Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Decorated CrO_x on Fe/TiO_2 with tunable and stable Oxygen Vacancy for Selective Oxidation of Glycerol to Lactic Acid

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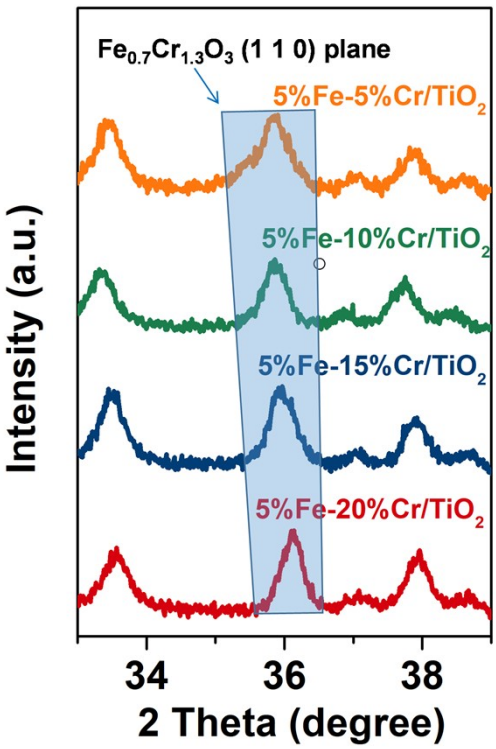

Figure S1. Zoomed area ranging from 33° to 39° in Figure 2a.

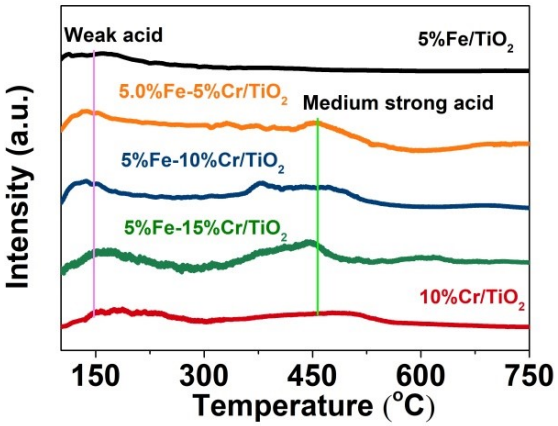

Figure S2. NH_3-TPD for various Fe-Cr/TiO_2 catalysts.

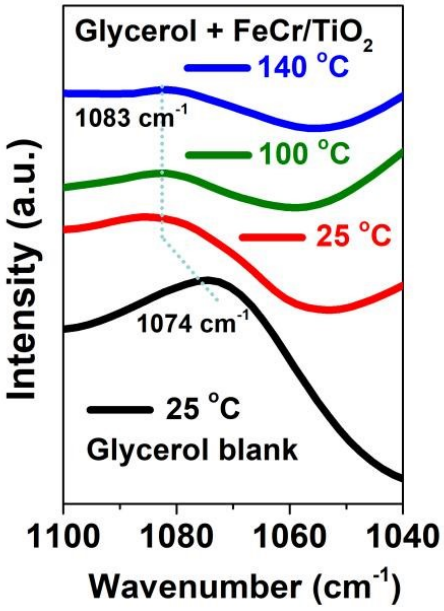

Figure S3. Zoomed area ranging from 1110 cm^{-1} to 1040 cm^{-1} in Figure 5.

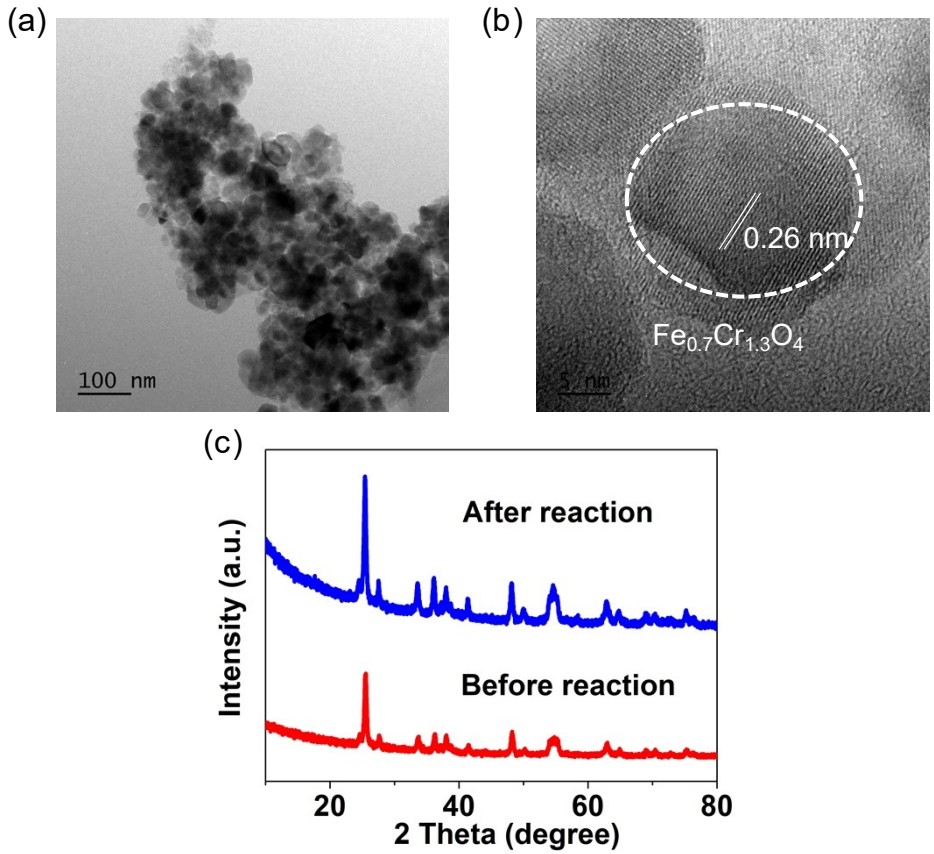

Figure S4. Characterization of the used 5%Fe-10%Cr/TiO_2 catalyst. (a) TEM image, (b) HRTEM image and (c) XRD pattern.

Table S1. Effect of catalysts on one-pot conversion of glycerol into LA.

Catalyst	Conv. (%)	Selectivity (C%)					Carbon balance (C%)
		Lactic acid	Glyceraldehyde	Acetic acid	Formic acid	Others	
TiO_2	72.1	15.1	6.5	3.1	3.3	11.5	39.5
Fe/TiO_2	55.3	40.7	5.5	1.3	3.2	14.3	65.0
Co/TiO_2	45.5	35.1	13.7	4.2	3.5	9.7	66.2
Ni/TiO_2	55.1	23.3	37.2	5.1	3.0	8.4	77.0
Cu/TiO_2	48.4	29.4	19.0	2.5	2.2	13.6	66.7
Zn/TiO_2	36.7	34.4	9.0	3.7	2.9	7.3	57.3
Ga/TiO_2	46,4	30.7	11.5	4.5	3.0	9.5	59.2

Reaction condition：1.0 g glycerol，0.2 g catalyst, 0.5 g NaOH, 50 ML H_2O, 140 ^oC, 1 Mpa initial pressure of O_2, 6 h.

Table S2. Acidity of 5%Fe-x%Cr/TiO_2 catalysts calculated from NH_3-TPD.

Catalysts	Total acid amount (μmol/g) [a]
5%Fe/TiO_2	3.0
5%Fe-5%Cr/TiO_2	8.1
5%Fe-10%Cr/TiO_2	14.6
5%Fe-15%Cr/TiO_2	16.2
10%Cr/TiO_2	12.8

[a] measured by NH_3-TPD.

Table S3. Acidity of 5%Fe-10%Cr/TiO_2 catalysts reduced at different temperatures calculated from pyridine-adsorbed FT-IR.

Reduction temperature (°C)	Lewis acid amount (μmol/g) [a]	Brönsted acid amount (μmol/g) [a]
300	13.9	2.5
450	11.2	1.1
600	6.9	0.5
750	1.5	0.1

[a] measured by Py-FTIR.

Table S4. Effect of temperature on one-pot conversion of glycerol into LA over 5%Fe-10%Cr/TiO_2 catalysts..

Temperature (°C)	Conv. (%)	Selectivity (C%)					Carbon balance (C%)
		Lactic acid	Glyceraldehyde	Acetic acid	Formic acid	Others	
120	10.4	27.3	10.0	22.5	7.1	11.2	78.1
140	60.5	60.4	6.7	2.3	2.9	6.5	78.8
160	97.4	7.1	1.2	8.7	6.6	9.7	33.3
180	99.2	7.8	0.6	10.4	17.4	8.4	44.6

Reaction condition：1.0 g glycerol，0.2 g catalyst, 0.5 g NaOH, 50 ML H_2O, 1 Mpa initial pressure of O_2, 6 h.