Table 1s The C1s bonding state and its relative percentage on the aged biochar surface as determined by XPS.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Biochar | Soil | Planting time | C1s chemical state (%) | | | | |
| -C-H, -C-C, -C=C | C-OH | C=O | | O=C-O |
| WBC700 | / | / | 76.9 | 14.6 | | 8.46 | /1） |
| FS | 1 | 68.9 | 6.89 | | 15.2 | 8.96 |
| 2 | 40.8 | 11.02 | | 40.8 | 9.38 |
| 3 | 30.3 | 30.0 | | 30.3 | 9.09 |
| GS | 1 | 49.3 | 9.86 | | 34.5 | 6.41 |
| 2 | 47.2 | 33.96 | | 9.91 | 8.97 |
| 3 | 41.5 | 6.22 | | 41.5 | 10.79 |

Note：1）\ :not determined.

Table 2s Parameters of Elovich model based on the desorption kinetics curves of Cd from biochar by organic acid and CaCl2 solution

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Biochar | Elovich model parameters | | | | | | | | |
| CaCl2 solution | | | Oxalic acid | | | Malic acid | | |
| *a* | *b* | *R2* | *a* | *b* | *R2* | *a* | *b* | *R2* |
| WBC300 | 0.811 | 0.0204 | 0.768 | 0.862 | 0.0280 | 0.906 | 0.903 | 0.0530 | 0.754 |
| WBC700 | 0.681 | 0.0470 | 0.898 | 0.735 | 0.0820 | 0.955 | 1.17 | 0.159 | 0.844 |
| PBC700 | 0.630 | 0.202 | 0.904 | 1.40 | -0.151 | 0.860 | 1.98 | 0.337 | 0.814 |

Table 3s Concentration of PO43-and HCO3-in biochar solution before and after desorption

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Biochar | PO43- (mg L-1) | | | HCO3- (mg L-1) | | |
| Before desorption | After desorption | | Before desorption | After desorption | |
| Oxalic acid solution | Malic acid solution | Oxalic acid solution | Malic acid solution |
| WBC300 | 0.0139 | 0.116 | 0.203 | 0.483 | 1.75 | 1.20 |
| WBC700 | 0.00620 | 0.0794 | 0.183 | 0.517 | 0.800 | 1.18 |
| PBC700 | 3.00E-3 | / | 0.0588 | 0.433 | 0.900 | 1.90 |



Figure 1s Percentage of fraction of Cd in biochar with different cultivation time in two soils. F1, F2, F3, and F4 represent acid-soluble fraction, reducible fraction, oxidizable fraction, and residual fraction, respectively; FS/GS-1, FS/GS-2, FS/GS-3 refers to biochar cultured in FS or GS without wheat for the first time, successive two times, and successive three times, respectively; FS/GS-1-W, FS/GS-2-W, FS/GS-3-W refers to biochar cultured in FS or GS with wheat for the first time, successive two times, and successive three times, respectively.