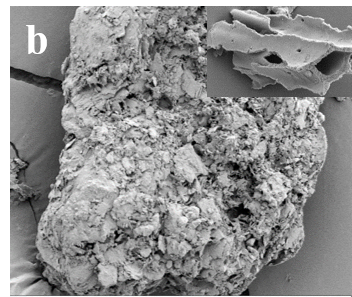
 

Figure S1 The SEM image of synthesized RT-900-60, scale bar=10 μm (a) and I/W(3:1)-900-60, scale bar=10 um, insert image scale bar=3 um (b)



Figure S2 Characterization of the prepared catalysts by N2 adsorption-desorption: (a) Pore size distribution; (b) adsorption-desorption isotherm



Figure S3 Stability and reusability of I/W(3:1)-900-60 for the degradation of MB

Figure S4 (a) XRD patterns of fresh and used I/W(3:1)-900-60; (b) SEM image of used I/W(3:1)-900-60 ([MB]=60 mg/L, [catalyst]=0.3 g/L, [H2O2]=16 mmol/L)