Development of Sustainable Technology to Mitigate VOCs Pollution from Air Using a Continuous System Composed of Fe-ZSM-5 Coated on Polypropylene Tubes Coupled with UV Irradiation at the Pilot Scale

Abdul Aziz, Muhammad Sajjad, Suho Kim, Muhammad Saifuddin and Kwang Soo Kim

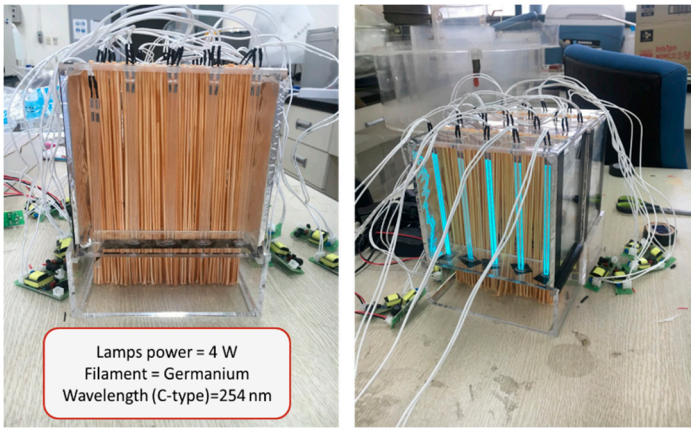


Figure S1. Reactor module, with and without lamps.

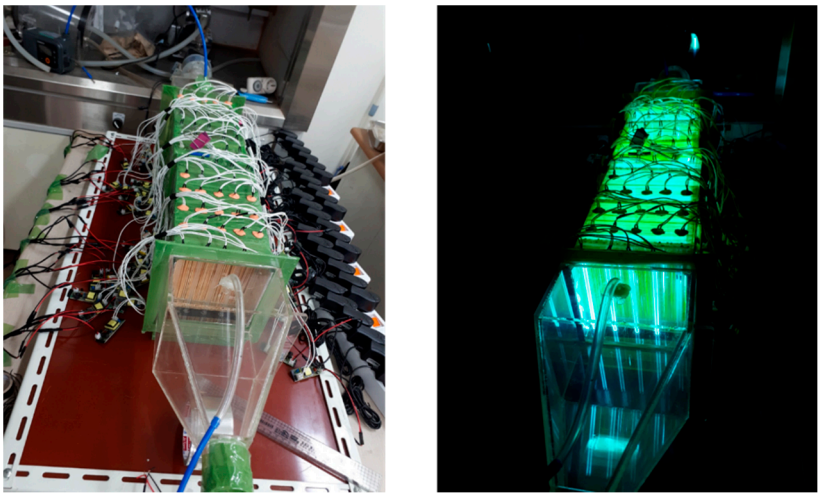


Figure S2. Complete semi pilot plant with lamps on and off respectively.

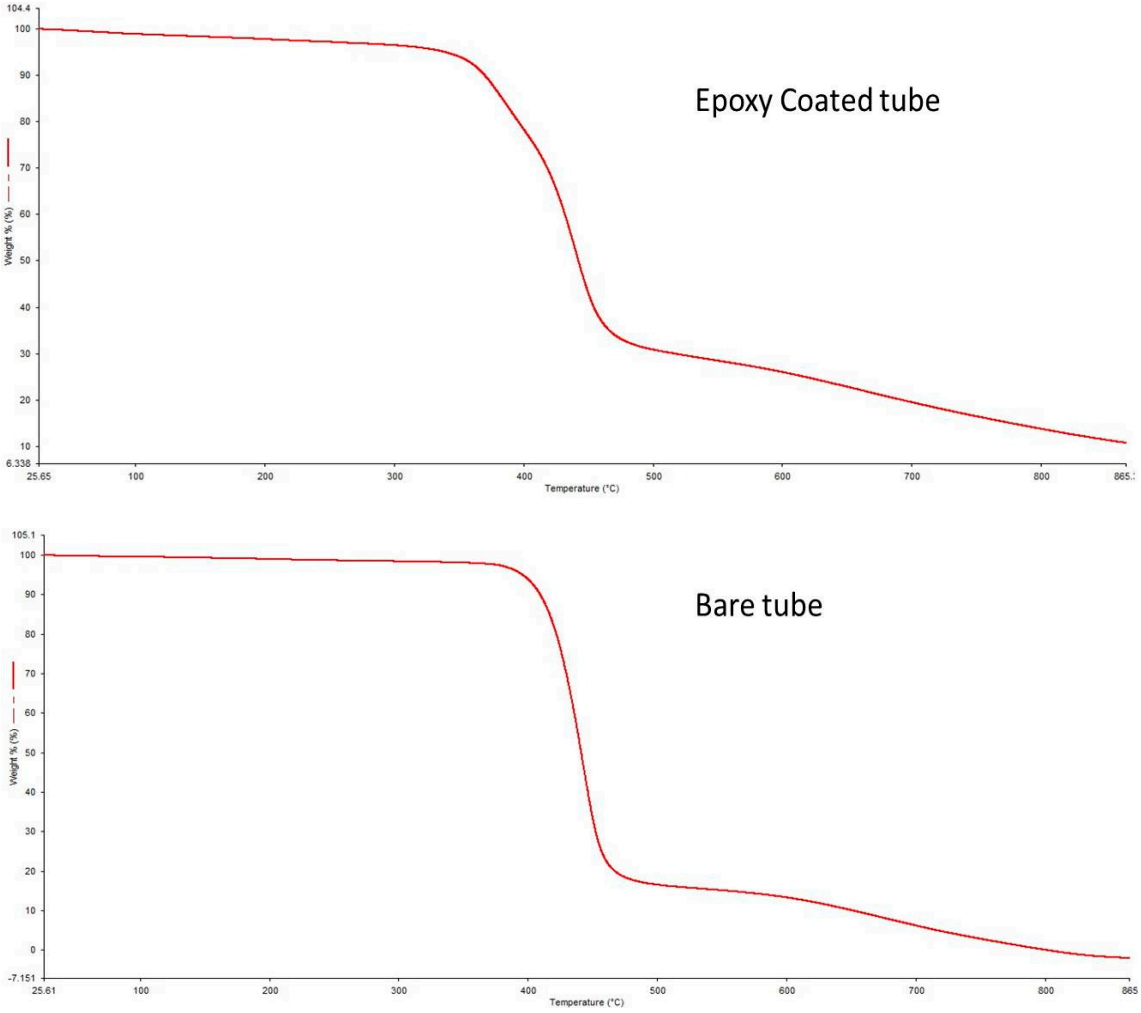


Figure S3. TGA results of bare and epoxy coated tubes.

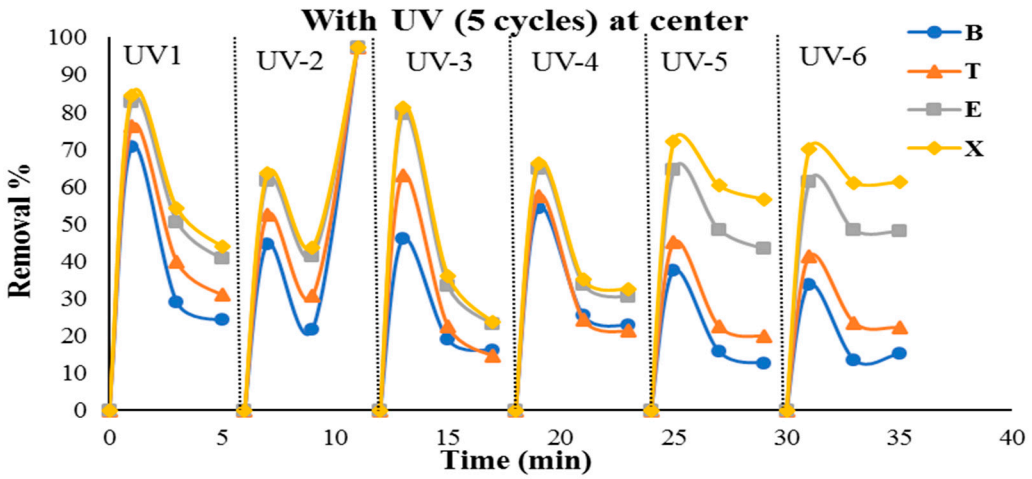


Figure S4. BTEX removal (%) at the center of semi pilot plant after being irradiated with UV. The experiment was run for 6 cycles. The BTEX concentration was 50 ppm, while the flow rate was 3.5 cm/s with a total running time of 60 minutes.

Table S1. Data at outlet (% Removal Efficiency).

Time	B	T	E	X
0	0	0	0	0
1	49.23	71.37	88.52	90.99
3	25.64	50.25	73.27	77.93
5	34.26	54.49	74.68	78.52
		Cycle-2		
0	0	0	0	0
1	45.63	65.50	81.68	83.90
3	48.45	64.12	79.74	81.94
5	25.79	43.96	65.51	69.57
		Cycle-3		
0	0	0	0	0
1	46.72	52.71	61.33	62.29
3	24.22	40.79	65.48	68.81
5	23.09	38.76	62.94	67.04
		Cycle-4		
0	0	0	0	0
1	45.94	61.69	78.69	80.15
3	30.61	45.79	68.63	71.31
5	28.72	40.84	64.35	67.37
		Cycle-5		
0	0	0	0	0
1	42.28	64.53	84.66	87.84
3	25.20	46.07	74.08	80.17
5	28.34	45.19	71.48	78.69
		Cycle-6		
0	0	0	0	0
1	37.51	58.11	80.89	84.98
3	23.07	43.25	70.57	76.82
5	21.51	37.94	67.89	76.22

Glove Box Test at lower Concentrations of VOCs: Closer Test to Real Scenario

This experiment was carried out to access the removal capability of the designed system for low concentrations of VOCs in a closed chamber. The dimensions of the box are 890 × 740 × 790 mm. The initial concentration of the box filled with VOCs is in the range of 3–4 ppm. We have installed just one module of the Fe-ZSM-5 coated tubes, having a total of 112 tubes. A small fan was used to circulate the contaminated air from the module. The different concentrations were monitored at the defined time intervals, with the sample taken from the top left corner of the box with the help of an air sampling pump and analyzed according to the procedure as already discussed.

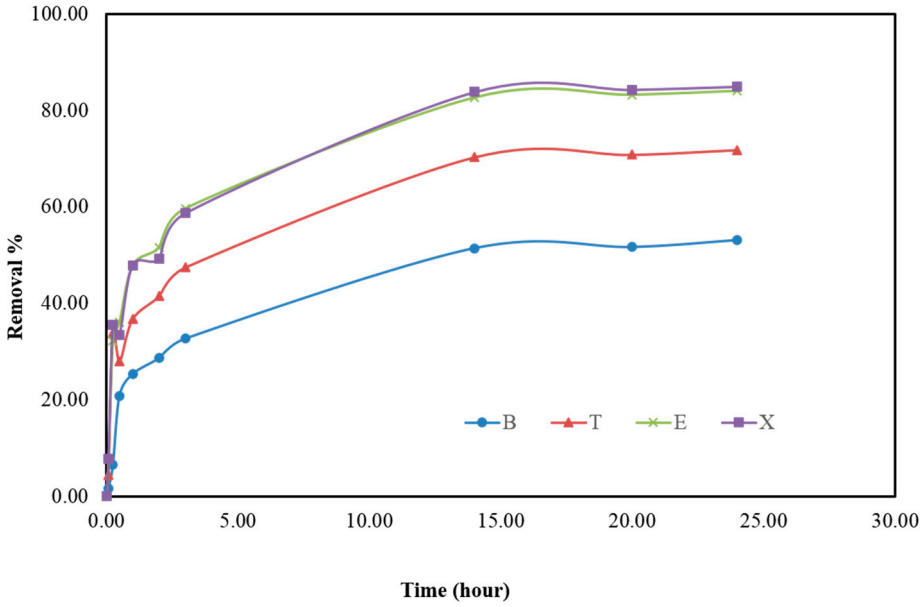


Figure S5. Removal (%) of BTEX with respect to time for one module installed in the closed chamber.