

Support Information

1) WET AIR OXIDATION OF ACETOVANILLONE: EFFECT OF THE REACTION TEMPERATURE

Table 1: Performances Comparison of the WAO of AV in the Catalytic and Blank Test; Acetovanillone Conversion, Vanillin Yield and Vanillin Selectivity. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent. 10 Bar of Air pressure. 1 h Reaction Time at 150°C

Catalyst	Blank				LaFeO ₃			
	130	150	170	190	130	150	170	190
Temperature (°C)	130	150	170	190	130	150	170	190
AV conversion (%)	32.2	55.0	70.7	74.9	35.5	57.6	73.6	77.4
vanillin yield (%)	3.4	7.5	16.2	22.2	5.2	9.1	14.0	17.0
vanillin selectivity (%)	10.6	13.6	23.0	29.6	14.6	15.7	19.0	22.0

Table 2: Performances Comparison of the WAO of AV in the Catalytic and Blank Test; Effect on Carbon Content Distribution (%_c) Among Acetovanillone, Vanillin and Carboxylic Acids, while the C Balance Represents the Sum of these Contributions. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 10 Bar of Air Pressure, 1 h reaction Time at 150°C

Catalyst	Blank				LaFeO ₃			
	130	150	170	190	130	150	170	190
Temperature (°C)	130	150	170	190	130	150	170	190
vanillin (% _c)	3.0	6.6	14.4	19.7	4.6	8.0	12.4	15.1
carboxylic acids (% _c)	18.8	24.8	14.2	4.2	20.5	25.4	14.9	7.0
acetovanillone (% _c)	67.8	45.0	29.3	25.1	64.5	42.4	26.4	22.6
C balance (% _c)	89.6	76.4	58.0	49.0	89.6	75.9	53.8	44.7

Table 3: Products Distribution in the Aqueous Phase after WAO in the Presence of LaFeO₃ as Catalyst and in Analogous Blank Test. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time and 10 Bar Pressure

Catalyst	Blank (Abundance %)				LaFeO ₃ (Abundance %)			
	130	150	170	190	130	150	170	190
Temperature (°C)	130	150	170	190	130	150	170	190
levulinic acid	86.4	82.9	62.7	24.4	90.3	85.9	65.8	57.1
lactic acid	5.3	6.8	13	23.2	3.9	6.6	11.2	11.6
oxalic acid	4.8	5.5	11.6	26.1	4.3	5.6	10.9	17.3
malonic acid	1.7	2	2.8	5.7	1.5	1.9	2.7	2.2
glycolic acid	1.8	2.8	9.8	20.5	0	0	9.4	11.9

2) WET AIR OXIDATION OF ACETOVANILLONE: EFFECT OF THE OXIDANT PRESSURE

Table 4: Effect of Initial Air Pressure on Acetovanillone Conversion, Vanillin Yield and Vanillin Selectivity. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time at 150°C

Temperature (°C)	150			
	5	10	20	30
AV conversion (%)	30.8	57.6	84.2	95.0
vanillin yield (%)	4.1	9.1	7.1	3.1
vanillin selectivity (%)	13.3	15.7	8.4	3.3

Table 5: Effect of Initial Air Pressure on carbon Content Distribution (%c) Among Acetovanillone, Vanillin and Carboxylic Acids, while the C Balance Represents the Sum of these Contributions. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time at 150°C

Temperature (°C)	150			
Air Pressure (bar)	5	10	20	30
vanillin (%c)	3.6	8.0	6.3	2.8
carboxylic acids (%c)	3.8	25.4	32.3	34.9
acevanillone (%c)	69.2	42.4	15.8	5.0
C balance (%c)	76.6	75.9	54.5	42.8

Table 6: Products Distribution in the Aqueous Phase after CWAO with Variable Initial Air Pressure. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time at 150°C

Temperature (°C)	150			
Air Pressure (bar)	5	10	20	30
levulinic acid	0.0	85.9	83.0	79.6
lactic acid	28.2	6.6	5.3	7.0
oxalic acid	71.8	5.6	5.6	5.2
malonic acid	0.0	1.9	2.6	4.3
glycolic acid	0.0	0.0	3.6	3.9

3) WET AIR OXIDATION OF ACETOVANILLONE: EFFECT OF THE VARIATION OF TEMPERATURE AND PRESSURE**Table 7: Effect of the Reaction Temperature on Acetovanillone Conversion, Vanillin Yield and Vanillin Selectivity. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time. The Experiments were Carried Out at 10 Bar and 20 Bar of Air Pressure**

Air Pressure (bar)	10				20			
	130	150	170	190	130	150	170	190
AV conversion (%)	35.5	57.6	73.6	77.4	58.2	84.2	98.1	99.9
vanillin yield (%)	5.2	9.1	14.0	17.0	2.8	7.1	4.1	1.7
vanillin selectivity (%)	14.6	15.7	19.0	22.0	4.8	8.4	4.1	1.7

Table 8: Effect of the Reaction Temperature on Carbon Content Distribution (%c) among Acetovanillone, Vanillin and Carboxylic Acids, while the C Balance Represents the Sum of these Contributions. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time. The Experiments were Carried Out at 10 Bar and 20 Bar of Air Pressure

Air Pressure	10 bar				20 bar			
	130	150	170	190	130	150	170	190
vanillin (%c)	4.6	8.0	12.4	15.1	2.5	6.3	3.6	1.5
carboxylic acids (%c)	20.5	25.4	14.9	7.0	35.8	32.3	24.3	16.8
acevanillone (%c)	64.5	42.4	26.4	22.6	41.8	15.8	1.9	0.1
C balance (%c)	89.6	75.9	53.8	44.7	80.2	54.5	29.8	18.4

Table 9: Effect of the Reaction Temperature on the Distribution of the Generated Carboxylic Acids for Two Sets of Test Carried Out at 10 and 20 Bar. Reaction Conditions: 3.5 g/l of AV, 0.4 g of LaFeO₃ as Catalyst, 25 ml of NaOH_{aq} 2M as Solvent, 1 h Reaction Time

Air Pressure	10 bar				20 bar			
Temperature (°C)	130	150	170	190	130	150	170	190
levulinic acid	90.3	85.9	65.8	57.1	79.4	83.0	71.2	62.2
lactic acid	3.9	6.6	11.2	11.6	10.3	5.3	12.4	15.4
oxalic acid	4.3	5.6	10.9	17.3	7.8	5.6	6.6	8.5
malonic acid	1.5	1.9	2.7	2.2	2.6	2.6	3.7	5.2
glycolic acid	0	0	9.4	11.9	0.0	3.6	6.1	8.7