**Supplementary Material**

**Adsorption performance and stability of the modified straws and their extracts of cellulose, lignin, and hemicellulose for Pb2+: pH effect**

**Hang Yu, Jing Wang , Jun-xia Yu \*, Yi Wang and Ru-an Chi**

Hubei Novel Reactor & Green Chemical Technology Key Laboratory, Key Laboratory for Green Chemical Process of Ministry of Education, School of Chemistry and Environmental Engineering, Wuhan Institute of Technology, Wuhan 430205, People’s Republic of China

Corresponding author

E-mail address:yujunxia\_1979@163.com(Dr. Jun-xia Yu).

Address: No. 693 Xiongchu Avenue, Hongshan District, Wuhan, Hubei, 430074, PR China.

Tel: +86 02787194980

Fax: +86 02787194980

Table S1

Fitted parameters of Pb2+ adsorption on unmodified and modified rape straw and the extracted cellulose, lignin, and hemicellulose.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Langmuir model |  |  | Freundlich model |  |  | Temkin model |  |
| Absorbent | *1/KL* | *qm* | *R2* | *KF* | *1/n* | *R2* | *AT* | *bT* | *R2* |
| (L mg-1) | (mg g-1) |  | (mg1-1/nL1/n g-1) |  |  | (L mg-1) | (g mg-1) |  |
| Rape straw | 28.32 | 54.37 | 0.9391 | 1.46  | 7.24 | 0.7459 | 0.46 | 192.62 | 0.8734 |
| Modified rape straw | 2.81 | 182.15 | 0.8092 | 1.16  | 93.67 | 0.8101 | 33.76 | 109.01 | 0.8636 |
| Rape hemicellulose | 5.62 | 104.25 | 0.9908 | 1.23  | 39.87 | 0.8443 | 4.44 | 146.68 | 0.9173 |
| Modified rape hemicellulose | 0.78 | 320.46 | 0.9673 | 1.19  | 167.46 | 0.8722 | 60.86 | 60.92 | 0.9547 |
| Rape lignin | 23.69 | 82.08 | 0.9716 | 1.42  | 12.74 | 0.8160 | 0.37 | 134.36 | 0.9172 |
| Modified rape lignin | 3.71 | 172.31 | 0.9506 | 1.19  | 79.21 | 0.8094 | 1.44 | 105.49 | 0.8599 |
| Rape cellulose | 5.02 | 29.43 | 0.9951 | 1.14  | 15.48 | 0.7493 | 44.57 | 739.99 | 0.8012 |
| Modified rape cellulose | 3.49 | 122.79 | 0.9747 | 1.16  | 60.82 | 0.9310 | 1.36 | 158.20 | 0.9583 |

Table S2

Fitted parameters of Pb2+ adsorption on unmodified and modified maize and the extracted cellulose, lignin, and hemicellulose.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Langmuir model |  |  | Freundlich model |  |  | Temkin model |  |
| Absorbent | *1/KL* | *qm* | *R2* | *KF* | *1/n* | *R2* | *AT* | *bT* | *R2* |
| (L mg-1) | (mg g-1) |  | (mg1-1/nL1/n g-1) |  |  | (L mg-1) | (g mg-1) |  |
| Maize straw | 2.49 | 47.58 | 0.9982 | 1.11 | 29.26 | 0.7721 | 373.30 | 549.66 | 0.8186 |
| Modified maize straw | 1.76 | 174.53 | 0.9913 | 1.16  | 89.89 | 0.8062 | 34.86 | 110.03 | 0.8872 |
| Maize hemicellulose | 4.48 | 69.68 | 0.9894 | 1.19  | 30.51 | 0.7823 | 9.47 | 247.16 | 0.8573 |
| Modified maize hemicellulose | 3.15 | 292.68 | 0.9845 | 1.25  | 108.59 | 0.7995 | 6.77 | 53.51 | 0.9021 |
| Maize lignin | 7.86 | 66.61 | 0.9633 | 1.21  | 25.86 | 0.6843 | 2.03 |  239.28 | 0.7540 |
| Modified maize lignin | 5.41 | 211.88 | 0.9922 | 1.23  | 78.93 | 0.8671 | 1.93 |  72.87 | 0.9367 |
| Maize cellulose | 13.59 | 32.68 | 0.9737 | 1.27  | 9.28 | 0.7799 | 243.57 | 413.85 | 0.8516 |
| Modified maize cellulose | 1.33 | 143.85 | 0.9873 | 1.09  | 94.10 | 0.9190 | 1.15 | 195.50 | 0.9461 |

Table S3

Fitted parameters of Pb2+ adsorption on unmodified and modifiedcotton and the extracted cellulose, lignin, and hemicellulose.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Langmuir model |  |  | Freundlich model |  |  | Temkin model |  |
| Absorbent | *1/KL* | *qm* | *R2* | *KF* | *1/n* | *R2* | *AT* | *bT* | *R2* |
| (L mg-1) | (mg g-1) |  | (mg1-1/nL1/n g-1) |  |  | (L mg-1) | (g mg-1) |  |
| Cotton straw | 16.24 | 58.41 | 0.9804 | 1.36  | 11.83 | 0.8676 | 0.69 | 208.14 | 0.9333 |
| Modified cotton straw | 1.51 | 156.99 | 0.8871 | 1.15  | 87.64 | 0.8257 | 124.47 | 142.06 | 0.8652 |
| Cotton hemicellulose | 11.57 | 76.07 | 0.9723 | 1.32  | 18.59 | 0.7782 | 0.96 | 162.45 | 0.8864 |
| Modified cotton hemicellulose | 2.33 | 257.18 | 0.9812 | 1.21  | 107.27 | 0.7343 | 9.74 | 63.34 | 0.8436 |
| Cotton lignin | 19.71 | 73.59 | 0.9696 | 1.39  | 13.62 | 0.9417 | 0.13 | 167.38 | 0.9532 |
| Modified cotton lignin | 1.88 | 199.31 | 0.9750 | 1.16  | 104.63 | 0.8799 | 1.30 | 100.04 | 0.9311 |
| Cotton cellulose | 11.31 | 38.26 | 0.9616 | 1.27  | 11.35 | 0.9587 | 6.13 | 369.44 | 0.9555 |
| Modified cotton cellulose | 1.79 | 160.00 | 0.9899 | 1.13  | 92.69 | 0.8589 | 1.23 | 142.47 | 0.9090 |

**Figure S1**

 

(a) (b) (c)

Fig. 1 Adsorption kinetic curves of Pb2+ on the modified straw and extracts (a) rape, (b) maize, and (c) cotton.