**Supplementary Material**

**Cellulose-based waste in a close loop: adsorbent for dyes removal from textile industry wastewater**

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**Table S1.** Pseudo-first and pseudo-second order adsorption rate constants, calculated using appropriate model, and experimental qe values for adsorption of selected dyes on cotton-based adsorbents

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Dye | Sample | Cott | Cottc | Cottac | Cott/PES | Cott/PESc | Cott/PESac |
| MO | qe,exp,  mg g-1 | 0.25 | 0.33 | 99.75 | 0.31 | 0.50 | 37.78 |
| MB | 10.78 | 2.85 | 99.33 | 6.30 | 1.62 | 79.37 |
| Pseudo-first order model | | | | | | | |
| MO | *q*e,cal,  mg g-1 | 0.23 | 0.28 | 96.30 | 0.28 | 0.40 | 33.51 |
| MB | 10.31 | 2.59 | 99.91 | 5.82 | 1.40 | 72.29 |
| MO | *k*1,  min-1 | 0.0343 | 0.0798 | 0.2979 | 0.0481 | 0.0877 | 0.1593 |
| MB | 0.1095 | 0.1977 | 0.3928 | 0.1172 | 0.1807 | 0.0421 |
| MO | *R*2 | 0.96328 | 0.80869 | 0.67796 | 0.91629 | 0.59018 | 0.34174 |
| MB | 0.83565 | 0.67271 | 0.98308 | 0.54210 | 0.62056 | 0.79825 |
| Pseudo-second order model | | | | | | | |
| MO | *q*e,cal,  mg g-1 | 0.28 | 0.32 | 100.39 | 0.33 | 0.45 | 36.26 |
| MB | 11.12 | 2.76 | 101.71 | 6.28 | 1.51 | 82.50 |
| MO | *k*2,  g mg-1min-1 | 0.1304 | 0.3177 | 0.0065 | 0.1646 | 0.2411 | 0.0067 |
| MB | 0.0151 | 0.1215 | 0.0137 | 0.0292 | 0.1902 | 0.0006 |
| MO | *R*2 | 0.98134 | 0.92104 | 0.97229 | 0.93567 | 0.78692 | 0.71694 |
| MB | 0.95622 | 0.91631 | 0.68521 | 0.80863 | 0.78059 | 0.89764 |

**Table S2.** Kinetic parameters for MO and MB adsorption on cotton-based adsorbents obtained by Elovich and intraparticle diffusion model

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Material | Dye | Cott | Cottc | Cottac | Cott/PES | Cott/PESc | Cott/PESac |
| Elovich model | | | | | | | |
| *R2* | MO | 0.99026 | 0.96500 | 0.87480 | 0.93400 | 0.92319 | 0.94111 |
| MB | 0.93148 | 0.97093 | 0.24819 | 0.93096 | 0.84670 | 0.95216 |
| *α*,  mg/g min | MO | 0.022 | 0.100 | 1.081x106 | 0.036 | 0.180 | 131.3 |
| MB | 14.63 | 55.21 | 1.32x1016 | 10.34 | 11.17 | 12.56 |
| *β*,  g/mg | MO | 16.7 | 18.3 | 0.17 | 14.3 | 13.2 | 0.23 |
| MB | 0.66 | 3.66 | 0.41 | 1.19 | 5.98 | 0.07 |
| *RE* | MO | 0.240 | 0.164 | 0.060 | 0.228 | 0.152 | 0.117 |
| MB | 0.142 | 0.096 | 0.025 | 0.133 | 0.103 | 0.193 |
| Intra-particle diffusion | | | | | | | |
| *kid,1*,  mg/g min1/2 | MO | 0.051 | 0.017 | 5.29 | 0.087 | 0.024 | 1.64 |
| MB | 1.10 | 0.082 | 14.9 | 0.420 | 0.052 | 4.88 |
| *C1*,  mg/g | MO | 0.84 | 0.11 | 67.76 | 0.002 | 0.16 | 19.71 |
| MB | 3.21 | 1.84 | 52.25 | 2.61 | 0.93 | 17.06 |
| *kid,2*,  mg/g min1/2 | MO | 0.022 |  | 0.51 | 0.022 |  | 0.18 |
| MB | 0.490 |  | 0.009 | 0.070 |  |  |
| *C2*,  mg/g | MO | 0.024 |  | 93.55 | 0.079 |  | 35.36 |
| MB | 6.59 |  | 99.66 | 5.38 |  |  |
| *kid,3*,  mg/g min1/2 | MO | 0.010 |  |  | 0.010 |  |  |
| MB | 0.063 |  |  |  |  |  |
| *C3*, mg/g | MO | 0.12 |  |  | 0.17 |  |  |
| MB | 9.93 |  |  |  |  |  |