**Supporting Information**

**MIL-101 (Cr) Hybrid Nanoporous Carbon Derived MOF as a Nano-adsorbent for Dye Removal Using RSM-CCD**

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Table S1: The linear form of the isotherms.

|  |  |  |
| --- | --- | --- |
| **Isotherms Name** | **Linear Form** | **Parameters** |
| Langmuir |  | qm (mg. g-1) = Maximum adsorption capacity  KL (L. mg−1)= Langmuir adsorption constant |
| Freundlich |  | n= The intensity adsorption  KF= The adsorption capacity |
| Tamkin | B1 = | B1 (J. mol-1) and KT (L. g-1)=Temkin constants  b= The heat of adsorption  k= The maximum bond energy |
| D-R |  | β (KJ2.mmol-2) = The coefficient of mean free adsorption  ε (J. mmol-1)= Polanyi potential  E (KJ. mmol-1)= Amount of energy |

Table S2: Isotherm constant and correlation coefficients calculated for MB adsorption by Zn-MOF-5 NPC@MIL nanohybrid.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Freundlich | | | | | |
| **Parameter** | | n | | Log KF | R2 |
|  | | 1.6 | | 5.98 | 0.95 |
| **Langmuir** | | | | | |
| **Parameter** | | Qm (mg.g-1) | | KL (L.mg-1) | R2 |
|  | | 1000 | | 0.714 | 0.99 |
| **Temkin** | | | | | |
| **Parameter** | | B1 | | KT(L.mg-1) | R2 |
|  | | 411 | | 2.94 | 0.98 |
| **D-R** | | | | | |
| **Parameter** | β\*10-3(KJ2.mmol- 2) | | qm (mg.g-1) | E\*10-3(KJ. mmol-1) | R2 |
|  | 0.052 | | 473.42 | 3.53 | 0.97 |

Table S3: Linear form of each kinetic models.

|  |  |  |  |
| --- | --- | --- | --- |
| **Eq.** | **Linear Form** | **Parameters** |  |
| **PFO** |  | qt (mg. g-1) =Adsorption capacity at time (t)  qe (mg. g-1) = Adsorption capacity at equilibrium  k1(min−1) = The PFO rate constant |  |
| **PSO** |  | K2 (g. mg-1. min)= The rate constant of the PSO. |  |
| **Elovich** | ln (t) | = The initial phenol adsorption rate  (g.mg-1) = The surface coverage |  |
| **Intraparticle Diffusion** |  | C (mg. g-1) =a constant of the model |  |

Table S4: Adsorption kinetic parameters for MB removal onto Zn-MOF-5 NPC@MIL nanohybrid.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PFO** | | | | | | | | | | |
| Parameter | R2 | | | | K1 (min-1) | | | qe, Calc (mg.g-1) | | |
|  | 0.98 | | | | 0.017 | | | 13.80 | | |
| **PSO** | | | | | | | | | | |
| Parameter | R2 | | | K2 (min-1) | | | qe, Calc (mg.g-1) | | | |
|  | 1 | | | 0.018 | | | 83.33 | | | |
| **Elovich** | | | | | | | | | | |
| Parameter | R2 | | (mg.g-1·min-1) | | | | | | (mg.g-1) | |
|  | 0.96 | | 7.07E+08 | | | | | | 0.29 | |
| **Intraparticle** | | | | | | | | | | |
| Parameter |  | R2 | | | | Kdif (L/min) | | | | C |
|  | Step (1) | 0.99 | | | | 2.4 | | | | 65 |
|  | Step (2) | 0.99 | | | | 0.81 | | | | 73 |
|  | Step (3) | 0.2 | | | | -0.026 | | | | 78 |
| **qe, Exp (mg. g-1)** |  | | | | | 78.55 | | | |  |