**Table S1.** Fitting parameters for the kinetic equations that describe Cd (II) adsorption on NBCs

| Adsorbent | pseudo-first-order | | | pseudo-second-order | | |
|---|---|---|---|---|---|---|
| | $q_e$(mg/g) | $k_1$ | $r^2$ | $q_e$(mg/g) | $k_2\times10^{-3}$ | $r^2$ |
| Pr-NBC+20ppm | 6.41 | 0.0049 | 0.787 | 7.22 | 0.193 | 0.853 |
| Pd-NBC+20ppm | 12.24 | 0.0034 | 0.959 | 14.97 | 0.239 | 0.962 |
| Gp-NBC+20ppm | 16.57 | 0.0123 | 0.944 | 18.43 | 0.896 | 0.971 |
| Pr-NBC+50ppm | 13.95 | 0.0027 | 0.983 | 17.86 | 0.140 | 0.984 |
| Pd-NBC+50ppm | 17.93 | 0.0026 | 0.983 | 24.33 | 0.101 | 0.985 |
| Gp-NBC+50ppm | 29.64 | 0.0038 | 0.993 | 36.51 | 0.106 | 0.993 |

**Table S2.** Fitting parameters for the Langmuir and Freundlich isotherms for Cd (II) adsorption by NBCs and pristine biochars

| Adsorbent | Langmuir | | | Freundlich | | |
|---|---|---|---|---|---|---|
| | $q_{max}$(mg/g) | $b$(L/mg) | $r^2$ | $K_F$(mg$^{1+n}$/g/L$^n$) | $n$ | $r^2$ |
| Pr-NBC | 12.68 | 0.085 | 0.968 | 3.02 | 0.277 | 0.957 |
| Pd-NBC | 24.04 | 0.357 | 0.990 | 9.10 | 0.249 | 0.988 |
| Gp-NBC | 35.95 | 0.468 | 0.973 | 13.94 | 0.261 | 0.962 |
| 700-BC | 11.98 | 0.095 | 0.962 | 3.43 | 0.296 | 0.983 |
| 800-BC | 15.82 | 0.110 | 0.924 | 3.80 | 0.325 | 0.982 |
| 900-BC | 11.01 | 0.213 | 0.881 | 4.17 | 0.226 | 0.997 |

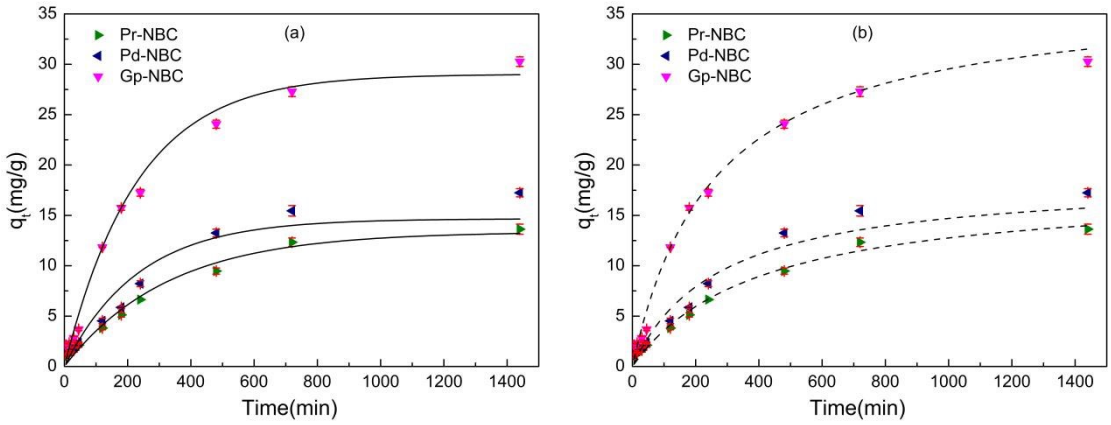


**Fig.S1.** Adsorption kinetics of 50 mg/L Cd(II) on NBCs (a): pseudo-first-order model; (b) : pseudo-second-order model

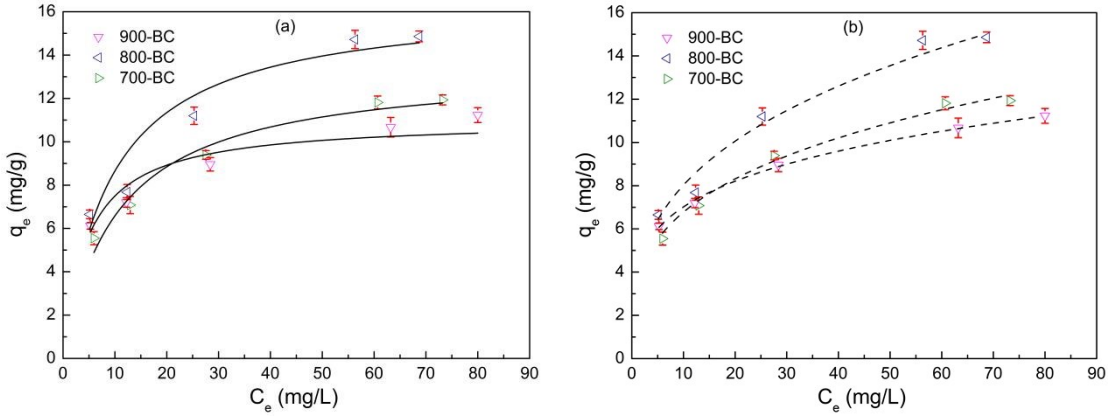


Fig.S2. Adsorption isotherm of Cd (II) on pristine BCs (a): Langmuir model; (b): Freundlich model.

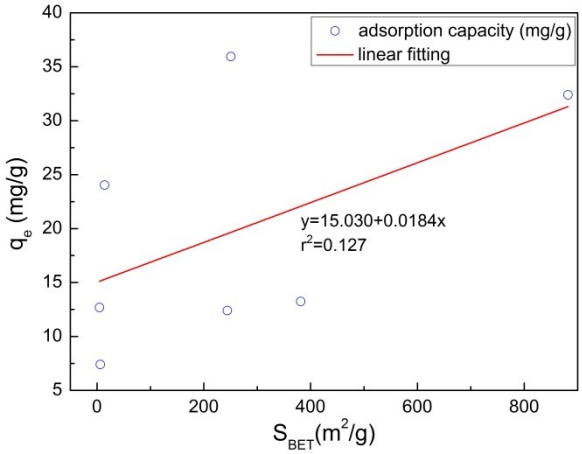


**Fig.S3.** The correlations of adsorption capacity ($q_e$, mg/g) with $S_{BET}$ ($m^2$/g)

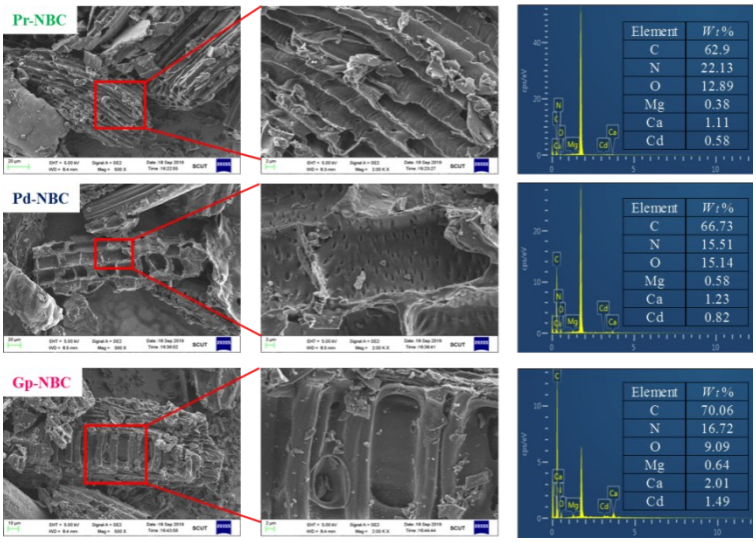


**Fig.S4.** SEM images and element relative content of NBCs' surface

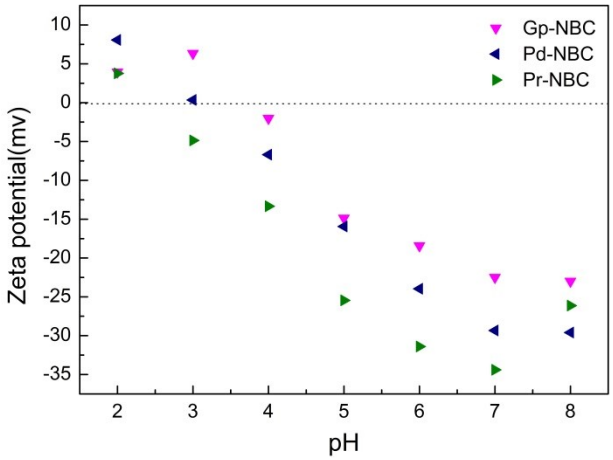


**Fig. S5.** Zeta potential of NBCs (pH from 2 to 8)

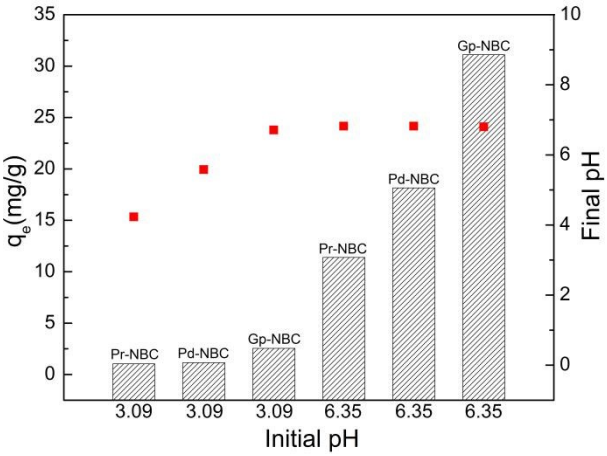


**Fig. S6.** Influence of initial pH on adsorption (red points represent pH after adsorption, and the columns represent adsorption capacities)

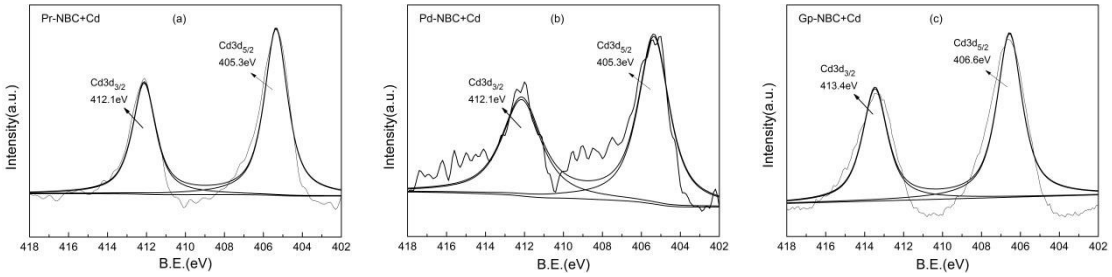


**Fig. S7.** High resolution XPS spectra of Cd3d on NBCs after adsorption