Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary content

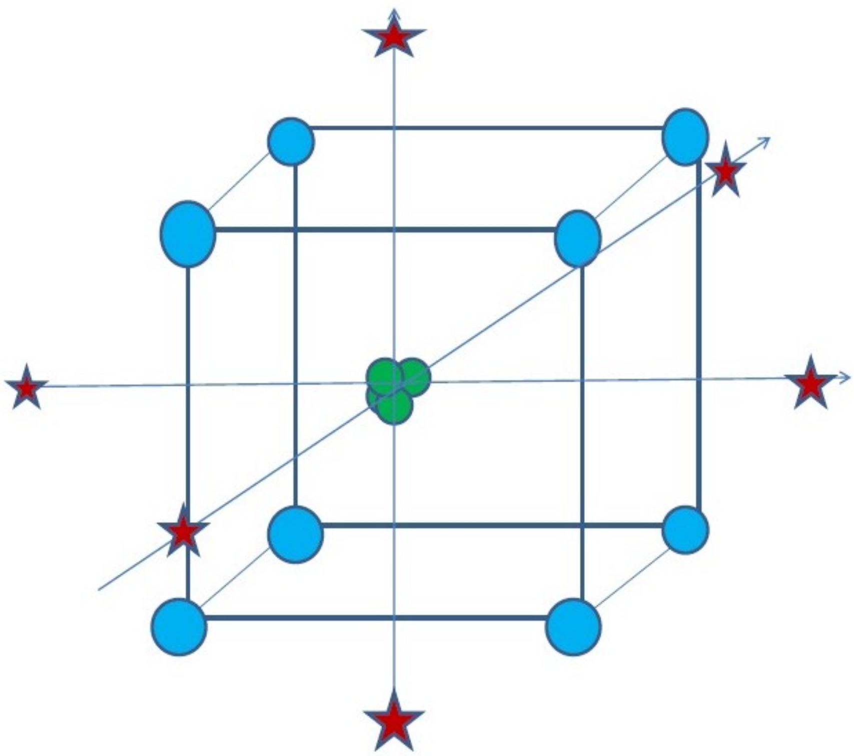


Fig. S1. Graphical presentation of central composite design with 3 factors

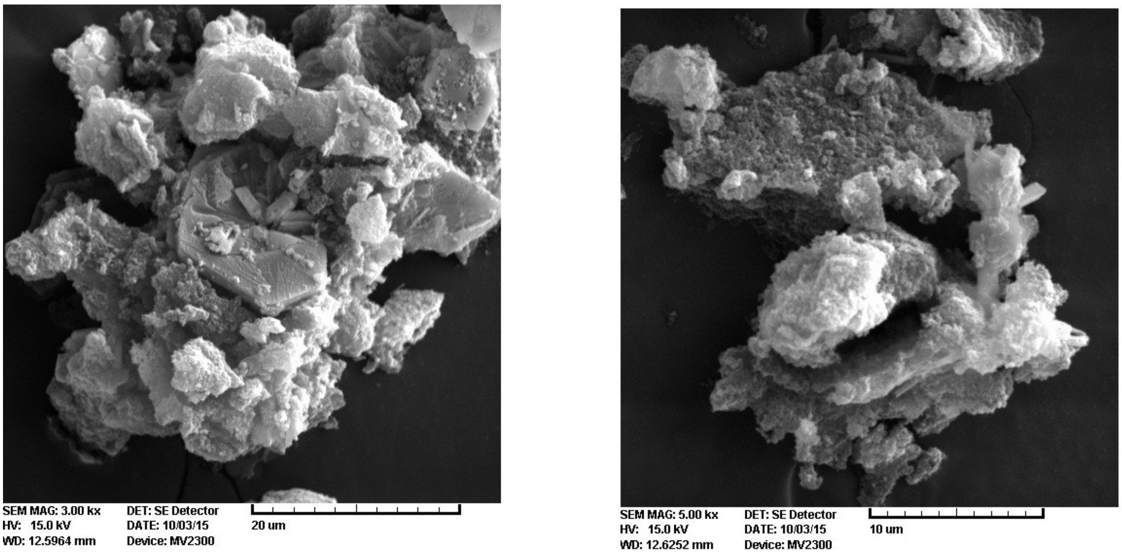


Fig.S2. Fine structure of suface of lemone citrus peels carbon active

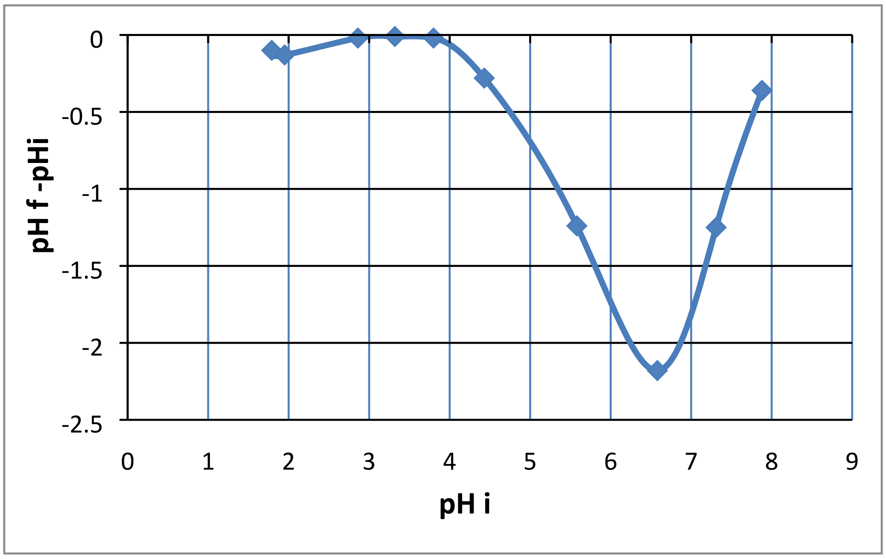
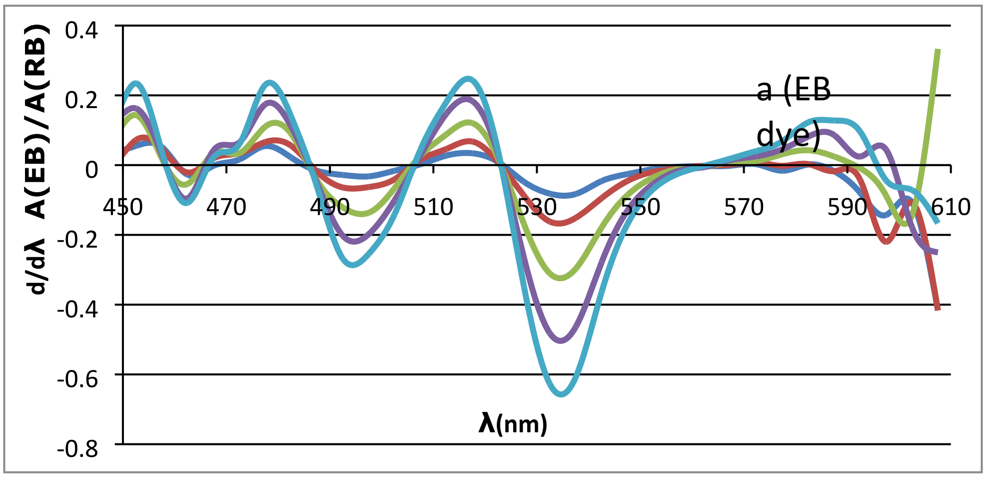


Fig.S3. Surface potential of lemon citrus powder carbon active



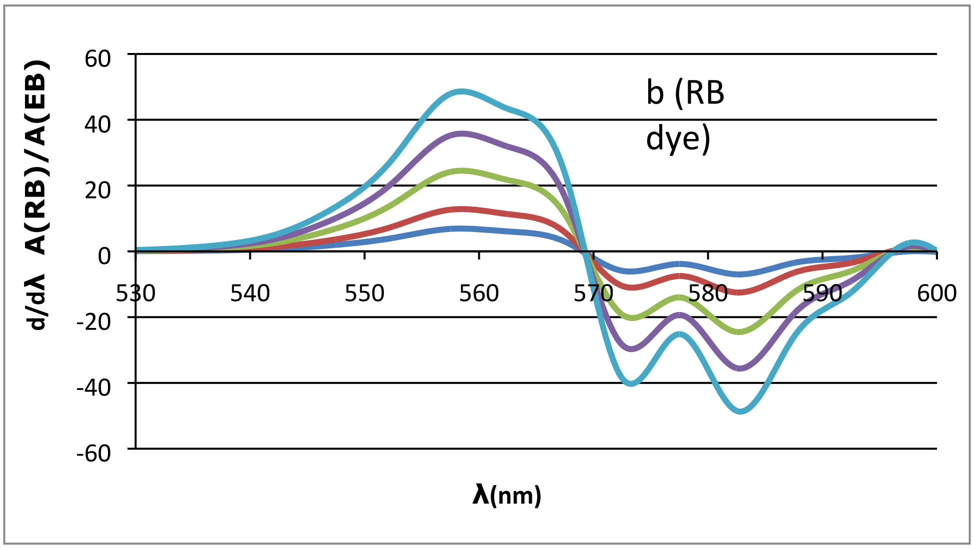
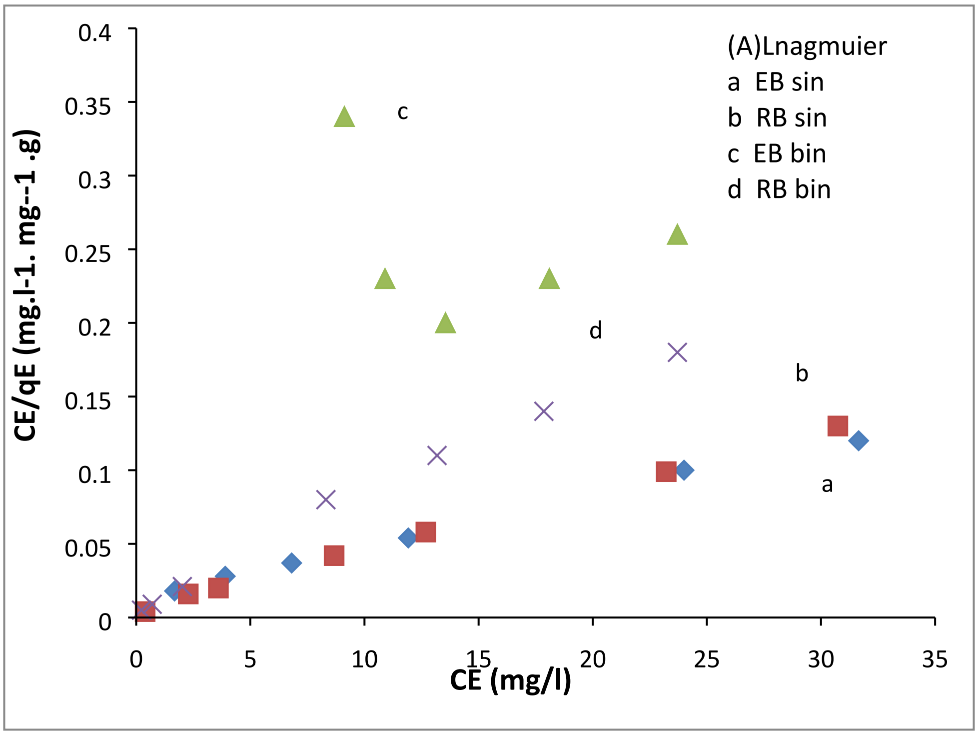


Fig. S4. Ratio-derivative spectra for (a) EB (b) RB (dye concentration = 1, 2, 4, 6, and 8 mg/l, the other dye concentration = 5 mg/l in all cases.



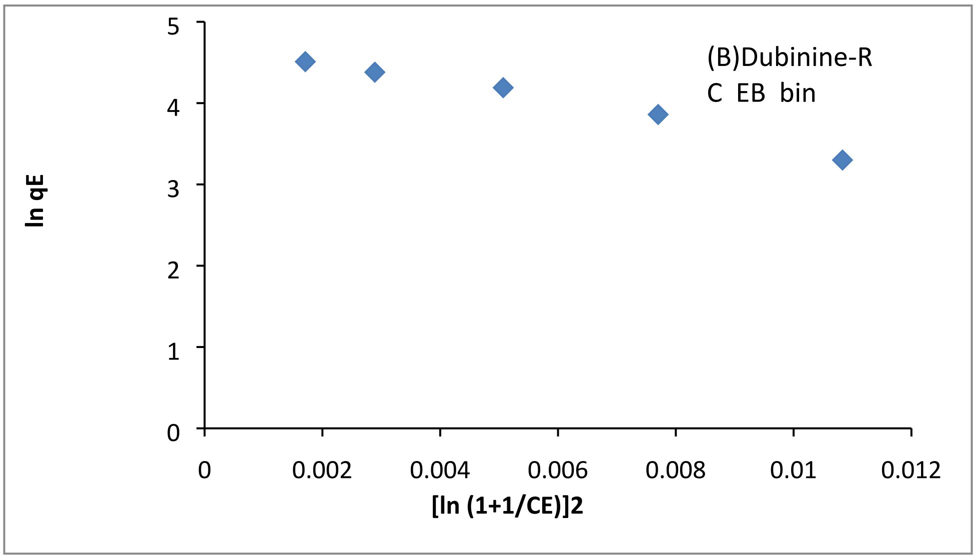


Fig. S5. Isotherms of single and binary dyes (A) Langmuir adsorption isotherm (B) Dubinine-Radushkovich adsorption isotherm. Temperature 25^0 C, pH =4, adsorbent dose 0.3 g/l.

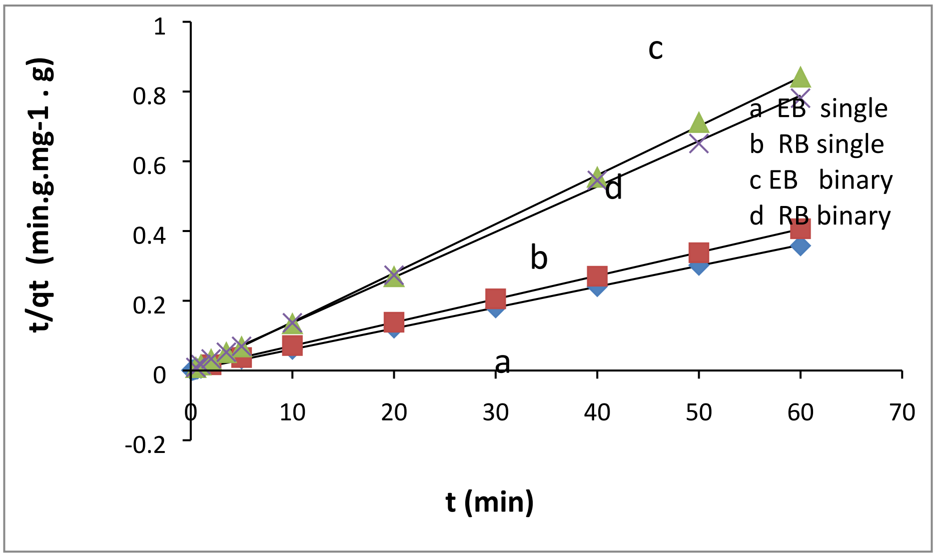


Fig. S6. Dye adsorption rate in single and binary dyes fitted to pseudo-second order kinetic equation. Initial dye concentration 20 mg/l , temperature 25^0 C, pH =4, adsorbent dose 0.3 g/l.

Table S1. Analysis of variance (ANOVA) for removal of EB and RB dyes

Source of variation	EB					**RB**				
	SS	DF	MS	F-Value	P- value	**SS**	**DF**	**MS**	**F-Value**	**P- value**
model	1753	9	194.8	52.16	<0.0001	**102.1**	**9**	**11.34**	**25.78**	**<0.0001**
X_1	787.4	1	787.4	210.8	<0.0001	**0.0190**	**1**	**0.0190**	**0.043**	**0.8407**
X_2	379.6	1	379.6	101.6	<0.0001	**4.69**	**1**	**4.690**	**10.65**	**0.0085**
X_3	40.99	1	40.99	10.98	0.0078	**29.23**	**1**	**29.23**	**66.44**	**<0.0001**
X_1X_2	318.3	1	318.3	85.23	<0.0001	**4.48**	**1**	**4.48**	**10.19**	**0.0096**
$X_1 X_3$	48.61	1	48.61	13.02	0.0048	**29.84**	**1**	**29.84**	**67.82**	**<0.0001**
$X_2 X_3$	62.61	1	62.61	16.76	0.0022	**7.20**	**1**	**7.20**	**16.36**	**0.0023**
X_1^2	84.62	1	84.62	22.66	0.0008	**2.04**	**1**	**2.04**	**4.64**	**0.0567**
X_2^2	41.75	1	41.75	11.18	0.0074	**3.09**	**1**	**3.09**	**7.03**	**0.0243**
X_3^2	1.930	1	1.930	0.5200	0.4891	**20.83**	**1**	**20.83**	**47.34**	**<0.0001**
Residual	37.34	10	3.734	-	-	**4.400**	**10**	**0.4400**	**-**	**-**
lack of fitness	30.38	5	6.08	4.36	0.0659	**2.39**	**5**	**0.480**	**1.19**	**0.4261**
Pure error	6.970	5	1.390			**2.01**	**5**	**0.400**		
Total	1790	19				**106.49**	**19**			

Table S2 : kinetic parameter for dye adsorption, T = 25 ^{0}c , pH = 4 , adsorbent = 0.3 g/l.

Equation		Single solution		Binary solution	
		Erythrosin B	Rhodamine B	Erythrosine B	Rhodamine B
Pesudo first order	R^2	0.95	0.96	0.88	0.87
$Ln\left(q_e - q_t\right) = Ln\, q_e - K_1 t$	K_1(min^{-1})	2.17	0.08	0.29	0.61
Plot the values of $Ln\left(q_e - q_t\right)$ againest t give a linear relationship that q_e and K_1 can be determined.	$q_{e \times p}$ (mg g^{-1})	149.25	148.16	73.38	72.97
	q_{calc}(mg g^{-1})	19.87	21.89	14.00	29.76
Pesudo second order	R^2	0.999	1.000	0.999	0.999
$t/q_t = 1/k_2 q_e^2 + t/q_e$	K_2 (g mg^{-1} min^{-1})	0.04	0.04	0.20	0.09
Plot the values of t/q_t agaınes t give a linear relationship wich k_2 and q_e can be determined.	$q_{e \times p}$(mg g^{-1})	149.25	148.16	73.38	72.97
	q_{calc}(mg g^{-1})	166.67	166.67	71.43	76.92