Supplementary Information (SI) for New Journal of Chemistry.

Supporting Information：

Co_3O_4-CuO bimetallic catalyst activated PMS to degrade LEV in wastewater: The existence of dual degradation mechanisms

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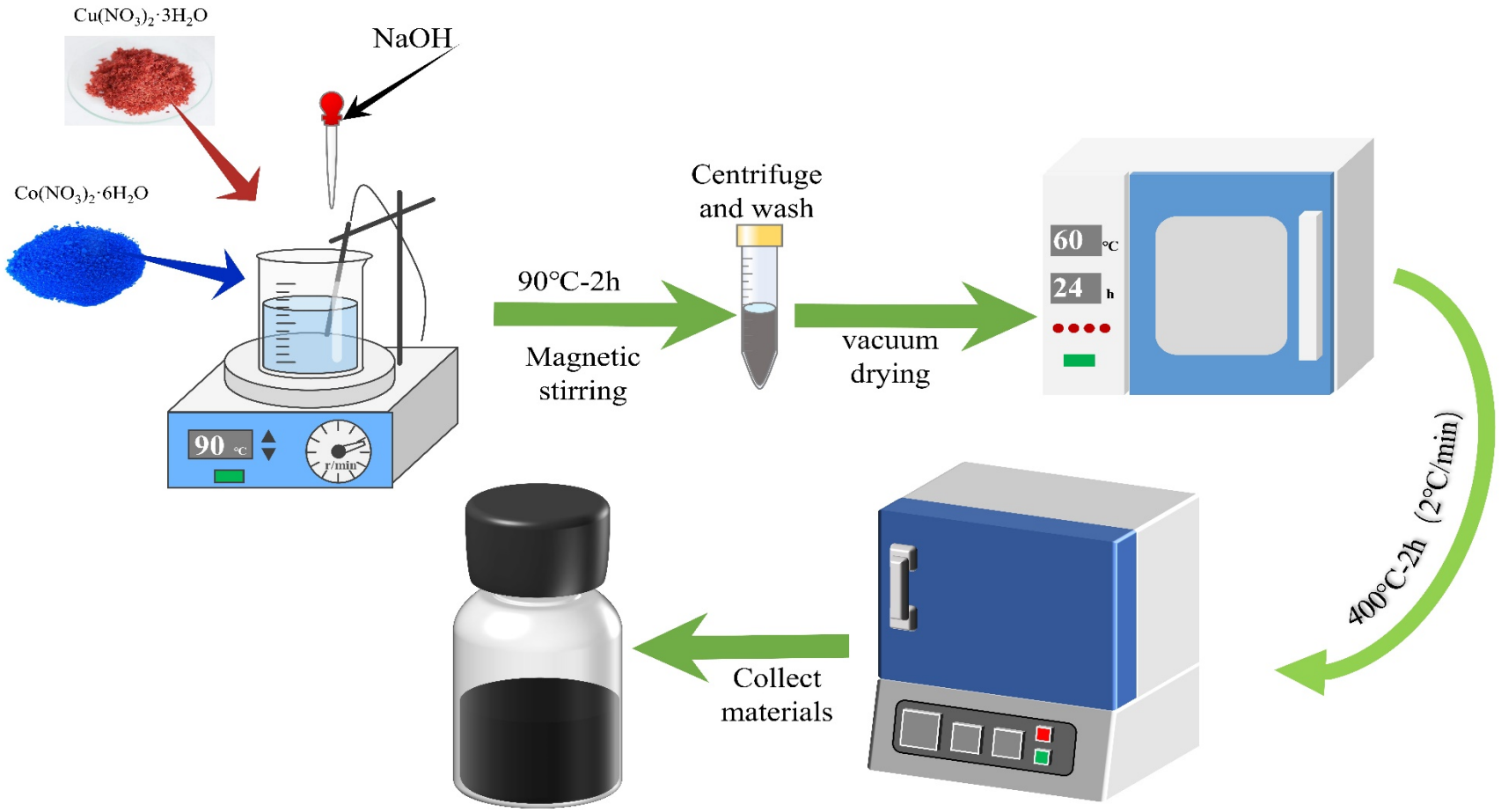


Fig S1 The schematic illustration of synthesis CCO.

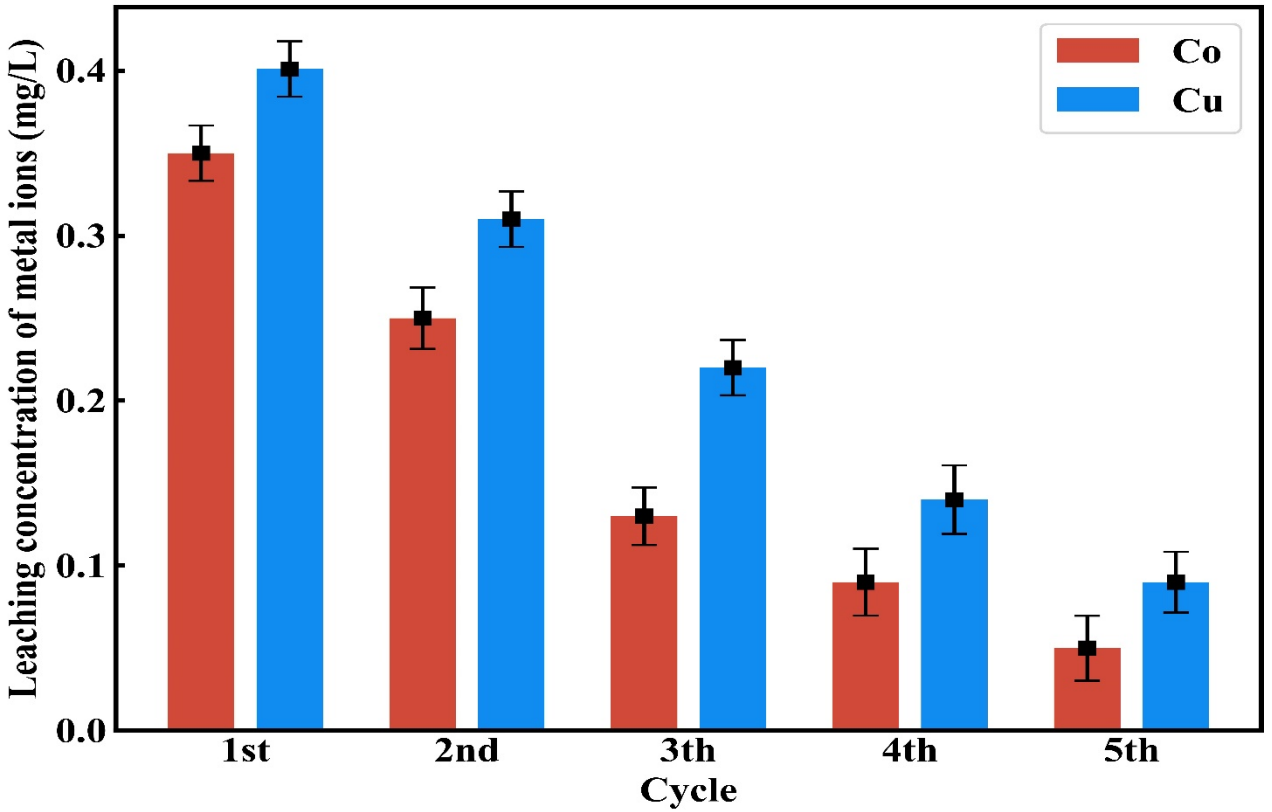


Fig.S2 Co and Cu leaching of CCO/PMS/LEV. Conditions: [LEV] = 20 mg/L, [PMS] = 0.8 g/L, [Catalyst] = 0.2 g/L, T = 298 K and initial solution pH 7.

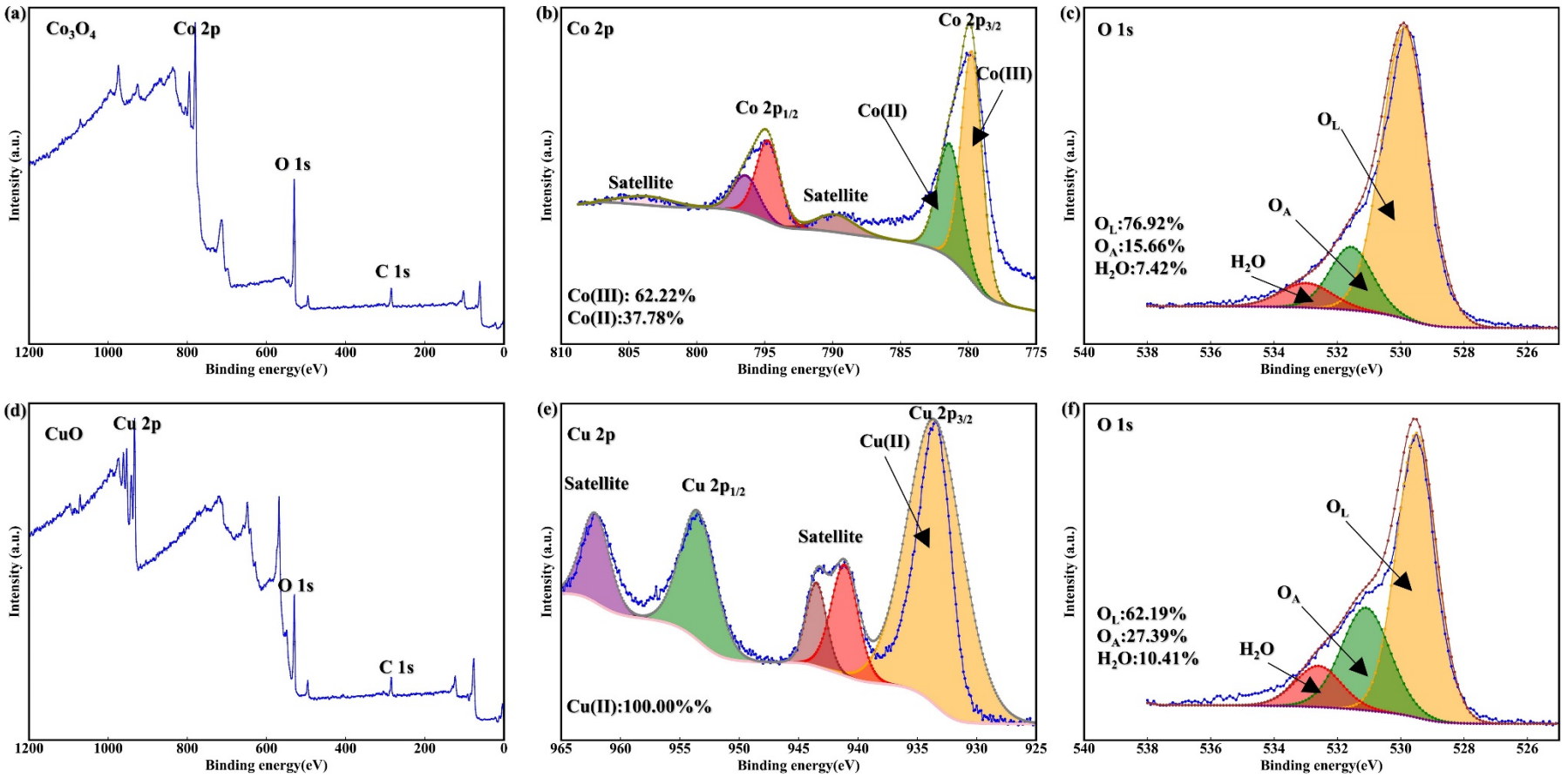


Fig.S3 (a) Full-range scan of the samples,(b) Co 2p, (c) O 1s of Co_3O_4 and (d) Full-range scan of the samples,(e) Cu 2p, (f) O 1s of CuO

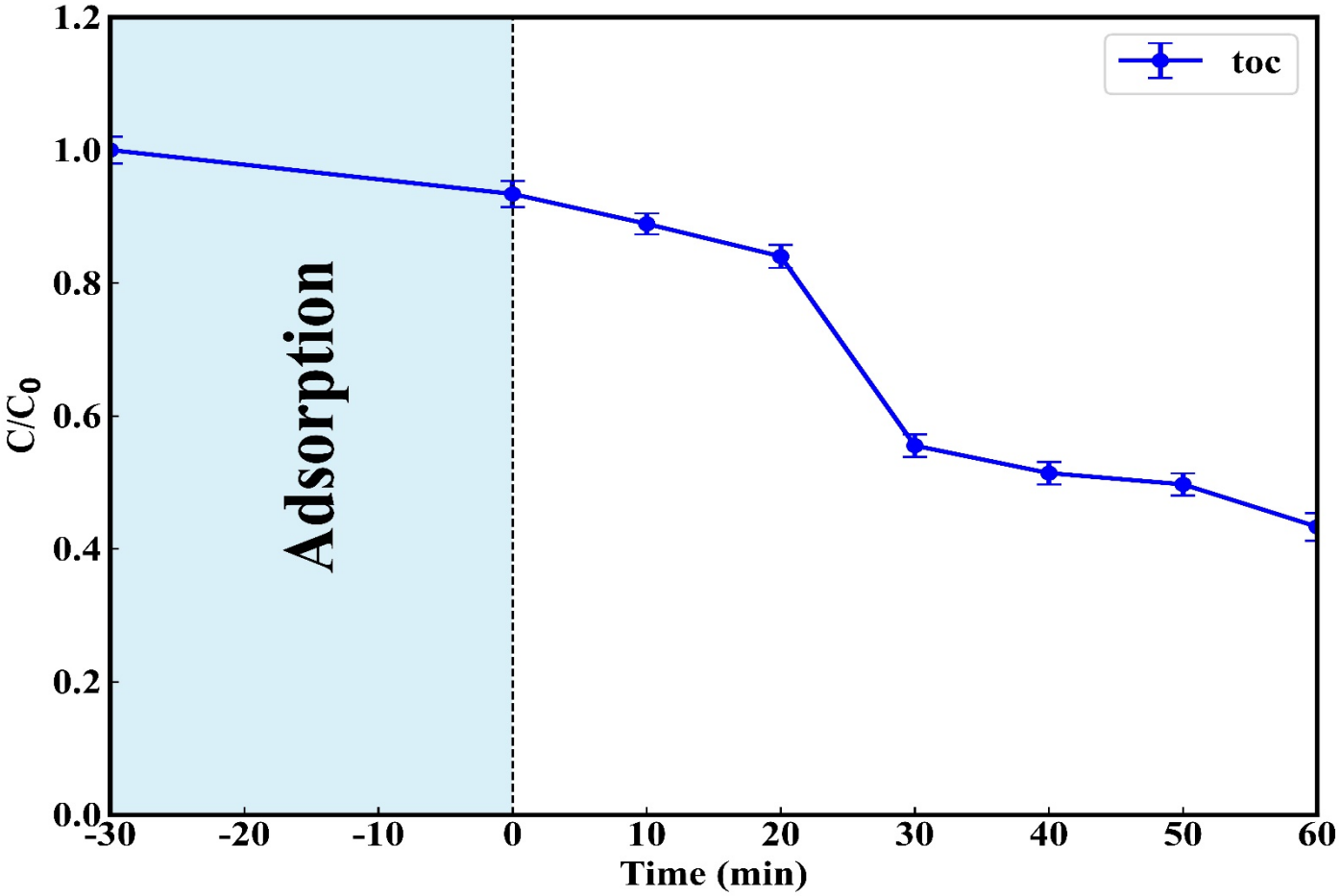


Fig.S4 The efficiency of TOC degradation in CCO/PMS system.

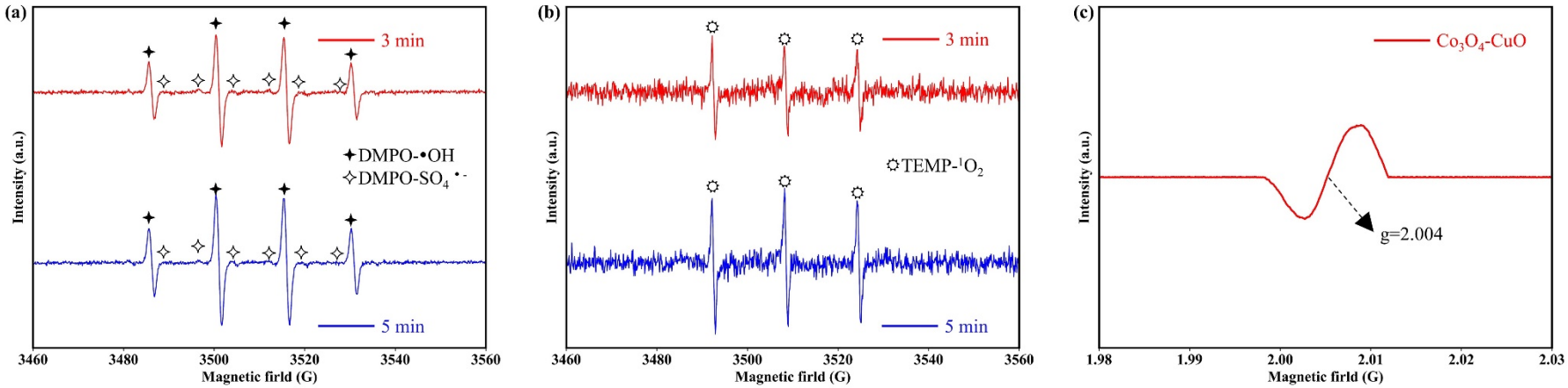


Fig.S5 The EPR spectrum of (a) •OH and $SO_4^{\bullet-}$, (b) $^1O_2$ and (c) Co_3O_4-CuO.

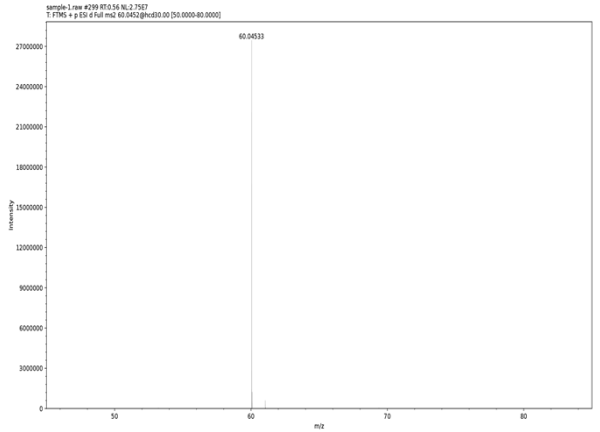
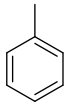
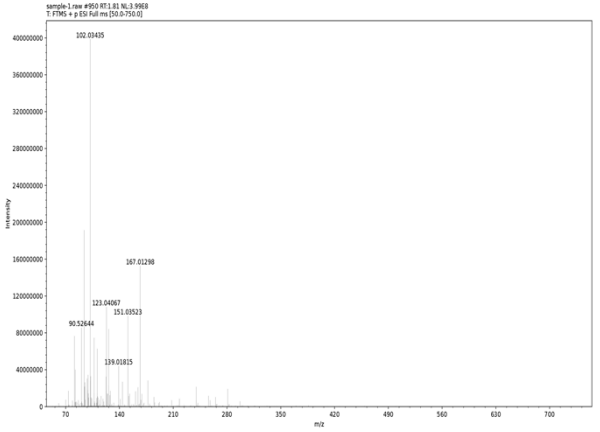
Table S1. Comparison of catalytic degradation efficiency of LEV based on reported catalysts.

Catalyst	Catalyst(mg/L)	LEV(mg/L)	PMS(mg/L)	Degradation efficiency(%)	Time(min)	Refs
Co_x/CN	100	20	400	80	90	[1]
ZnCo-MOF	600	20	922	98.3	80	[2]
$SrTiO_3/CoFe_2O_4$/rGO	100	20	500	50%	5	[3]
$AlSi_2Co_4$-200	100	20	615	98.5	80	[4]
$LaCoO_3/Co_3O_4$	100	20	300	90	20	[5]
nZVI/CF-900-0.3	200	20	615	93.83	60	[6]
$Co_3O_4/MnCo_2O_4$	400	20	300	88	30	[7]
Eu_2O_3/Co_3O_4	200	20	307	85	20	[8]
Co-Fe PBAs@rGO	500	20	615	97.6	30	[9]
CuCoFe-LDH	200	20	500	88.07	10	[10]
CCO	200	20	800	96	60	This work

Table S2. Partial water quality parameters of deionized water, tap water, lake water, and Yellow River water.

Type of the water body.	pH	COD (mg/L)	Cl^- (mg/L)	NO_3^- (mg/L)	$H_2PO_4^-$ (mg/L)	HCO_3^- (mg/L)
Tap water	7.12	30.20	0.36	17.25	0.010	121.25
lake water	7.44	110.10	52.22	30.23	0.102	1100.25
Yellow River water	8.35	165.20	113.82	20.74	0.066	227.76

Table S3. Possible structures, and EI mass spectra of LC-MS derivatives of the intermediates from LEV degradation in the CCO/PMS system.

Intermediates number	Possible structure	Mass spectra
1		
2		

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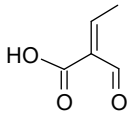
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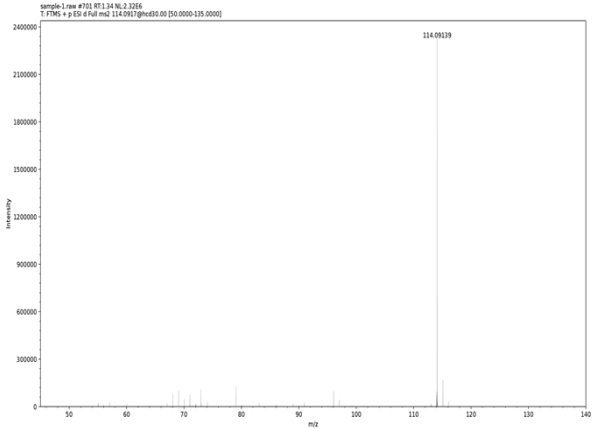
O
O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Intensity
m/z

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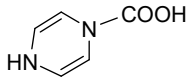
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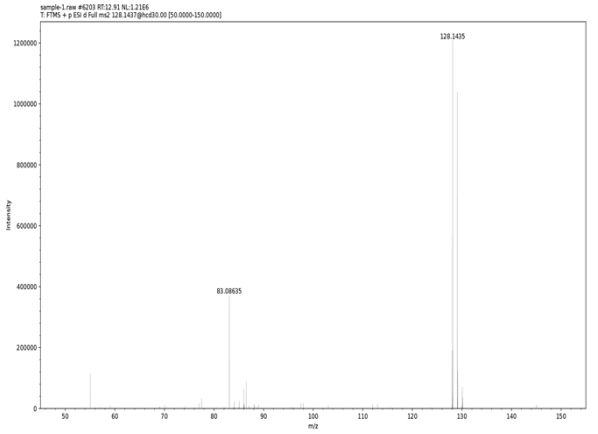
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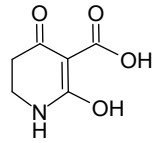
Intensity
m/z

5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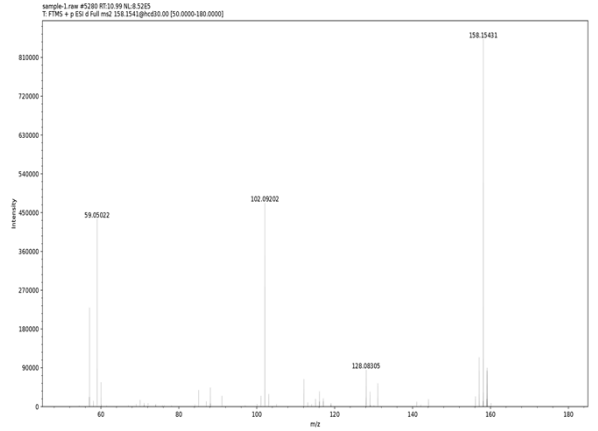
OH
OH
N
H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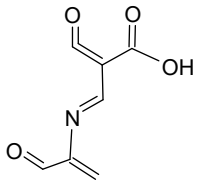
Intensity
m/z

6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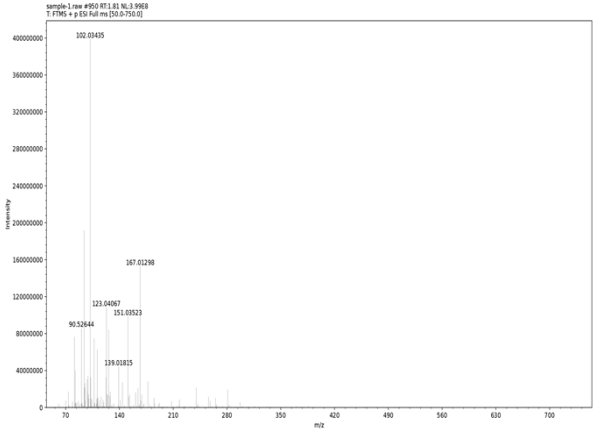
OH
N
O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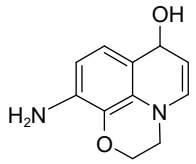
Intensity
m/z

7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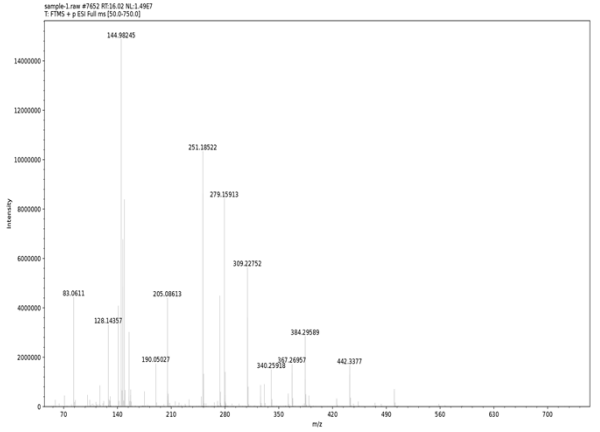
H2N
N
O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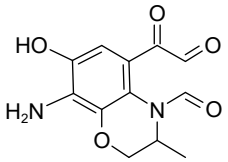
190.05027
340.25928
343.26957
442.3377
Intensity
m/z

8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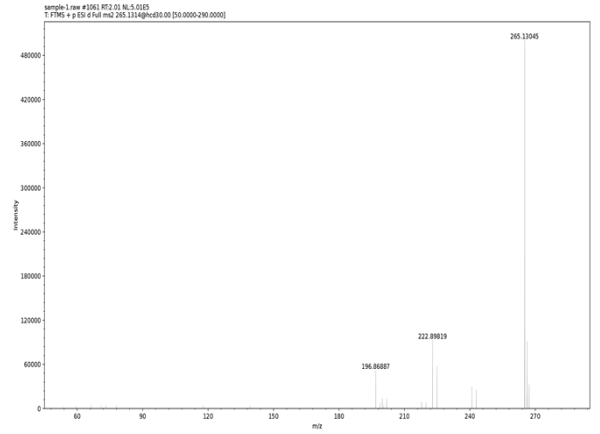
HO
O
H2N
N
O
O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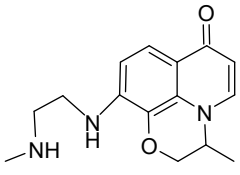
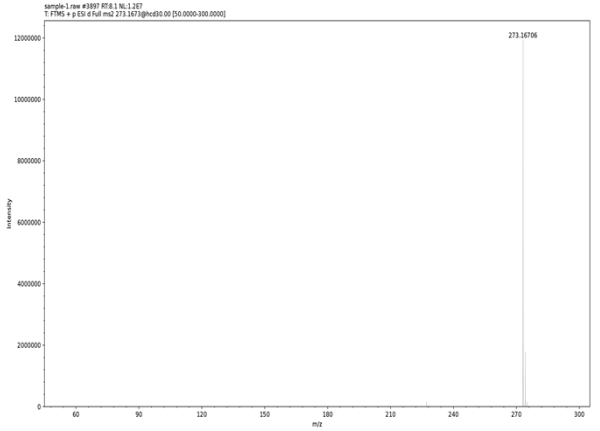
Intensity
m/z

9


O
N
H
NH
O
N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Intensity
m/z

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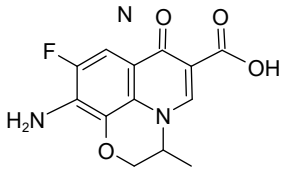
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O
F
OH
H2N
N
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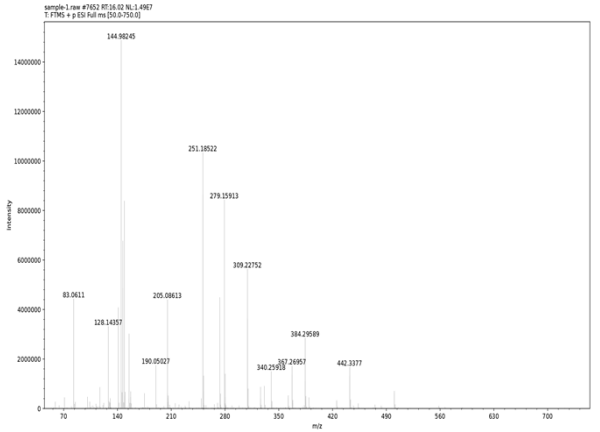
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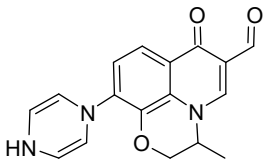
Intensity
m/z

11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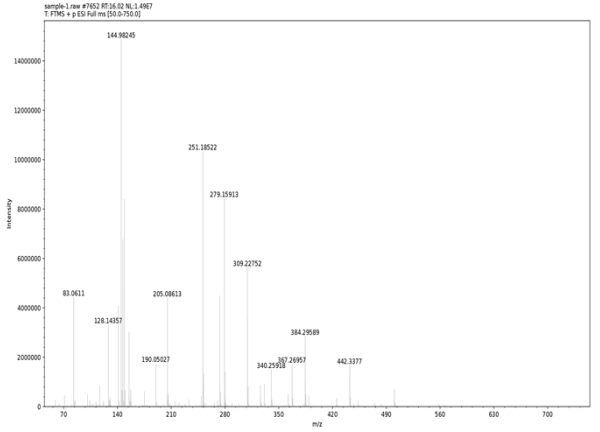
O
N
N
HN
O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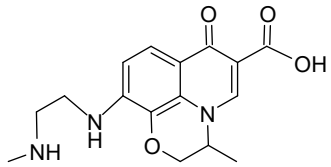
442.3377
Intensity
m/z

12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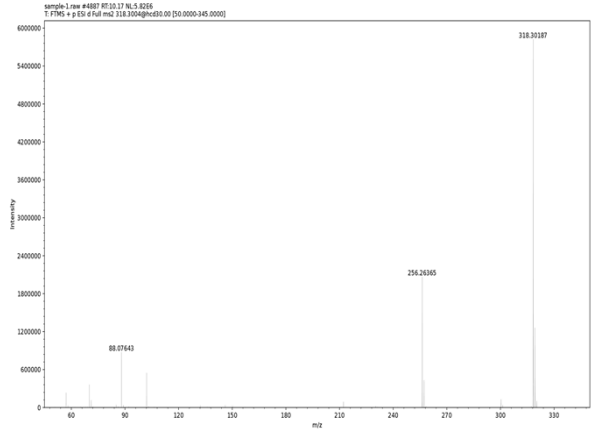
H
N
NH
O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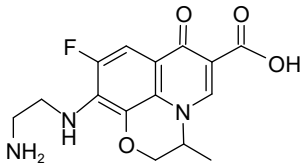
Intensity
m/z

13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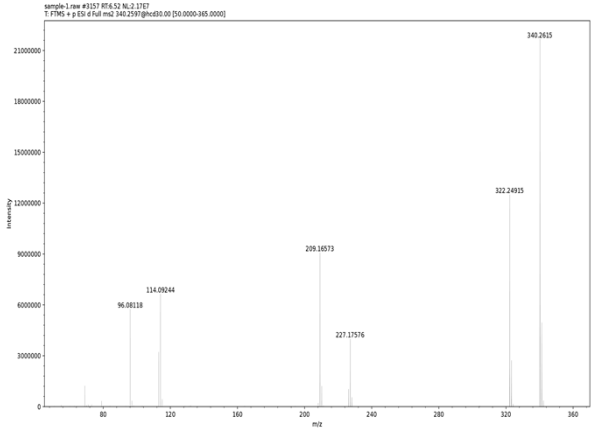
N
H
N
NH2
O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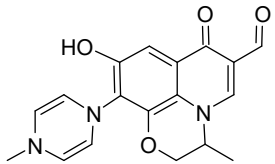
96.08118
227.17576
Intensity
m/z

14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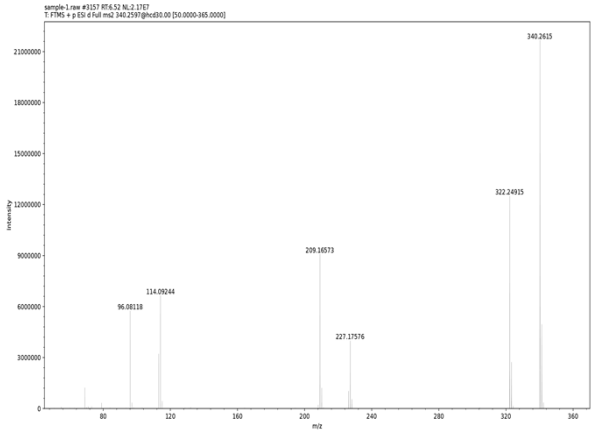
O
O
N
N
N
O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Intensity
m/z

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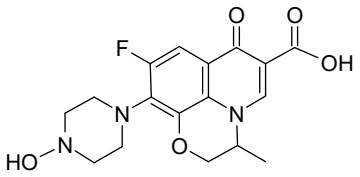
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HO
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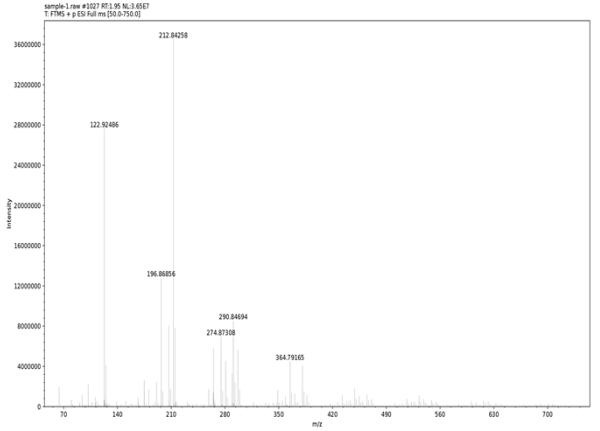
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Intensity
m/z

Reference:

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