Table S1. Box Behnken Design Matrix with Input Factors and Levels

Factors		**Levels**		**Reference**
Factors (Coded)	Low (-1)	Medium (0)	High (1)	
A: Catalyst concentration (g/L)	2	5	8	[1-3]
B: Run time (min)	30	60	90	[2-4]
C: Air flow rate (L/min)	0.768	1.11	1.48	[5]

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Table S2. The Box-Behnken Experimental Design Outputs

		Factors			Degradation	
Std	**Run**	**A: Catalyst concentration (g/L)**	**B: Run time (min)**	**C: Air flow rate (L/min)**	**Oil (%)**	**Phenol (%)**
8	1	8	60	1.480	73.40	53.33
10	2	5	90	0.768	32.23	33.33
15	3	5	60	1.110	85.71	40.00
9	4	5	30	0.768	49.83	36.67
2	5	8	30	1.110	85.05	66.67
6	6	8	60	0.768	61.79	20.00
5	7	2	60	0.768	52.82	33.33
14	8	5	60	1.110	85.71	40.00
11	9	5	30	1.480	82.39	70.00
4	10	8	90	1.110	68.44	33.33
13	11	5	60	1.110	85.71	40.00
12	12	5	90	1.480	79.12	46.67
16	13	5	60	1.110	85.71	40.00
17	14	5	60	1.110	85.71	40.00
3	15	2	90	1.110	77.08	33.33
1	16	2	30	1.110	83.39	40.00
7	17	2	60	1.480	66.33	30.00

Table S3. ANOVA of Oil (SOG) Degradation Model

Source	Sum of squares	df	Mean square	F-value	*p*-value	
Oil (SOG)-model	3,564.65	9	396.07	6.36	0.0017	significant
A: Catalyst concentration	10.12	1	10.12	0.1626	0.0088	
B: Run time	233.37	1	233.37	3.75	0.0941	
C: Air flow rate L/min	1,366.86	1	1,366.86	21.95	0.0522	
AB	26.52	1	26.52	0.426	0.0048	
AC	0.5233	1	0.5233	0.0084	0.0095	
BC	51.59	1	51.59	0.8285	0.033	
A^2	21.58	1	21.58	0.3465	0.0046	
B^2	103.43	1	103.43	1.66	0.0514	
C^2	1,746.59	1	1,746.59	28.05	0.0011	
Residual	435.86	7	62.27			
Lack of fit	435.86	3	145.29	1.86	0.8768	Not significant
Pure error	89.24	4	122.31			
Cor total	4,000.51	16				
Std. Dev.	7.89			R-Squared	0.9766	
Mean	72.97			Adj R-Squared	0.9613	
C.V. %	10.81			Pred R-Squared	0.8846	
PRESS	1,180.078			Adeq Precision	8.0833	
-2 log likelihood	100.9804			BIC	117.9797	

Table S4. ANOVA of Phenol Degradation Model

Source	Sum of squares	df	Mean square	F-value	*p*-value	
Phenol-model	2,405.55	9	267.28	18.59	0.0004	significant
A: Catalyst concentration	181.29	1	181.29	12.61	0.0093	
B: Run time	568.34	1	568.34	39.53	0.0004	
C: Air flow rate L/min	734.79	1	734.79	51.11	0.0002	
AB	177.82	1	177.82	12.37	0.0098	
AC	329.75	1	329.75	22.94	0.002	
BC	97.22	1	97.22	6.76	0.0354	
A^2	88.51	1	88.51	6.16	0.0421	
B^2	263.94	1	263.94	18.36	0.0036	
C^2	11.14	1	11.14	0.7746	0.408	
Residual	100.63	7	14.38			
Lack of fit	100.63	3	33.54	0.46	0.8478	Not significant
Pure error	889.24	4	222.31			
Cor total	2,506.18	16				
Std. Dev.	3.79		R-Squared		0.9798	
Mean	40.98		Adj R-Squared		0.9613	
C.V. %	9.25		Pred R-Squared		0.8286	
PRESS	3,073.17		Adeq Precision		16.9682	
-2 log likelihood	127.56		BIC		138.9	

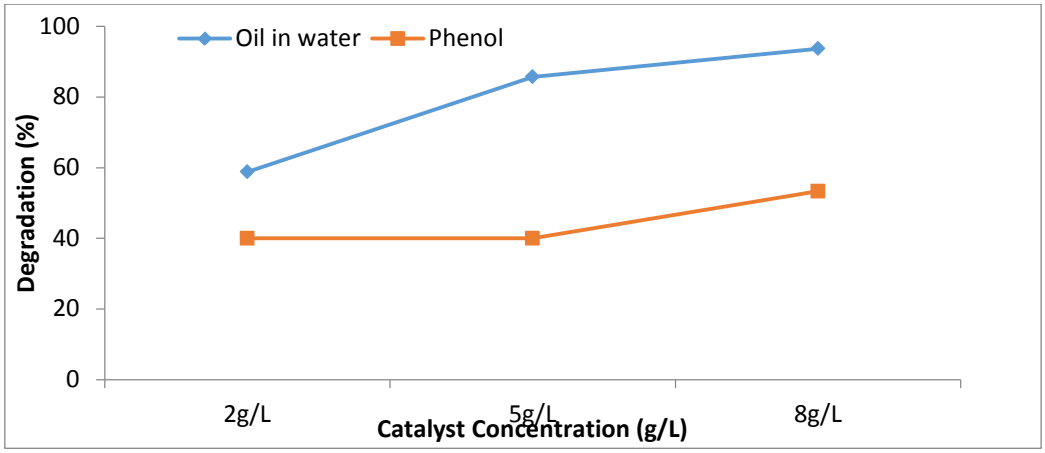

Fig. S1. The effect of catalyst concentration on degradation (run time and air flow rate at 60 min and 1.11 L/min, respectively).

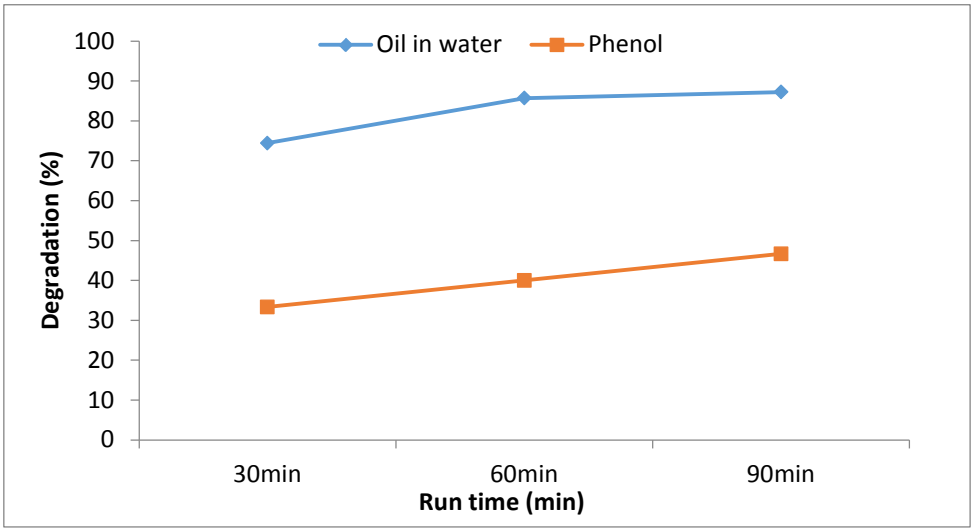

Fig. S2. The effect of run time on degradation (catalyst concentration and airflow rate at 5 g/L and 1.11 L/min, respectively).

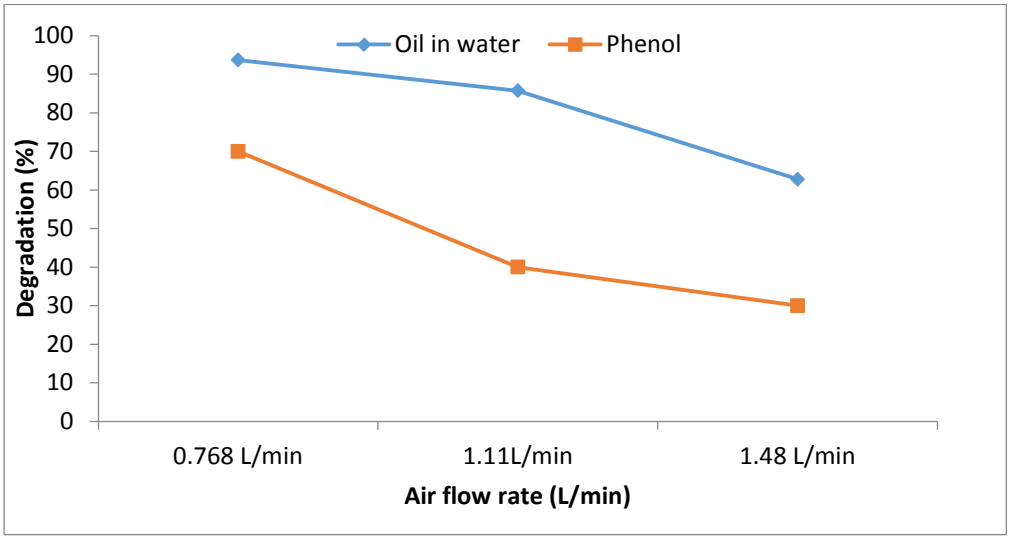

Fig. S3. The effect of airflow rate on degradation (catalyst concentration and run time at 5 g/L and 60 min, respectively).

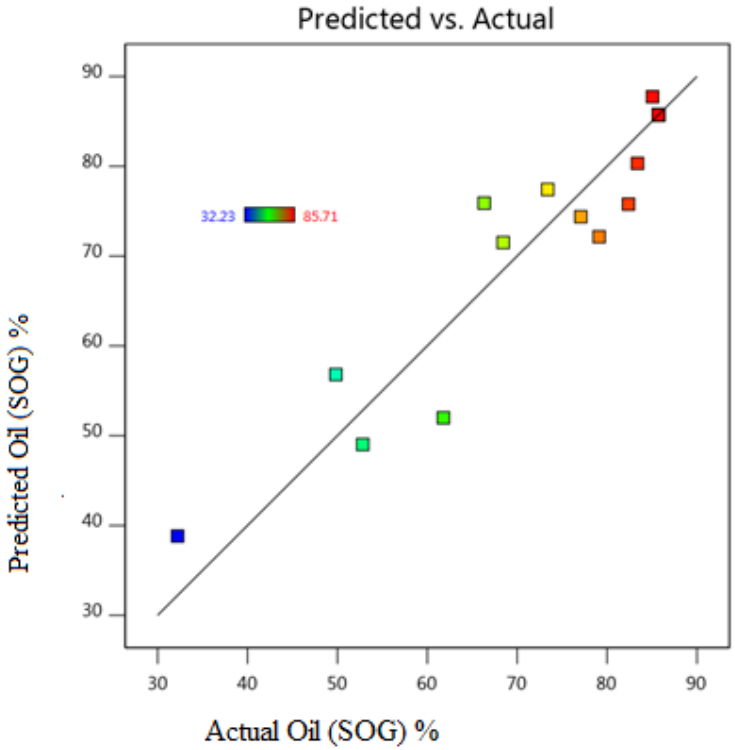

Fig. S4. Predicted vs. actual data for the degradation of oil (R^2 = 0.9766)

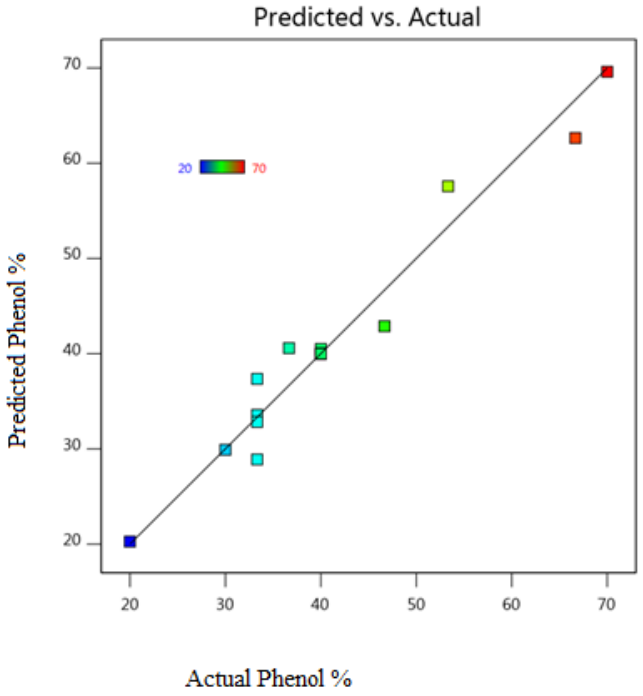

Fig. S5. Predicted vs. actual data for the degradation of phenol (R^2 = 0.9798)

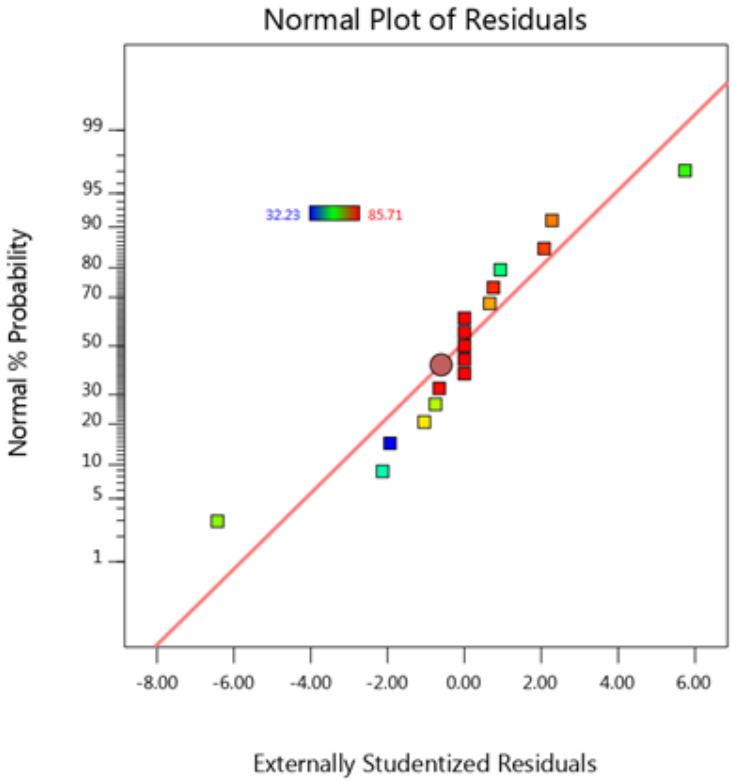

Fig. S6. Normal plot of residuals for the degradation of phenol.

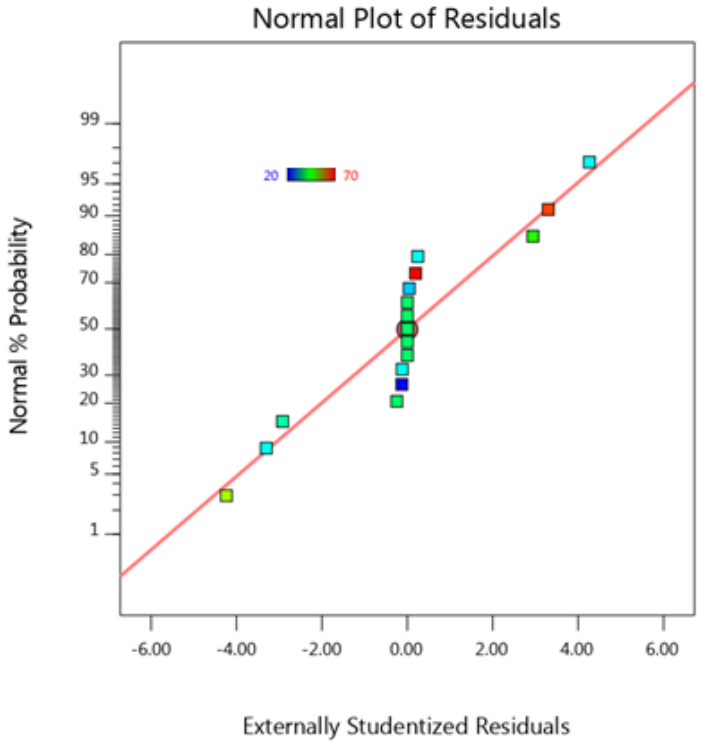

Fig. S7. Normal plot of residuals for the degradation of oil.

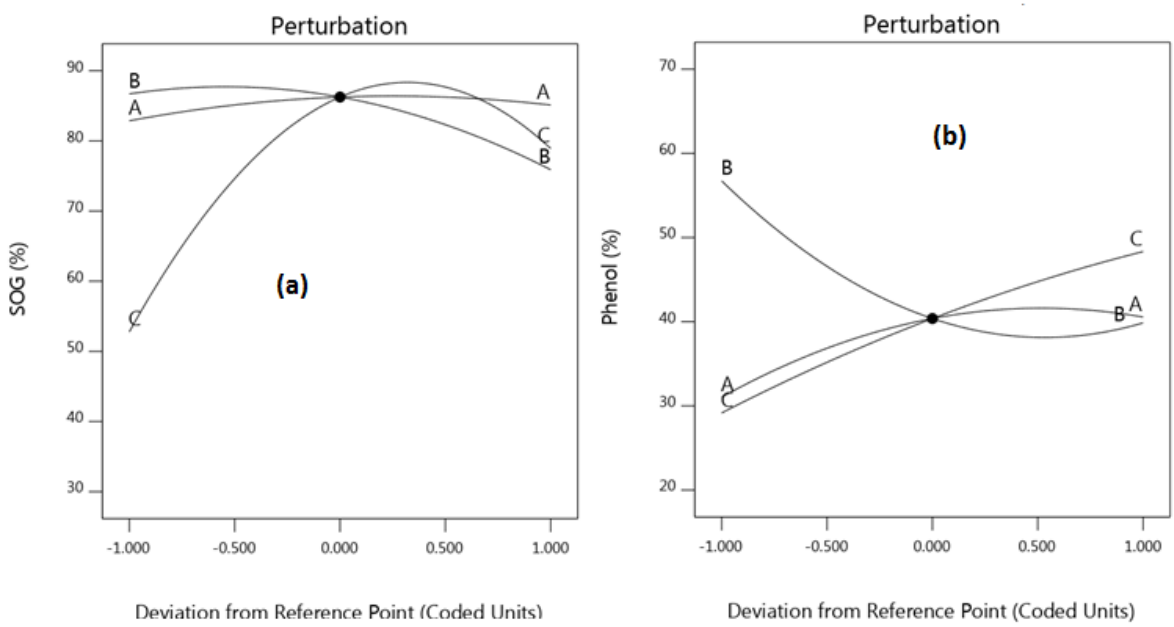

Fig. S8. Perturbation representation of the interactions of the model terms (a) oil (SOG) (b) phenol models.

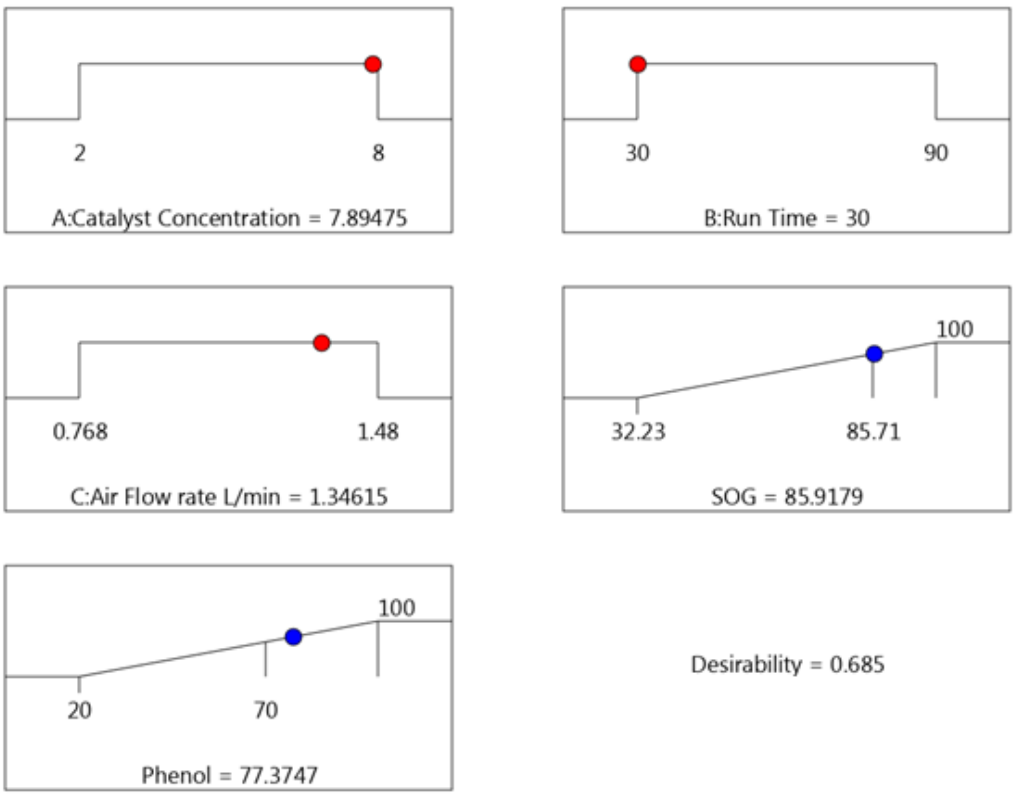

Fig. S9. Ramp plot of the obtained optimum condition for the desirability goal for degradation.