

200105 Supplementary Materials

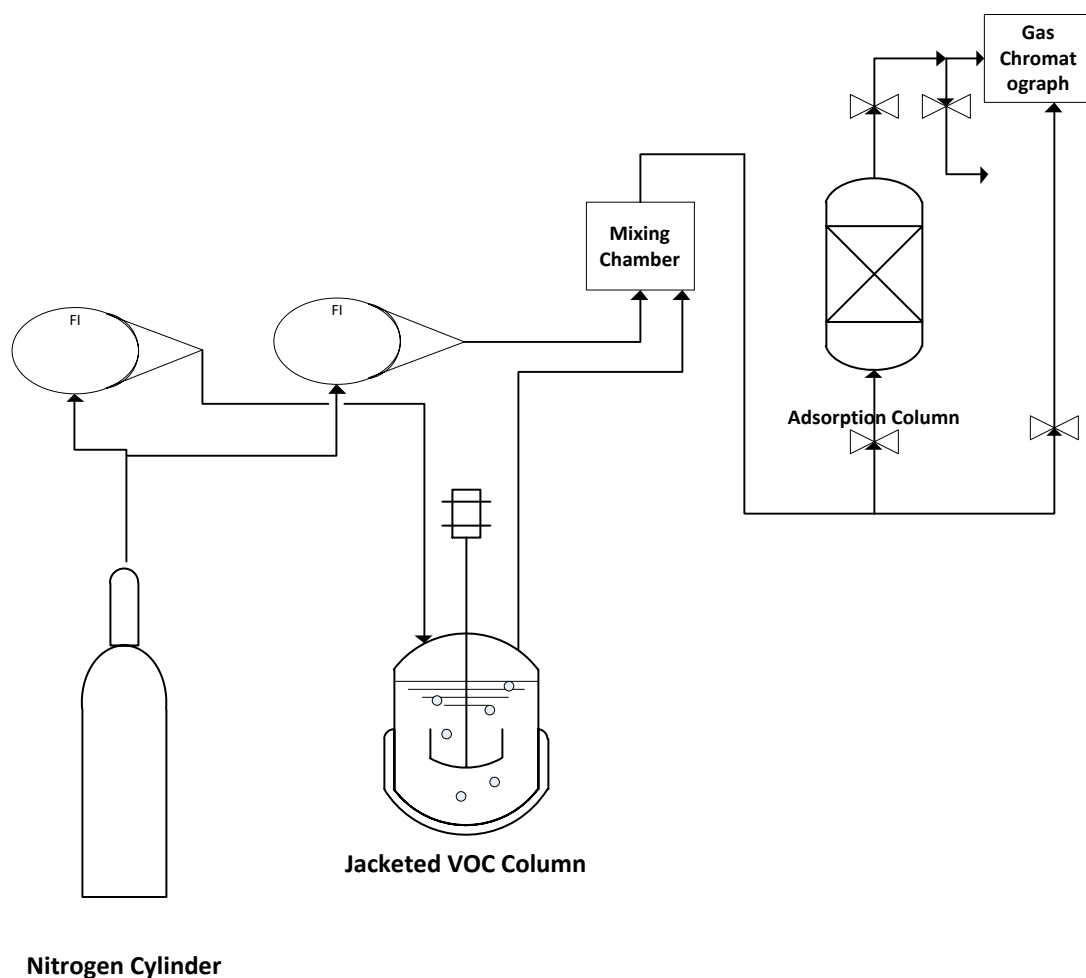
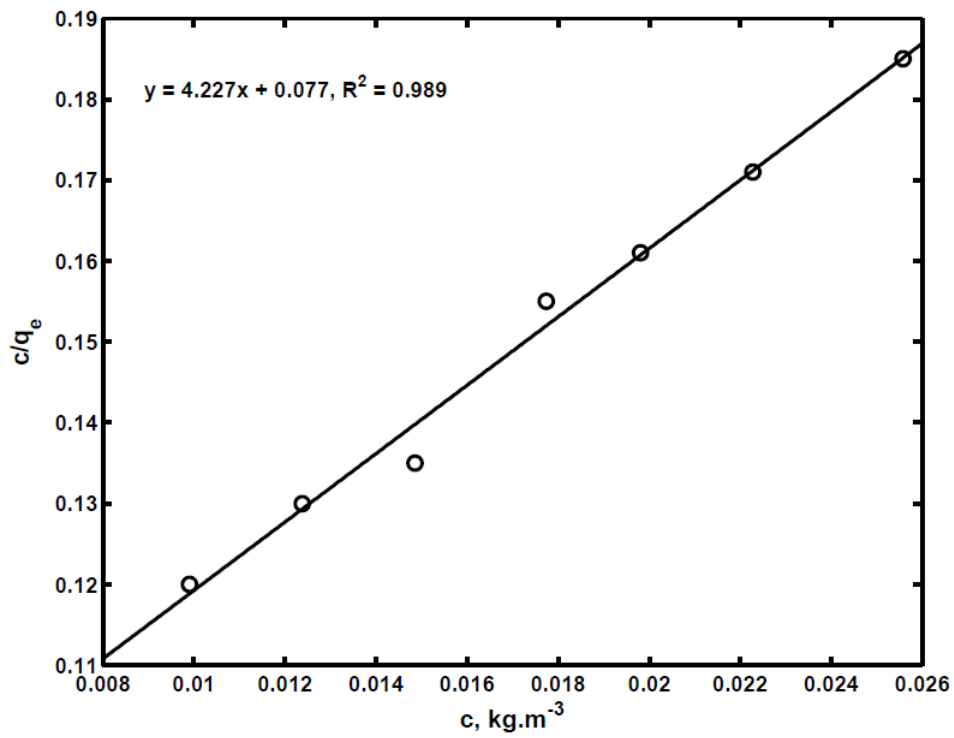


Fig. S1. Schematic diagram of the experimental set-up for VOC adsorption (Pressure = 1 atm, Temperature = 40°C).

(a)



(b)

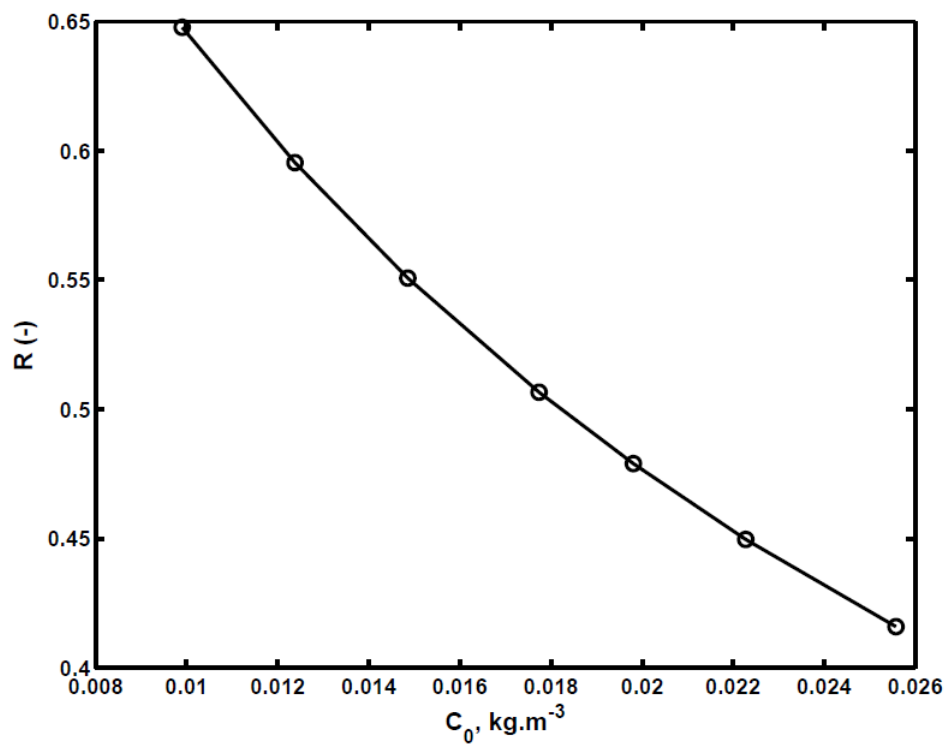
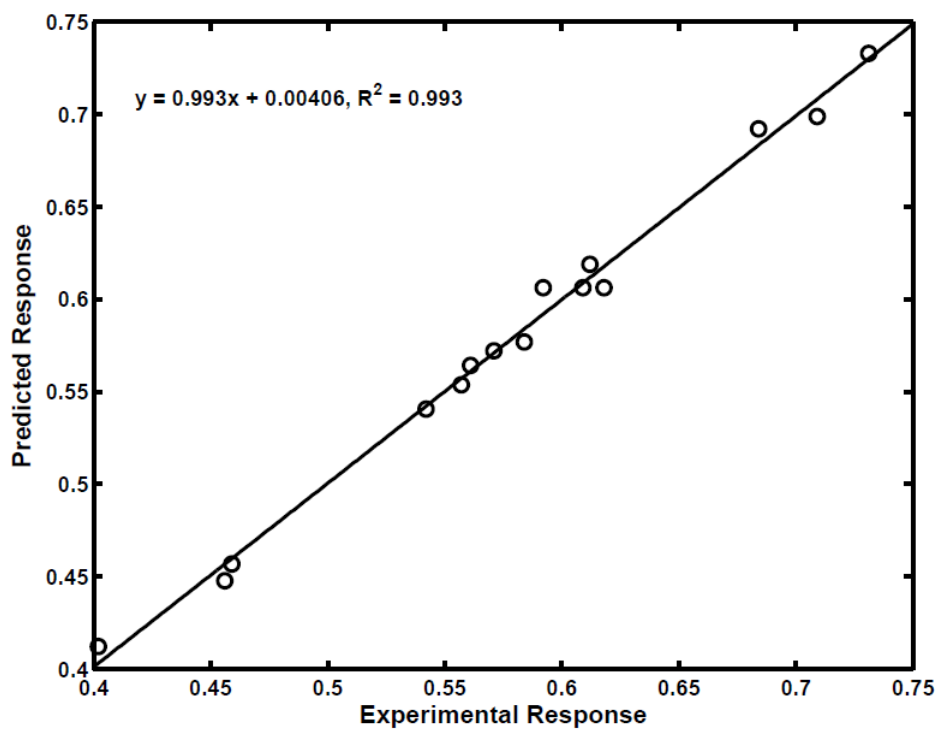
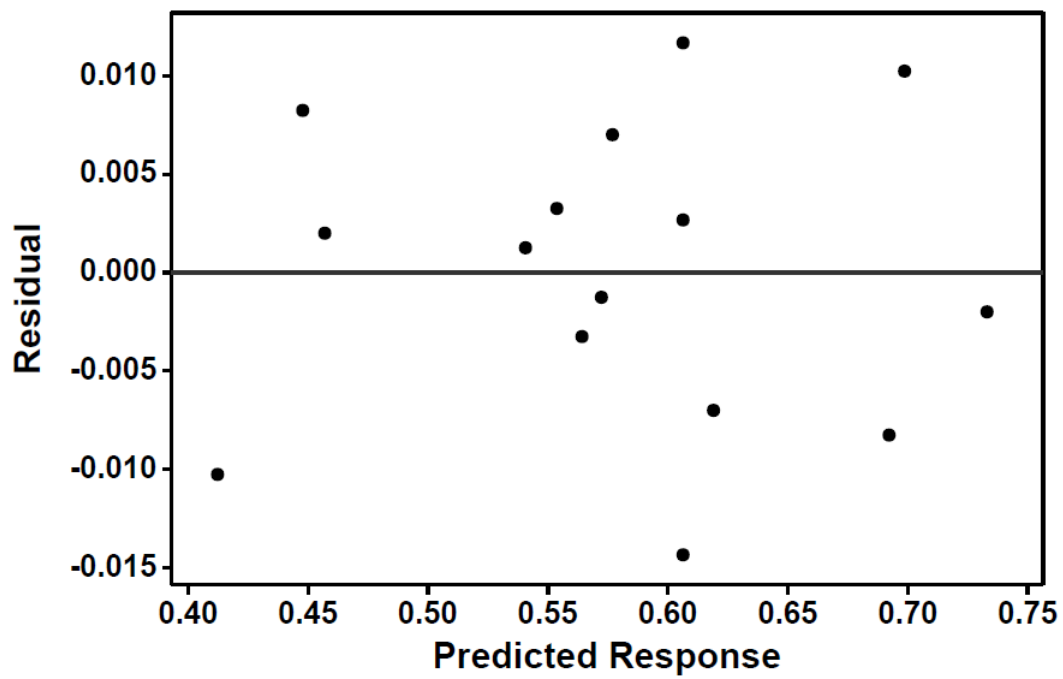


Fig. S2. Validity of equilibrium data (a) Langmuir isotherm plot for xylene on granular activated carbon. (b) Separation factor for different initial xylene concentrations.

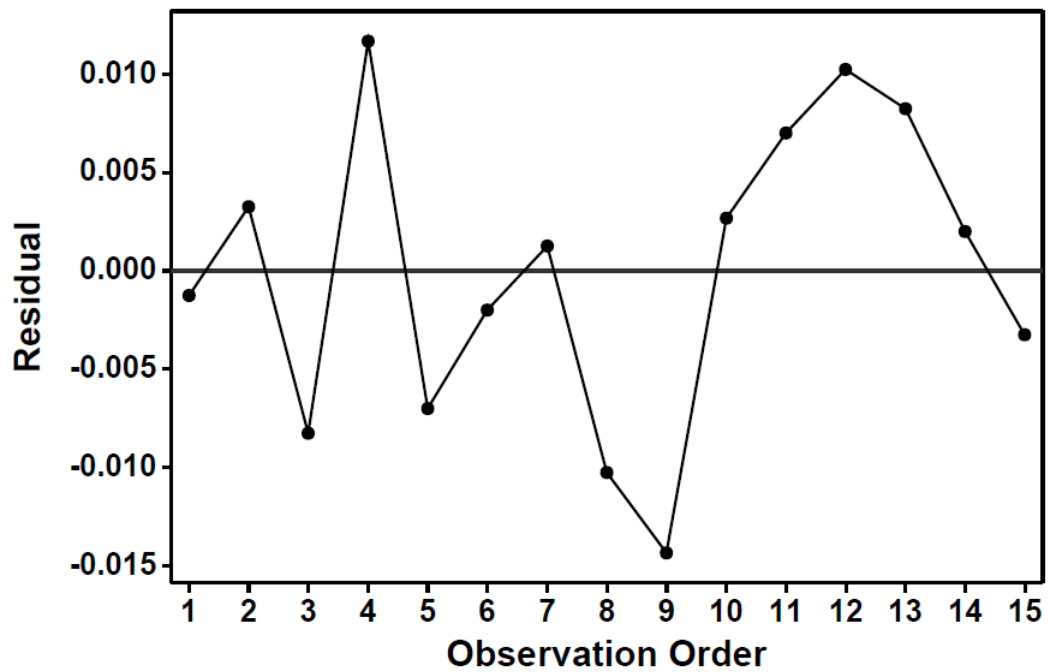
(a)



(b)



(c)



(d)

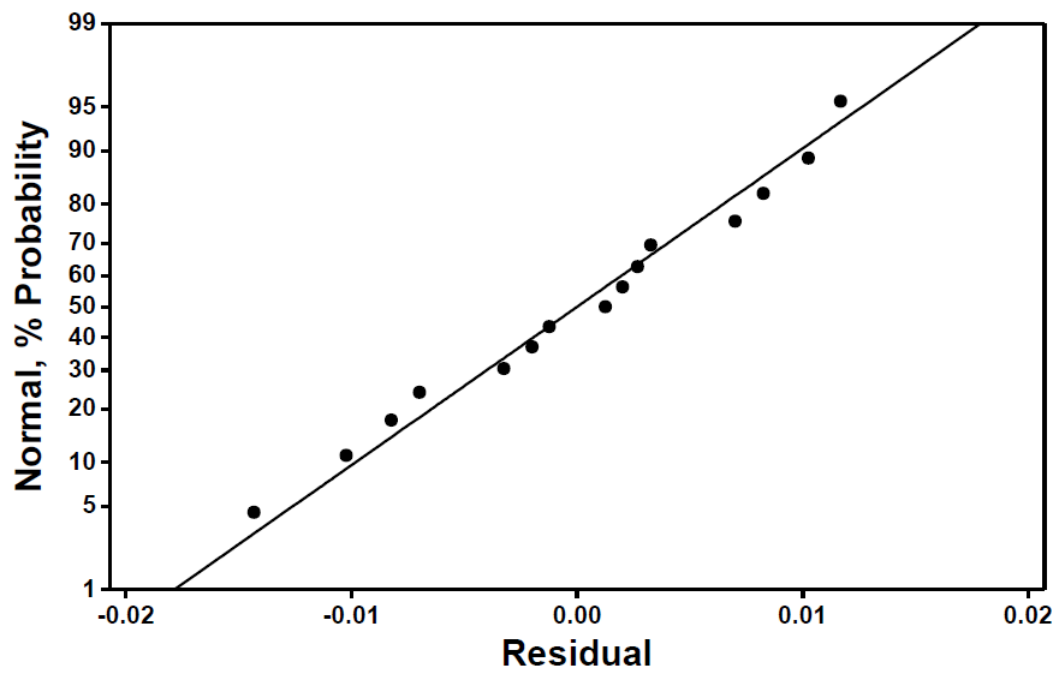


Fig. S3. Model validity (a) Linear plot showing comparison between experimental response and predicted response. (b) Plot of residual versus predicted response. (c) Plot of residual versus observation order. (d) Probability plot of residual for normality.

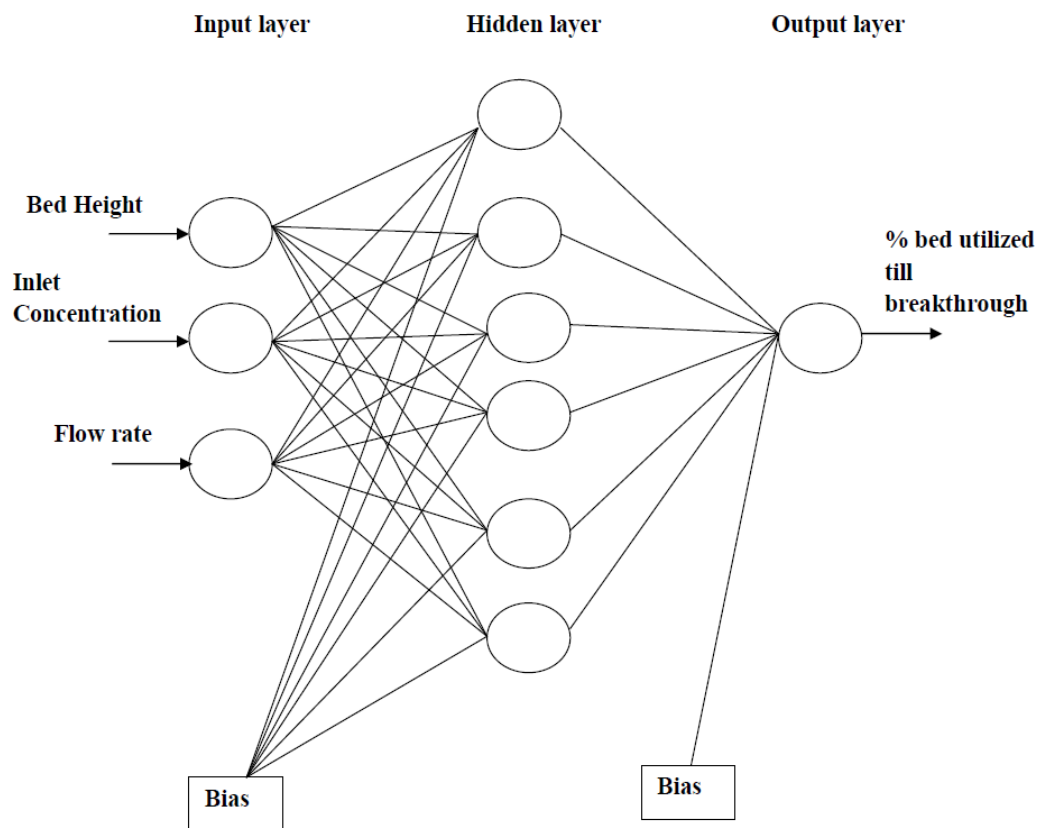


Fig. S4. Optimized ANN topology.

Table S1. Coded and Actual Levels of Three Variables

Symbol	Input Parameters	Coded levels of variables		
		-1	0	+1
X ₁	Bed height, m	0.015	0.02	0.025
X ₂	Inlet concentration, ppm	2400	4300	6200
X ₃	Flow rate, mL. min ⁻¹	25	50	75

Table S2. Experimental Design Matrix and Response Based on The Experimental Runs and Predicted Values Proposed by BBD Design

Run	<u>Independent Variables</u>			<u>Response</u>	
	Bed height, X ₁ (m)	Inlet concentration, X ₂ (ppm)	Flow rate, X ₃ (mL min ⁻¹)	Experimental	Predicted
1	0.025 (+1)	4300 (0)	75 (+1)	0.571	0.5722
2	0.02 (0)	6200 (+1)	75 (+1)	0.557	0.5537
3	0.02 (0)	6200 (+1)	25 (-1)	0.684	0.6922
4	0.02 (0)	4300 (0)	50 (0)	0.618	0.6063
5	0.025 (+1)	2400 (-1)	50 (0)	0.612	0.619
6	0.025 (+1)	6200 (+1)	50 (0)	0.731	0.733
7	0.015 (-1)	4300 (0)	25 (-1)	0.542	0.5407
8	0.015 (-1)	4300 (0)	75 (+1)	0.402	0.4122
9	0.02 (0)	4300 (0)	50 (0)	0.592	0.6063
10	0.02 (0)	4300 (0)	50 (0)	0.609	0.6063
11	0.015 (-1)	6200 (+1)	50 (0)	0.584	0.577
12	0.025 (+1)	4300 (0)	25 (-1)	0.709	0.6987
13	0.02 (0)	2400 (-1)	75 (+1)	0.456	0.4477
14	0.015 (-1)	2400 (-1)	50 (0)	0.459	0.457
15	0.02 (0)	2400 (-1)	25 (-1)	0.561	0.5642

Table S3. Results of ANOVA for Developed Model

Source	Response (Fraction of bed utilized till breakthrough)	
	F-value	p-value
Regression	78.78	0.000
Linear	223.09	0.000
Square	12.97	0.009
Interaction	0.26	0.849
Lack of fit	0.91	0.561

Table S4. Matrices of Weights, W1: Weights between Input and Hidden Layers; W2: Weights between Hidden and Output Layers

Neuron	Variable			<u>W1</u>	Neuron	<u>W2</u>
	(Bed height)	(Flow rate)	(Inlet concentration)	Bias		Variable
1	0.88813	-1.3932	0.50526	-3.1119	1	2.024
2	2.6277	0.077367	-0.032973	-0.99913	2	-0.053218
3	-0.55786	0.6329	-0.23999	0.21606	3	-0.6257
4	0.014914	1.841	-1.1939	0.48654	4	-0.028291
5	0.75431	-0.83913	0.31374	2.2668	5	2.1961
6	-0.68929	0.74865	1.2471	-2.2999	6	-0.11345
					Bias	-0.057915