

**Supporting Information**  
**Effective Removal of Direct Black-38 Dye from Wastewater by Using**  
**Newly Silica Modified Resin: Equilibrium and Thermodynamic**  
**Modelling Studies**

Ranjhan Junejo<sup>1\*</sup>, Shahabuddin Memon<sup>1</sup>, Savas Kaya<sup>2</sup>

<sup>1</sup>National Center of Excellence in Analytical Chemistry, University of Sindh Jamshoro 76080-PAKISTAN

<sup>2</sup>Sivas Cumhuriyet University, Health Services Vocational School, Department of Pharmacy, 58140, Sivas/TURKEY

\*To whom correspondence should be addressed. E-mail: [ranjhanjunejo@yahoo.com](mailto:ranjhanjunejo@yahoo.com)

**Table S1** Effect of adsorbent dosage on % adsorption of DB-38 dye

<b>Adsorbent Dosage(mg)</b>	<b>Concentration (mol/L)</b>	<b>% Adsorption</b>
10	$2 \times 10^{-5}$	30.563±1.631
15	$2 \times 10^{-5}$	40.358±1.231
20	$2 \times 10^{-5}$	50.439±0.994
25	$2 \times 10^{-5}$	57.208±0.876
30	$2 \times 10^{-5}$	65.403±0.761
35	$2 \times 10^{-5}$	71.342±0.701
40	$2 \times 10^{-5}$	87.326±0.577
45	$2 \times 10^{-5}$	88.255±0.566
50	$2 \times 10^{-5}$	93.076±0.531
55	$2 \times 10^{-5}$	99.044±0.503
60	$2 \times 10^{-5}$	99.193±0.503
65	$2 \times 10^{-5}$	99.023±0.504
70	$2 \times 10^{-5}$	99.304±0.503
75	$2 \times 10^{-5}$	99.340±0.503
80	$2 \times 10^{-5}$	99.293±0.503
85	$2 \times 10^{-5}$	98.770±0.506
90	$2 \times 10^{-5}$	99.026±0.504
95	$2 \times 10^{-5}$	99.370±0.503
100	$2 \times 10^{-5}$	99.110±0.502

**Table S2** Effect of pH on % Adsorption of DB-38 dye

<b>pH</b>	<b>Concentration (mol/L)</b>	<b>% Adsorption</b>
1	$2 \times 10^{-5}$	99.32±0.5034
2	$2 \times 10^{-5}$	99.10±0.5045
3	$2 \times 10^{-5}$	99.04±0.5048
4	$2 \times 10^{-5}$	89.28±0.5599
5	$2 \times 10^{-5}$	78.37±0.6379
6	$2 \times 10^{-5}$	50.11±0.9977
7	$2 \times 10^{-5}$	20.73±2.4111
8	$2 \times 10^{-5}$	10.07±3.6195
9	$2 \times 10^{-5}$	8.073±3.9123
10	$2 \times 10^{-5}$	7.365±4.0810
11	$2 \times 10^{-5}$	6.106±4.5910
12	$2 \times 10^{-5}$	5.093±4.8010

**Table S3** The effect of temperature on % adsorption of DB-38 dye onto DIS resin

<b>% Adsorption</b>			
<b>Temperature (K)</b>	293	303	308
<b>Time</b>			
5	89.3093±0.5598	81.2326±0.6155	70.3901±0.7103
10	89.9387±0.5559	85.5460±0.5844	71.3383±0.7008
15	88.3208±0.5661	88.1521±0.5672	75.6331±0.6610
30	95.8810±0.5441	88.2588±0.5665	77.2661±0.6471
45	99.3652±0.5430	89.5103±0.5585	85.5846±0.5842
60	99.3204±0.5415	90.4947±0.5525	85.5661±0.5843
90	99.3931±0.5411	90.4657±0.5526	85.2956±0.5861
120	99.7942±0.5388	90.5857±0.5519	85.3041±0.5861

**Table S4** Langmuir adsorption Isotherm model

<b><i>Ce/Cads</i> (mmol/g)</b>				
<b>Temperature (K)</b>	293	303	308	313
<b><i>Ce</i>(mol/L)</b>				
$2.40 \times 10^{-07}$	0.1256±0.0403	0.1198±0.0421	0.1127±0.0467	0.1158±0.0433
$2.00 \times 10^{-06}$	0.1248±0.0406	0.1185±0.0423	0.1165±0.0434	0.1145±0.0399
$1.40 \times 10^{-05}$	0.1227±0.0406	0.1173±0.0429	0.1153±0.0438	0.1133±0.0442
$1.00 \times 10^{-04}$	0.1217±0.0405	0.1160±0.0435	0.1140±0.0440	0.1120±0.0444
$4.00 \times 10^{-04}$	0.1198±0.0421	0.1148±0.0427	0.1128±0.0441	0.1108±0.0450

**Table S5** Freundlich adsorption Isotherm model

<b><i>lnCads</i> (mmol/g)</b>				
<b>Temperature (K)</b>	293	303	308	313
<b><i>lnCe</i>(mol/L)</b>				
-21.544	-20.216±0.0323	-20.279±0.0291	-20.318±0.0410	-20.387±0.025
-19.337	-17.890±0.0381	-17.951±0.0281	-17.976±0.0421	-18.029±0.028
-17.197	-15.553±0.0371	-15.611±0.0211	-15.648±0.0411	-15.686±0.034
-15.019	-13.195±0.0311	-13.285±0.0231	-13.285±0.0421	-13.309±0.029
-13.346	-10.840±0.0410	-10.903±0.0315	-10.936±0.0511	-10.982±0.039

**Table S6** D-R adsorption Isotherm model

	$\epsilon^2$			
<b>Temperature (K)</b>	293	303	308	313
<b>lnC<sub>ads</sub> (mmol/g)</b>				
-24.906	4450±0.0112	4305±0.0116	4255±0.0117	4110±0.0121
-23.876	4260±0.0117	4122±0.0121	3990±0.0125	3880±0.0128
-23.050	4150±0.0120	4210±0.0118	3879±0.0128	3690±0.0135
-22.344	3800±0.0131	3780±0.0132	3580±0.0139	3301±0.0151
-21.562	3500±0.0142	3433±0.0145	3310±0.0151	3250±0.0153
-20.753	3200±0.0156	3190±0.0156	2970±0.0168	2780±0.0179
-20.071	3000±0.0166	2961±0.0168	2791±0.0179	2590±0.0193
-19.342	2800±0.0178	2788±0.0179	2610±0.0191	2400±0.0208
-18.639	2400±0.0208	2370±0.0210	2250±0.0222	2010±0.0248
-17.936	2000±0.0251	1990±0.0251	1819±0.0274	1713±0.0291
-17.232	1800±0.0277	1775±0.0281	1560±0.0320	1380±0.0362
-16.529	1500±0.0333	1433±0.0348	1350±0.0370	1266±0.0394
-15.827	1300±0.0384	1228±0.0407	1090±0.0458	910±0.0549
-15.124	900±0.0555	890±0.0561	713±0.0701	510±0.0980
-14.422	700±0.0714	669±0.0747	511±0.0978	422±0.1184