Supplementary Material for:

Optimization of oxidative leaching for vanadium extraction from low-grade stone coal using response surface methodology

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Table S-1. ANOVA for RSM model for leaching of V from stone coal.

Model term	Sum of squares	Df	Mean value	*F*-value	*P*-value	significance
Model	12006.81	8	1500.85	198.91	<0.0001	significant
A	3008.32	1	3008.32	398.69	<0.0001	
B	6115.23	1	6115.23	810.45	<0.0001	
C	2248.47	1	2248.27	297.99	<0.0001	
D	134.9	1	134.9	17.88	0.0004	
AB	293.27	1	293.27	38.87	<0.0001	
BC	86.96	1	86.96	11.52	0.0027	
A^2	53.35	1	53.35	7.07	0.0147	
C^2	79.28	1	79.28	10.51	0.0039	
Residual	158.46	21	7.55			
Lack of fit	145.95	16	9.12	3.65	0.0794	not significant
Pure error	12.51	5	2.5			
Cor total	12165.26	29				

$R^2 = 0.9611$ $R^2_{adj} = 0.9820$

Table S-2. CCD matrix and response values of four variables.

Run	*A*	*B*	*C*	*D*	H_2SO_4	Temperature	Time	MnO_2	Leaching efficiency (%)	
					%	℃	h	%	V	Fe
1	−1	−1	−1	−1	16	70	4	1	16.1	59.7
2	2	0	0	0	40	80	6	2	71.3	62.9
3	−1	−1	1	−1	16	70	8	1	27.3	60.9
4	−1	1	1	−1	16	90	8	1	57.1	63.4
5	−1	−1	−1	1	16	70	4	3	17.9	63.8
6	1	−1	1	1	32	70	8	3	44.8	64
7	0	0	0	0	24	80	6	2	50.9	61.2
8	1	1	−1	1	32	90	4	3	70.0	63.9
9	1	−1	1	−1	32	70	8	1	40.8	62.1
10	0	0	0	0	24	80	6	2	51.4	62.4
11	−1	−1	1	1	16	70	8	3	30.9	62
12	1	1	−1	−1	32	90	4	1	62.1	62.9
13	0	0	0	0	24	80	6	2	48.9	58.7
14	1	−1	−1	1	32	70	4	3	31.4	62.3
15	0	0	0	0	24	80	6	2	51.7	62.8
16	−2	0	0	0	8	80	6	2	22	62.6
17	0	0	2	0	24	80	10	2	68	64.1
18	0	−2	0	0	24	60	6	2	22.9	52.1
19	0	2	0	0	24	100	6	2	84.3	64
20	1	1	1	−1	32	90	8	1	86	63.4
21	−1	1	−1	−1	16	90	4	1	33.6	62.6
22	0	0	0	0	24	80	6	2	48.2	59.7
23	0	0	0	2	24	80	6	4	54.7	62.8
24	1	−1	−1	−1	32	70	4	1	26	61.8
25	0	0	0	−2	24	80	6	0	42.6	63.6

26	0	0	−2	0	24	80	2	2	22.9	62.2
27	1	1	1	1	32	90	8	3	89.3	64.7
28	−1	1	1	1	16	90	8	3	60.2	63.8
29	−1	1	−1	1	16	90	4	3	37.2	62
30	0	0	0	0	24	80	6	2	52	63.2