Three-Dimensional Hierarchical Porous Carbon Derived from Natural Resources for Highly Efficient Treatment of Polluted Water

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**Figure S1.** Photo of the MB solutions before and after adsorption by the PC-500-6.

The optical photographs were taken before and after MB adsorption (**Figure S1**). For example, after the adsorption of MB with an initial concentration of 300 mg/l on PC-500-6, the polluted water became clear and colorless, which further revealed the efficient adsorption and distinct discoloration for wastewater using PC-500-6.



**Figure S2.** Equilibrium adsorption isotherms of (a) C-800 (b) PC-800-2 (c) PC-800-4 and PC-800-6; and (d) Langmuir, (e) Freundlich and (f) Temkin isotherms of MB on C-800 and PC-800-Y. (20 mg of C-800, PC-800-2 or PC-800-4/6 added to a 50 mL MB solution (10-80 mg/L, 100-500 mg/L or150-550 mg/L) at a designated concentration after stirring for 12 h.)

**Table S1** Langmuir, Freundlich and Temkin isotherm parameters of C-800 and PC-800-Y for MB.

|  |  |  |
| --- | --- | --- |
| Isotherm | Parameter | Adsorbent |
| C-800 | PC-800-2 | PC-800-4 | PC-800-6 |
| Langmuir | *qm* (mg/g) | 16.66 | 354.61 | 724.64 | 862.07 |
| *KL* (L/mg) | 0.8883 | 0.6845 | 0.902 | 1.3143 |
| *R2* | 0.99999 | 0.99995 | 0.99996 | 0.99994 |
| Freundlich | *1/n* | - | 0.03074 | 0.03534 | 0.04534 |
| *KF* (mg/g(L/mg)1/n) | - | 109.346 | 149.572 | 157.931 |
| *R2* | - | 0.25472 | 0.99003 | 0.97274 |
| Temkin | *BT* | - | 10.4196 | 21.5372 | 33.7500 |
| *KT* (L/mg) | - | 8.41\*103 | 8.14\*103 | 3.40\*103 |
| *R2* | - | 0.90715 | 0.99538 | 0.98245 |

**Table S2** Comparison table of adsorption capacities of MB on different adsorbents.

|  |  |  |  |
| --- | --- | --- | --- |
| Entry | Adsorbent | Adsorption capacity (mg/g) | Ref. |
| 1 | Activated carbon from coconut husk | 418.15 | [1] |
| 2 | Activated carbon from coconut shells | 526 | [2] |
| 3 | Activated carbon from date stones | 316 | [3] |
| 4 | Activated carbon from cashew nut shell | 476 | [4] |
| 5 | Porous carbon nanotubes | 319.1 | [5] |
| 6 | CNF aerogel | 800.0 | [6] |
| 7 | Activated CNT | 400 | [7] |
| 8 | Porous carbon sheets | 769.2 | [8] |
| 9 | ZIF-derived nitrogen-doped porous carbons | 791.3 | [9] |
| 10 | Activated carbon membranes | 235.2 | [10] |
| 11 | Agar/graphene oxide composite aerogel | 578 | [11] |
| 12 | Boron doped carbon nitride nanoscrolls | 250 | [12] |
| 13 | Magnetic halloysite nanotube | 714.29 | [13] |



**Figure S3.** The pseudo first-order kinetic model of PC-500-Y for the adsorption of MB. (Experimental conditions: MB concentration = 250 mg/L for PC-500-2, 300 mg/L for PC-500-4 and PC-500-6 and adsorbent concentration = 20 mg/L).

**Table S3**. Kinetic parameters of the pseudo first-order kinetic model for MB on the PC-500-Y.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Absorbent | *C0* (mg/L) | *qe,exp* (mg/g) | *qe,cal* (mg/g) | *k1*(min-1) | *R2* |
| PC-500-2 | 150 | 360.94 | 70.07 | 0.00642 | 0.6430 |
| PC-500-4 | 250 | 718.30 | 50.37 | 0.00375 | 0.3625 |
| PC-500-6 | 300 | 861.18 | 314.00 | 0.00147 | 0.2648 |



**Figure S4.** Kinetic curves (a) and the pseudo second-order kinetic model (b) of PC-800-Y for the adsorption of MB. (Experimental conditions: MB concentration was 250 mg/L for PC-800-2, 300 mg/L for PC-800-4 and PC-800-6 and adsorbent concentration was 20 mg/L).

**Table S4**. Kinetic parameters of the pseudo second-order kinetic model for MB on the PC-800-Y.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Adsorbent | *C0*(mg/L) | *qe,exp*(mg/g) | Pseudo first-order model | Pseudo second-order model |
| *k1*(min)-1 | *qe,cal*(mg/g) | *R2* | *k2*(min-1) | *h*(mg/g/min) | *R2* |
| PC-800-2 | 150 | 365.62 | 0.00356 | 29.95 | 0.2468 | 8.75\*10-9 | 0.00102 | 0.9998 |
| PC-800-4 | 250 | 714.29 | 0.00728 | 93.67 | 0.8106 | 2.01\*10-8 | 0.0103 | 0.9999 |
| PC-800-6 | 300 | 862.07 | 0.00773 | 66.28 | 0.6100 | 1.18\*10-8 | 0.0082 | 0.9994 |

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