Electronic Supplementary Information

Synthesis of MXene supported Co nanoparticle catalyst for efficient catalytic transfer hydrogenation of nitro compounds with formic acid

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Table S1 Co content and textural properties of the various catalysts.

Catalyst	Co content (%)[a]	S_{BET} (m^2/g)[b]	V_{total} (cm^3/g)
NC/MXene	-	313.1	0.25
2.6% Co/MXene	2.6	252.3	0.21
33.0% Co/MXene	33.0	84.8	0.15
3.4% Co/NC	3.4	515.7	0.31

[a]By ICP–AES method. [b]By BET method.

Table S2 Element analysis results for the various samples analyzed by XPS.

Catalyst	Co (%)	C (%)	N (%)	O (%)	Ti (%)
NC/MXene	-	82.3	3.4	9.8	4.5
2.6% Co/MXene	0.5	82.5	10.4	6.4	0.2
33.0% Co/MXene	1.9	79.4	5.4	10.7	2.6
3.4% Co/NC	0.6	84.6	8.3	6.5	-

Table S3 Catalytic performance of the various catalysts for the catalytic transfer hydrogenation of nitrobenzene with FA.

Entry	Catalyst	Conversion (%)	Selectivity (%)
1	Blank	0	-
2	2.6% Co/MXene	100.0	99.9
3	NC/MXene	4.0	100.0
4	33.0% Co/MXene	16.4	100.0
5	3.4% Co/NC	34.5	99.6
6	MXene	0.3	100.0
7	3.0% Co_{im}/MXene	41.0	99.1
8	$Co(NO_3)_2 \cdot 6H_2O$	0.3	100.0

Reaction conditions: nitrobenzene (0.5 mmol), toluene (3 mL), catalyst (10 mg), time (4 h), temperature (100 °C), 10 equiv of HCOOH, N_2 atmosphere.

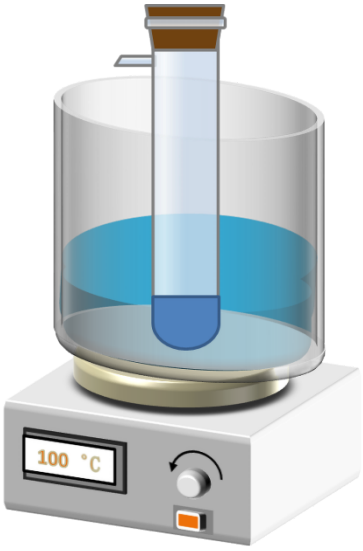


Figure S1. Schematic illustration of the experimental setup.

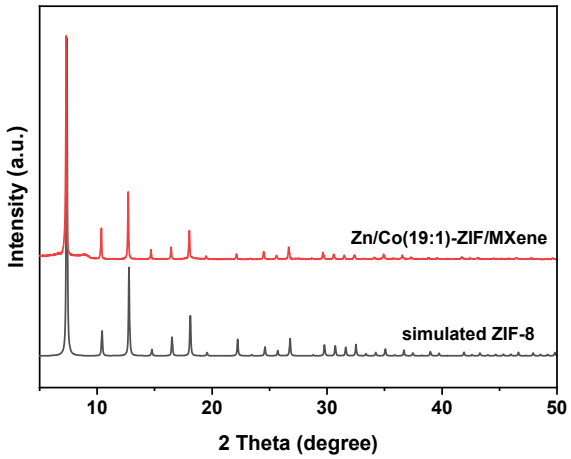


Figure S2. XRD patterns of simulated ZIF-8 and synthesized Zn/Co(19:1)-ZIF/MXene.

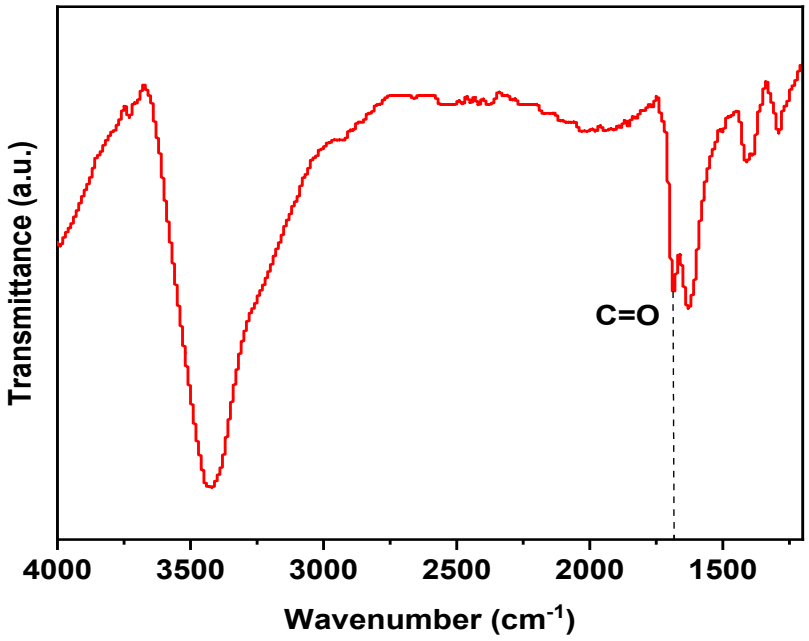


Figure S3. FT-IR spectrum of the carboxyl functionalized MXene.

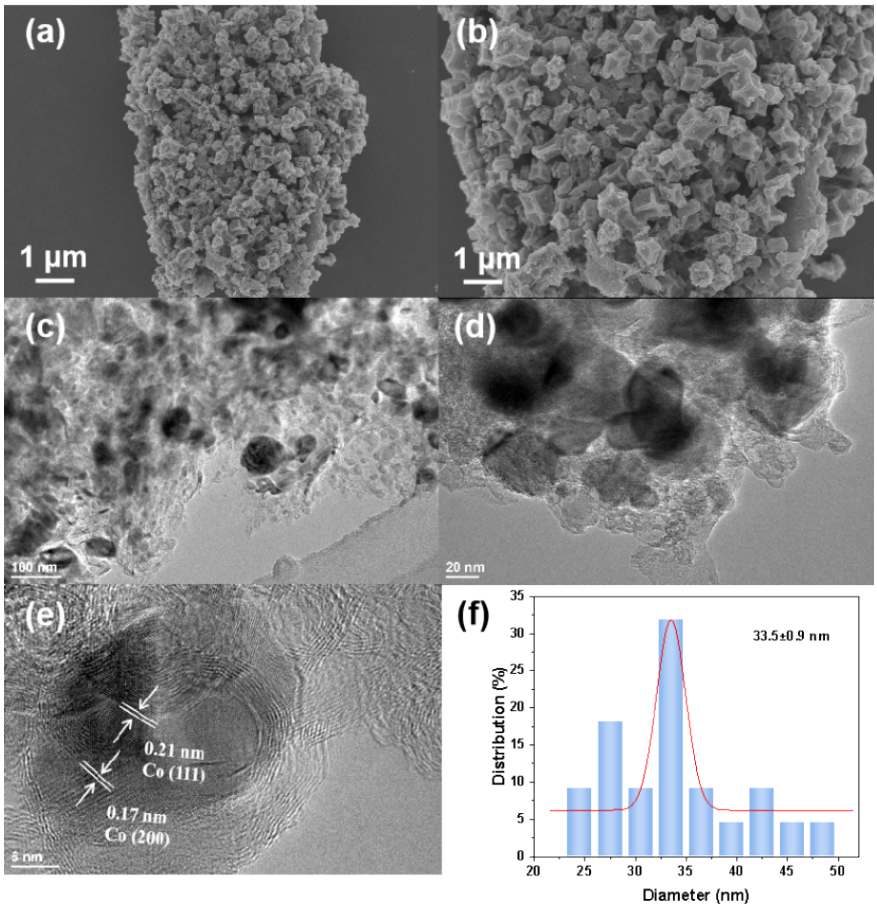


Figure S4. SEM and TEM images of 33.0% Co/MXene.

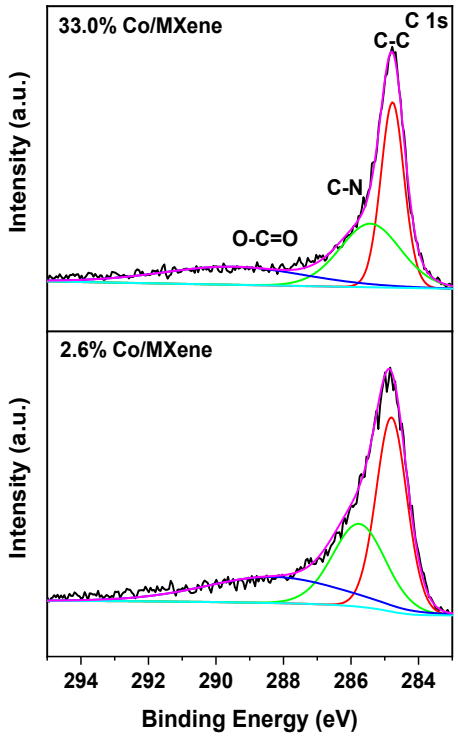


Figure S5. XPS spectra of C 1s region of 2.6% Co/MXene and 33.0% Co/MXene.

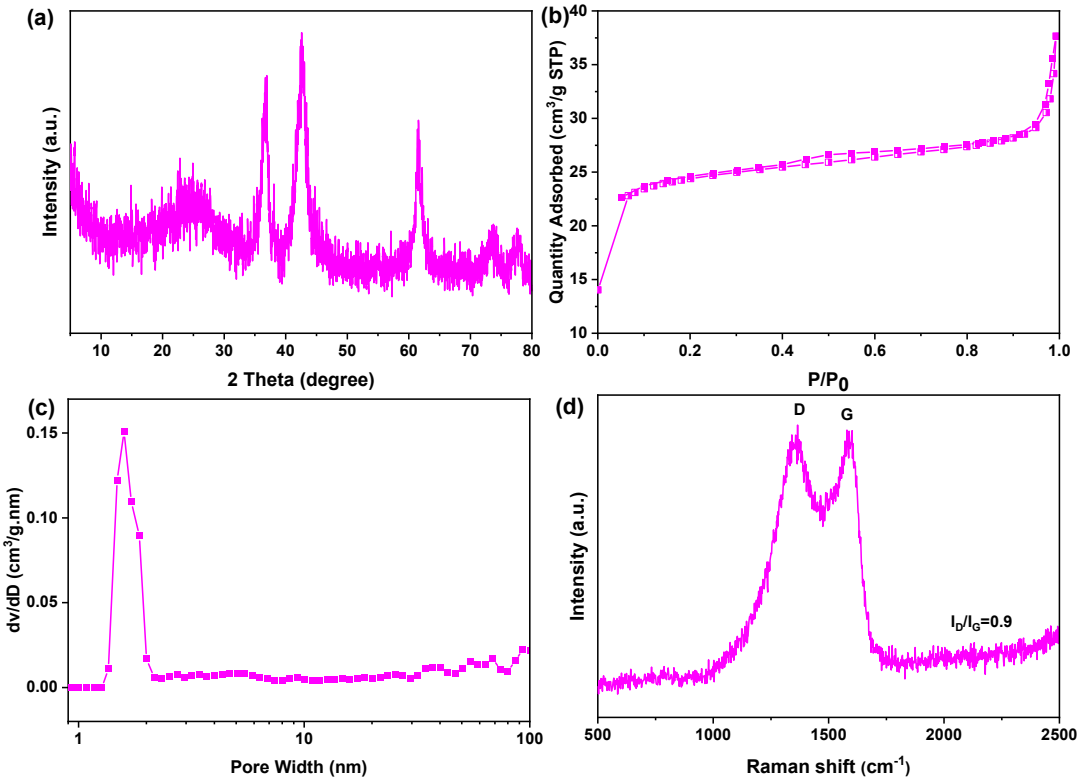


Figure S6. XRD pattern (a), N_2 adsorption–desorption isotherms (b), pore size distribution curve (c), and Raman spectrum (d) of 3.4% Co/NC.

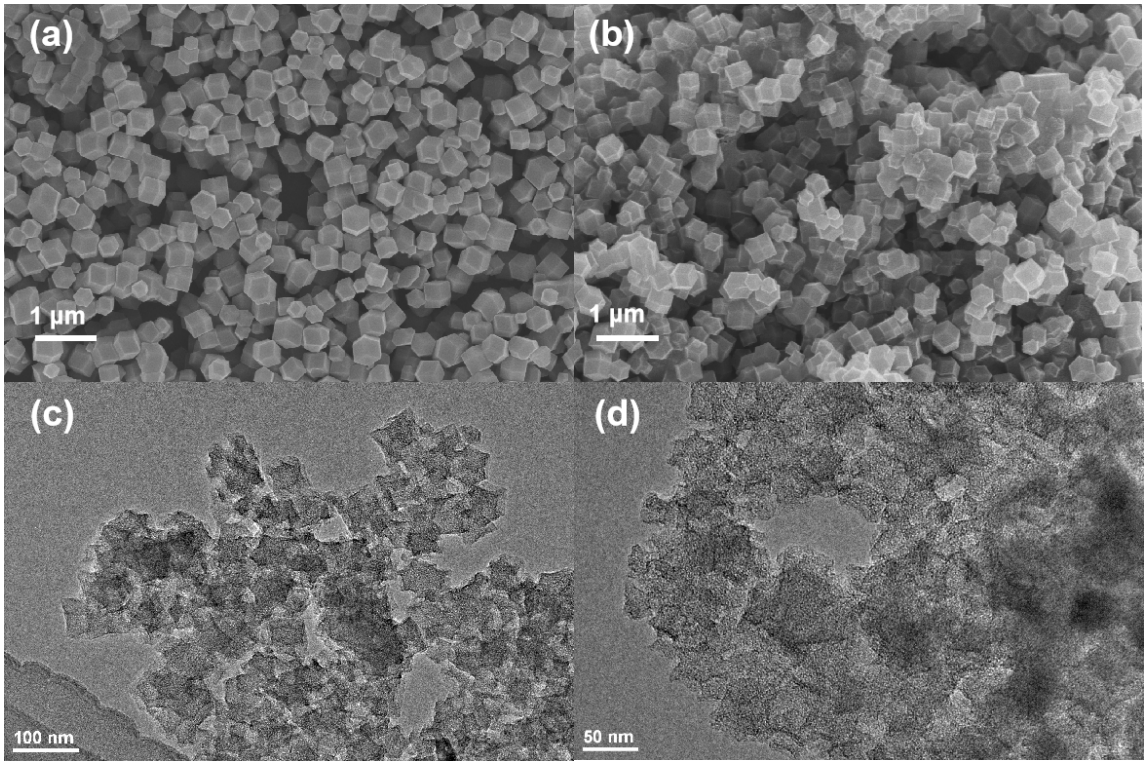


Figure S7. SEM and TEM images of 3.4% Co/NC.

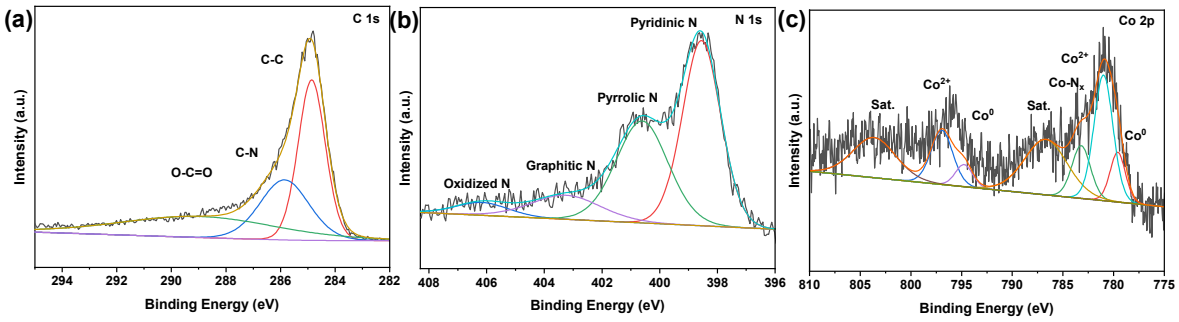


Figure S8. XPS spectra of 3.4% Co/NC.

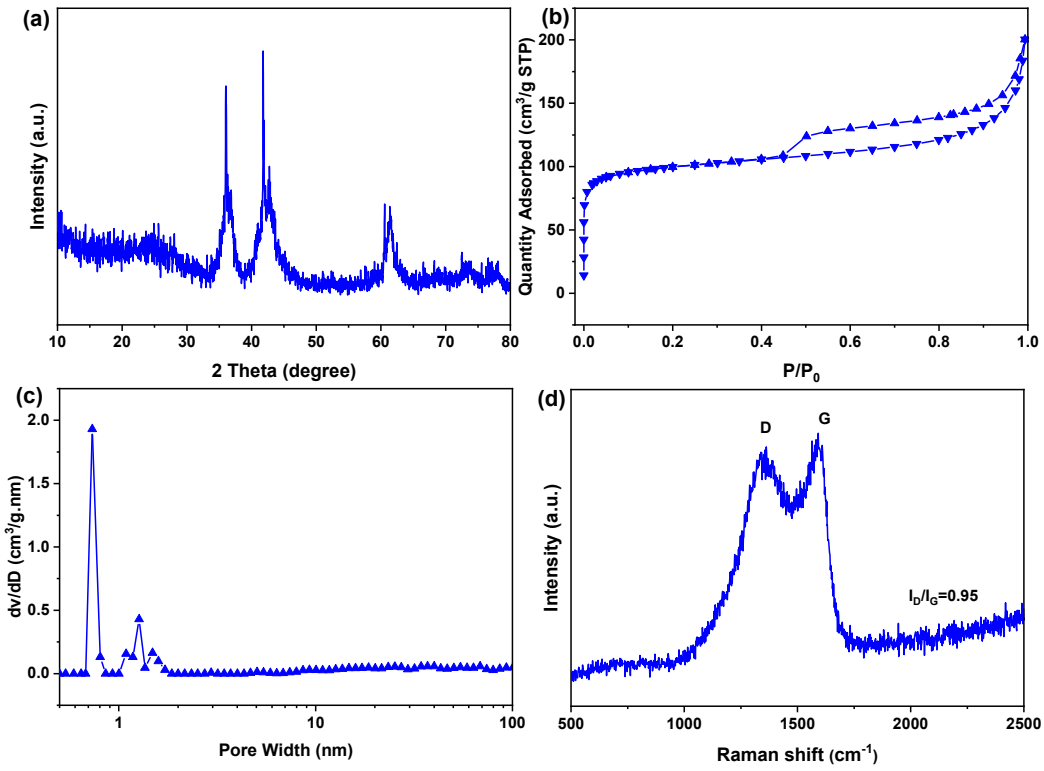


Figure S9. XRD pattern (a), N_2 adsorption–desorption isotherms (b), pore size distribution curve (c), and Raman spectra (d) of NC/MXene.

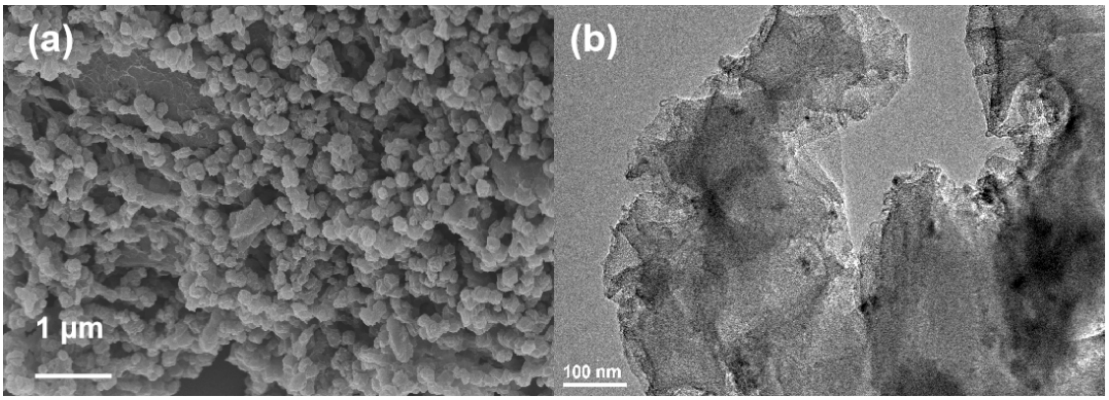


Figure S10. SEM and TEM images of NC/MXene.

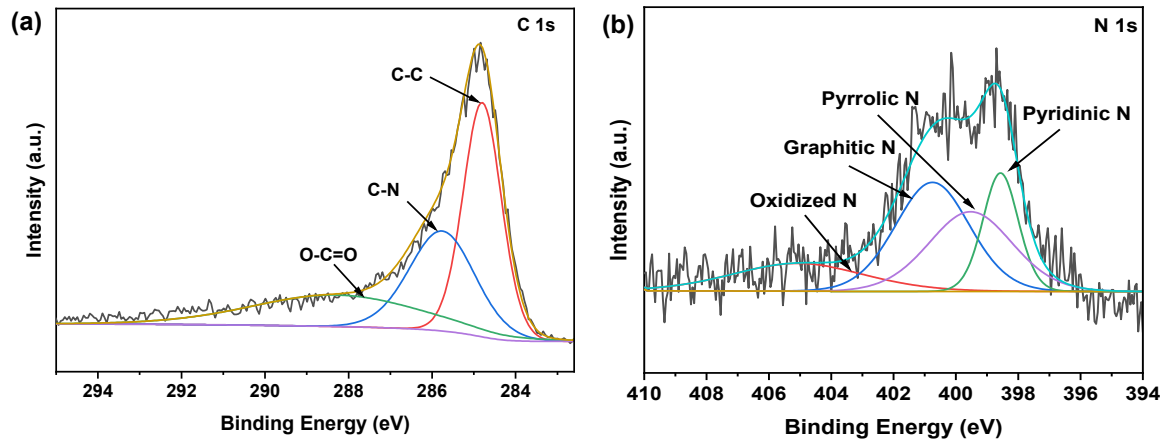


Figure S11. XPS spectra of NC/MXene.

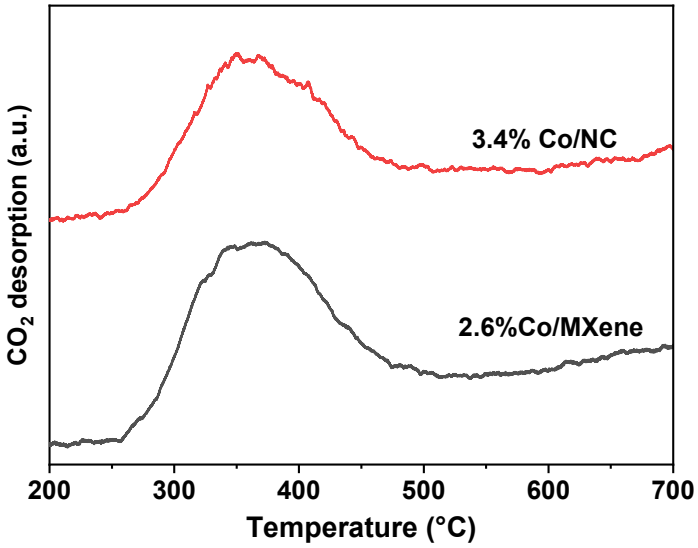


Figure S12. CO_2–TPD profiles of 2.6% Co/MXene and 3.4% Co/NC.

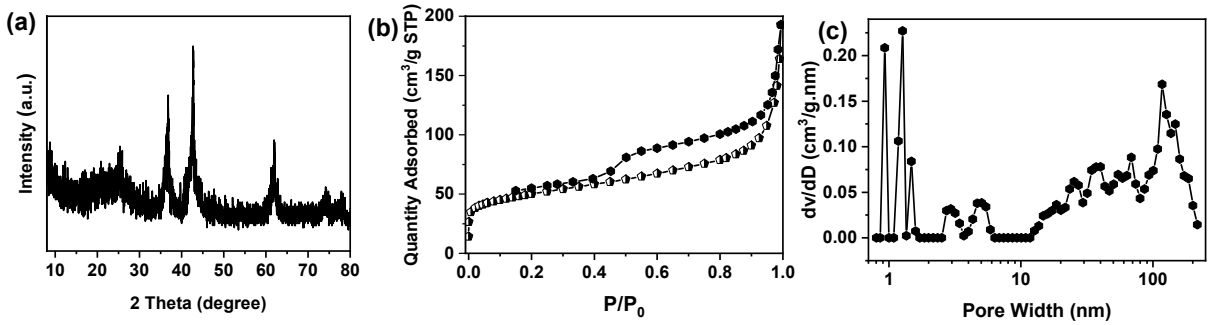


Figure S13. XRD pattern (a), N_2 adsorption–desorption isotherms (b), pore size distribution curve (c) of the spent 2.6% Co/MXene.

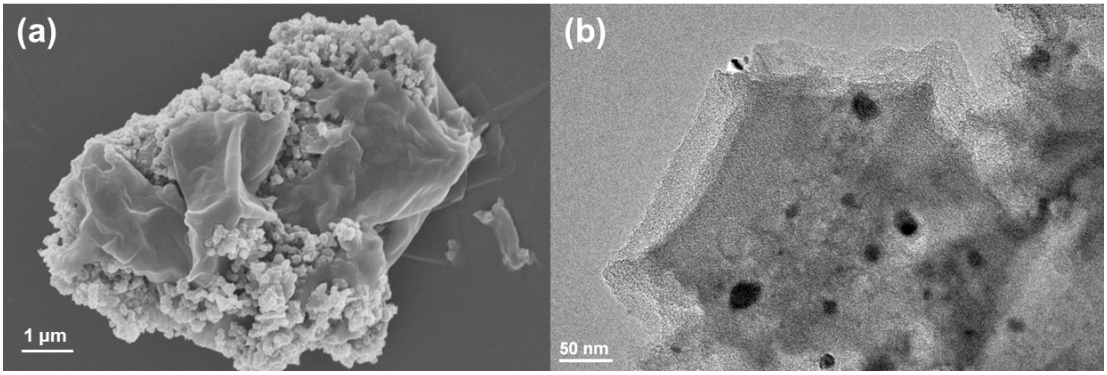
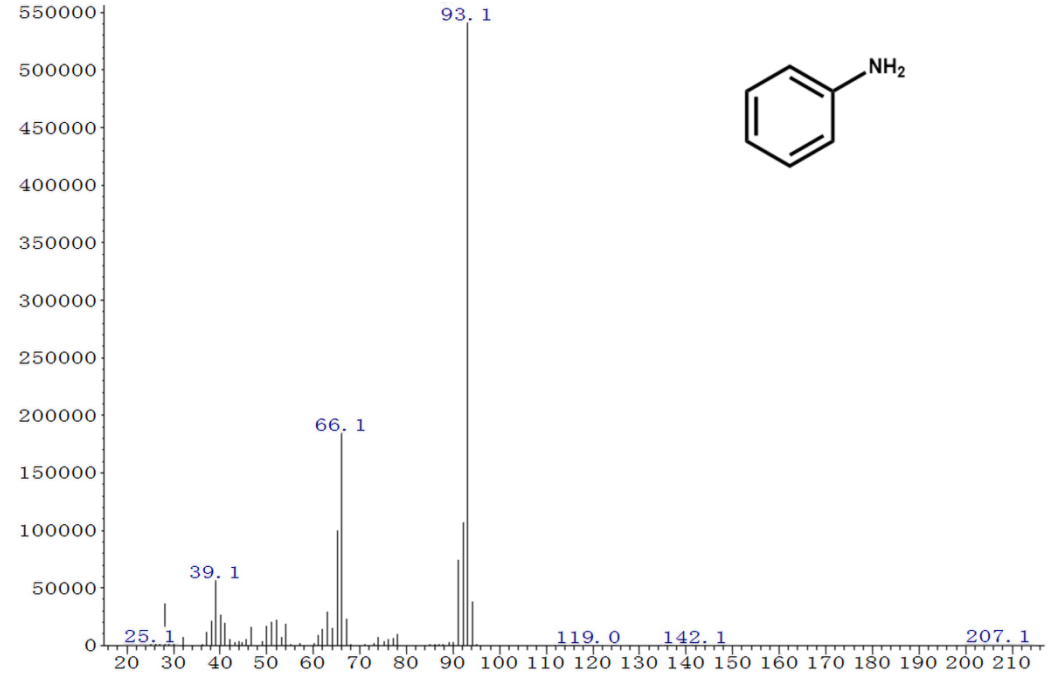
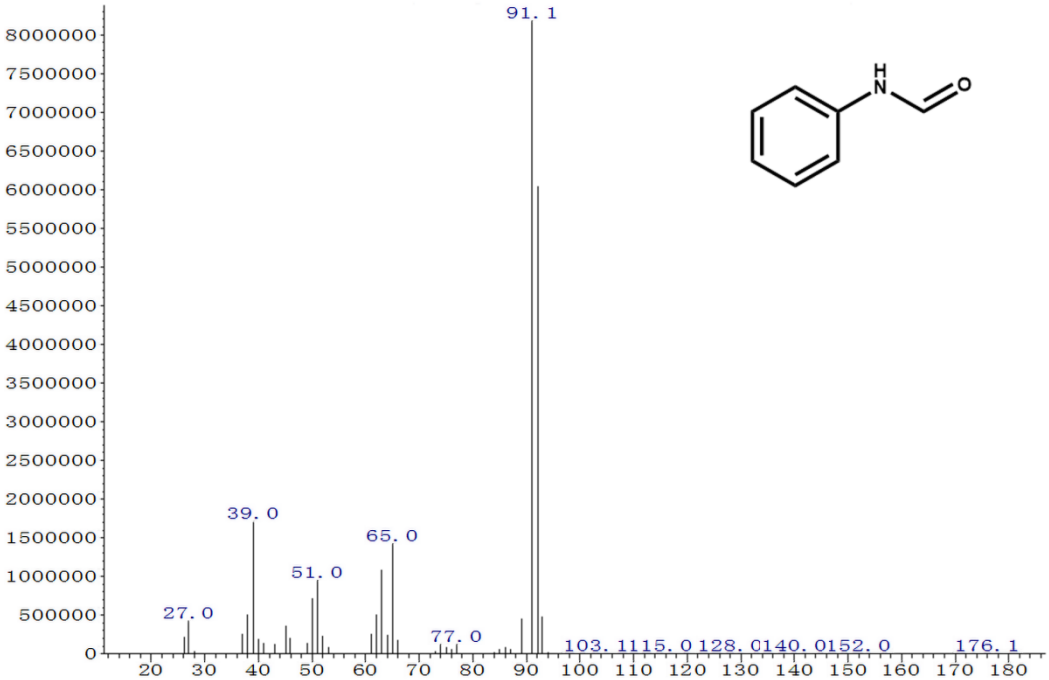
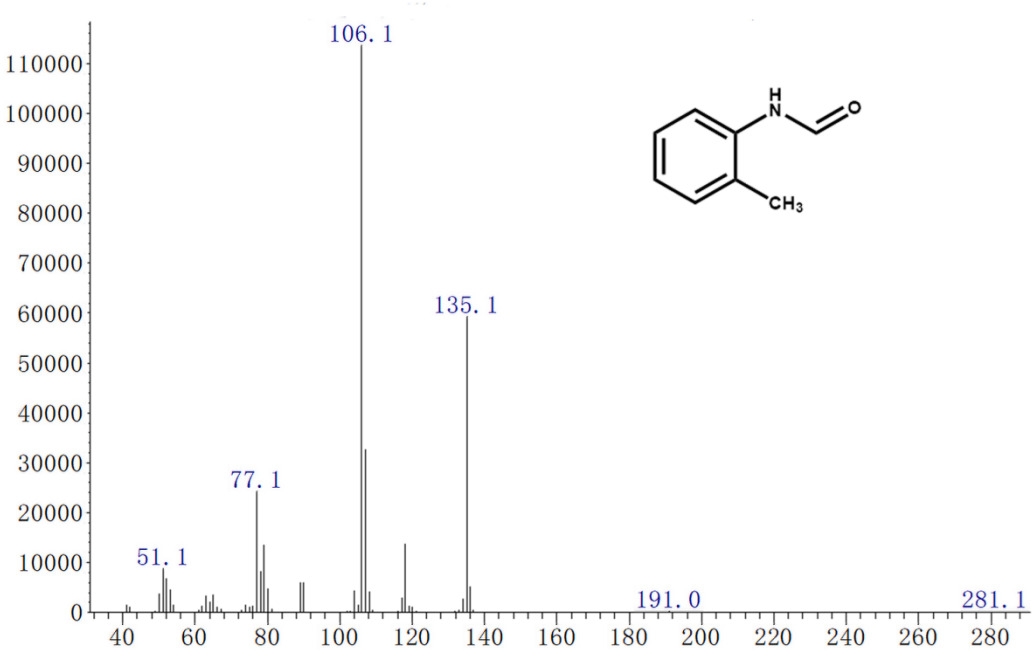


Figure S14. SEM and TEM images of the spent 2.6%Co/MXene.

MS spectra of the typical products



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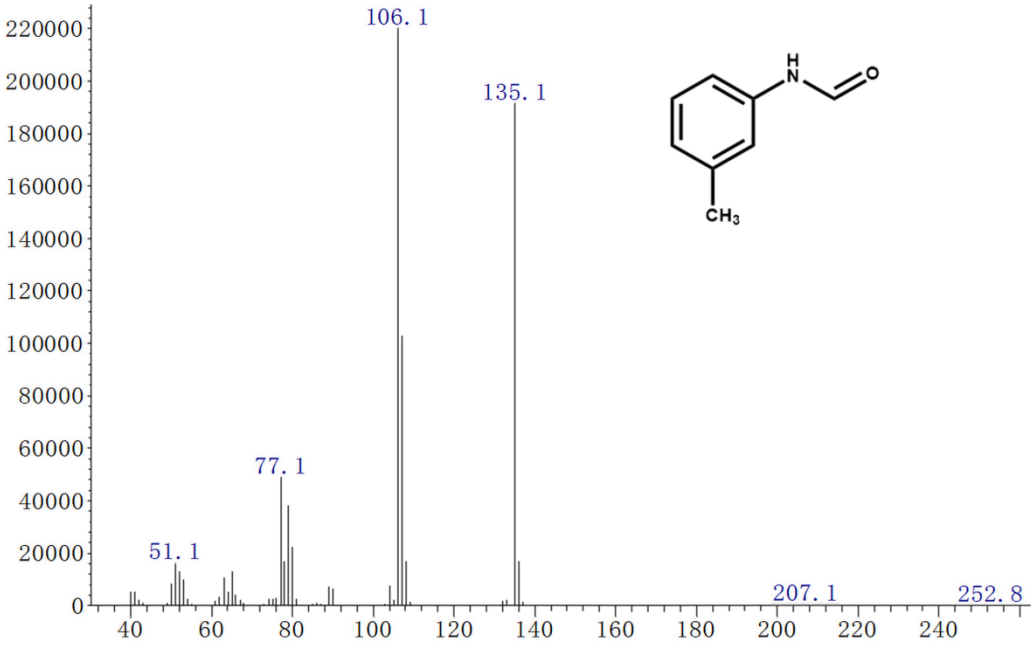
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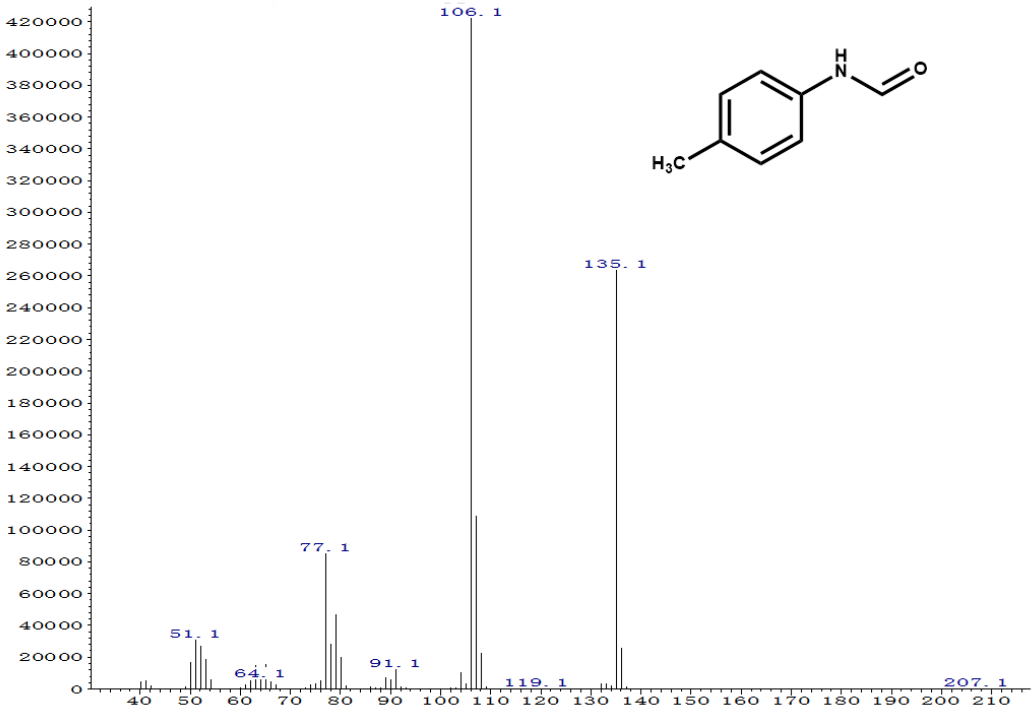
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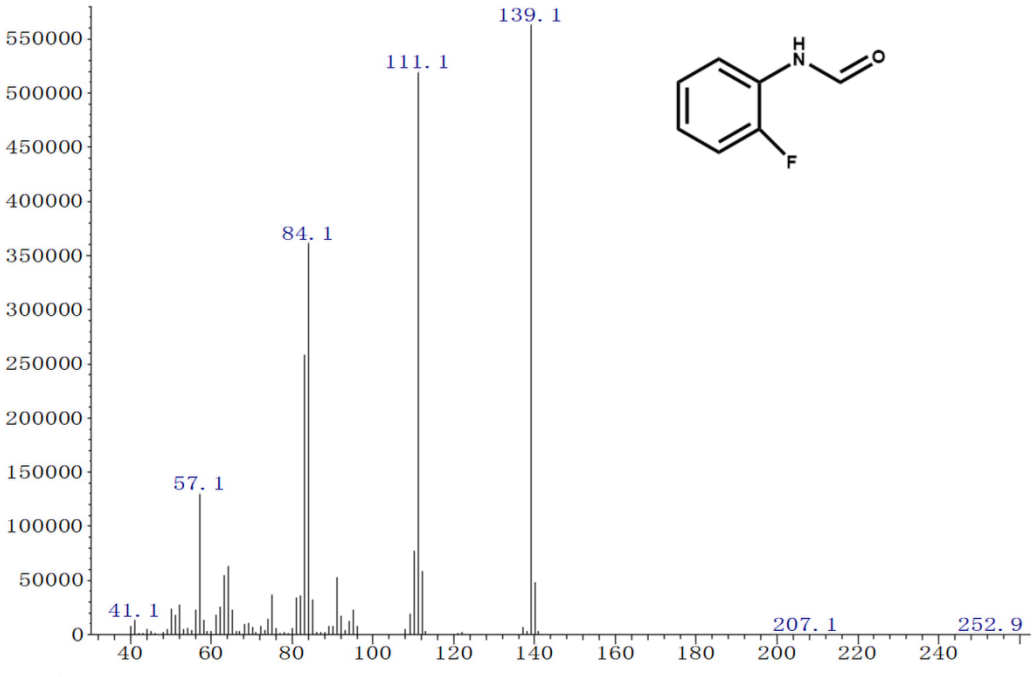
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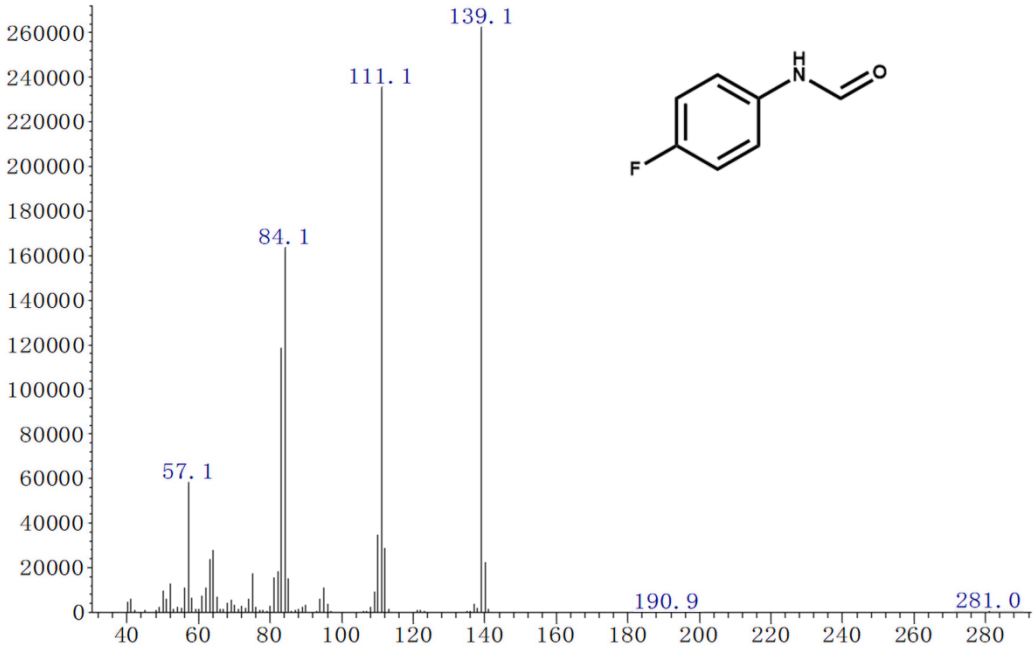
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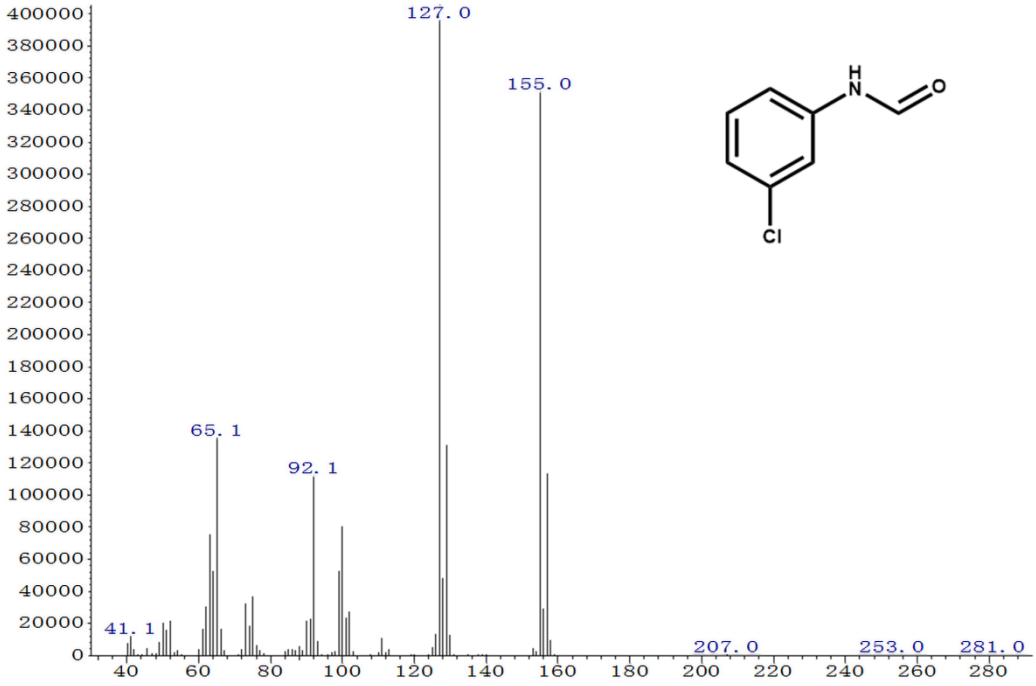
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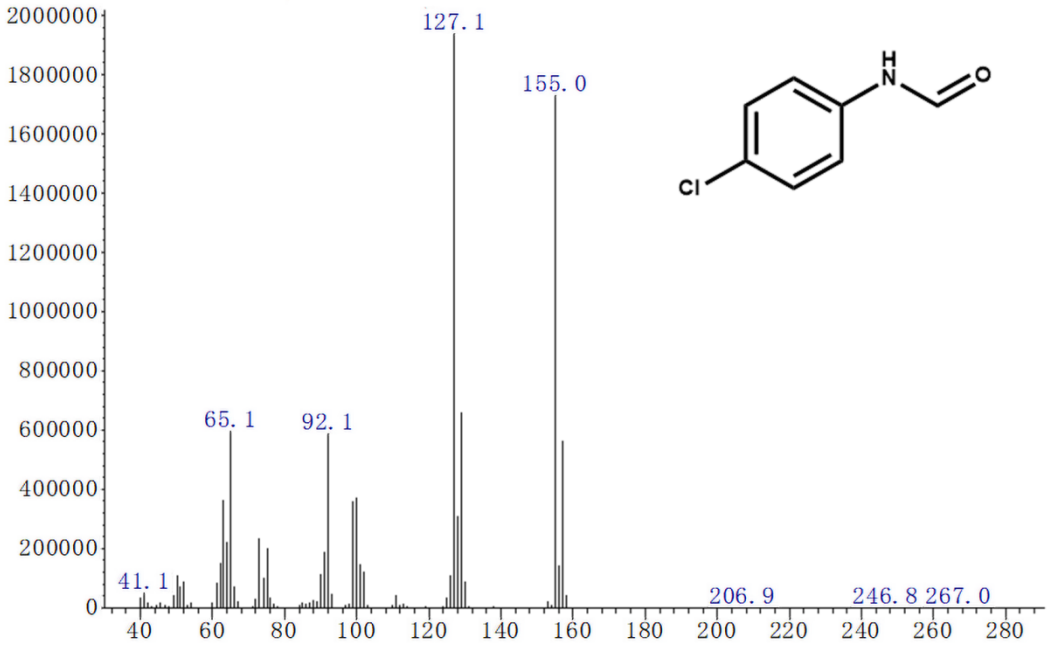
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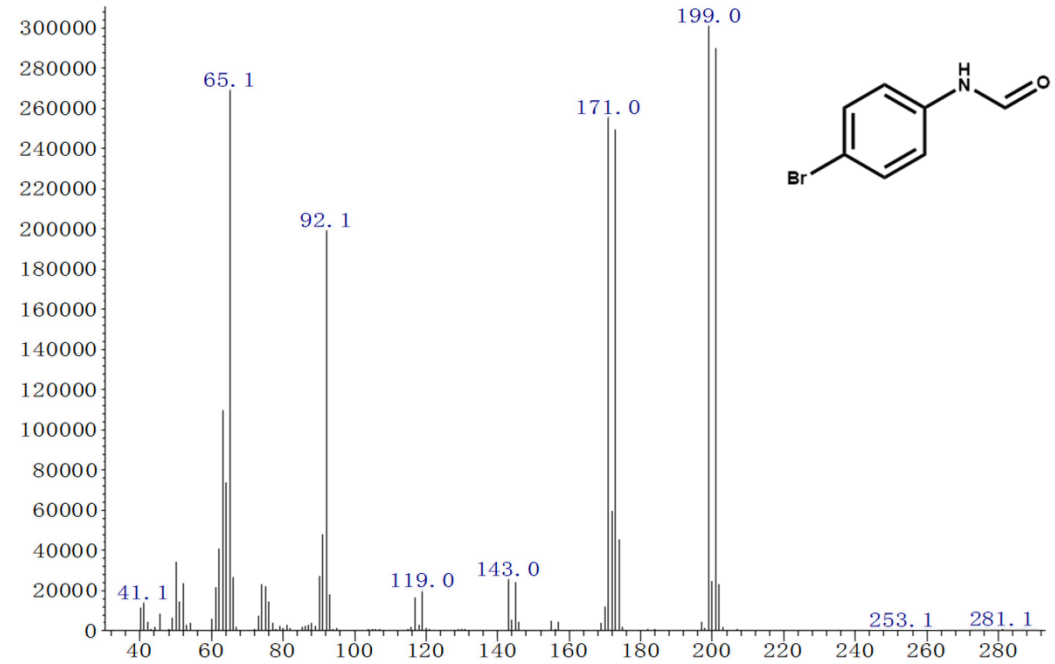
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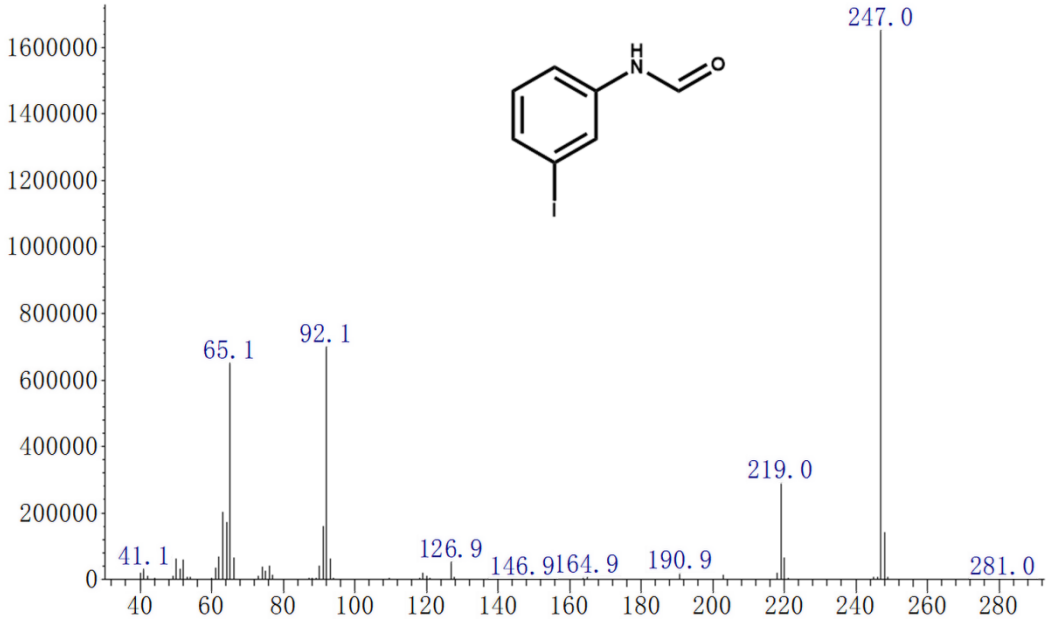
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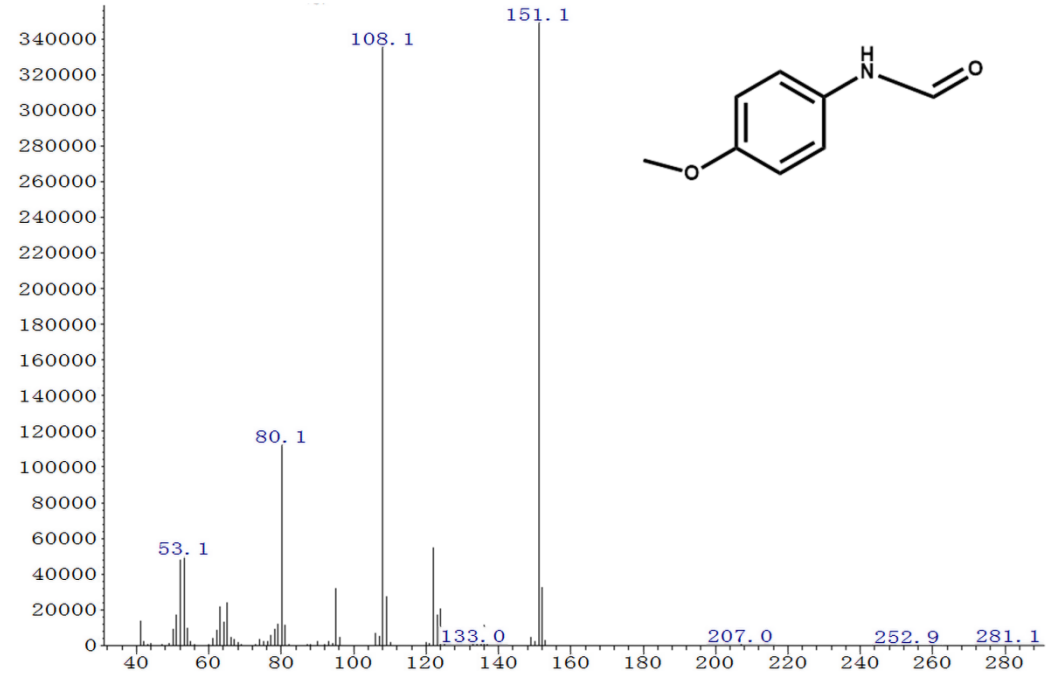
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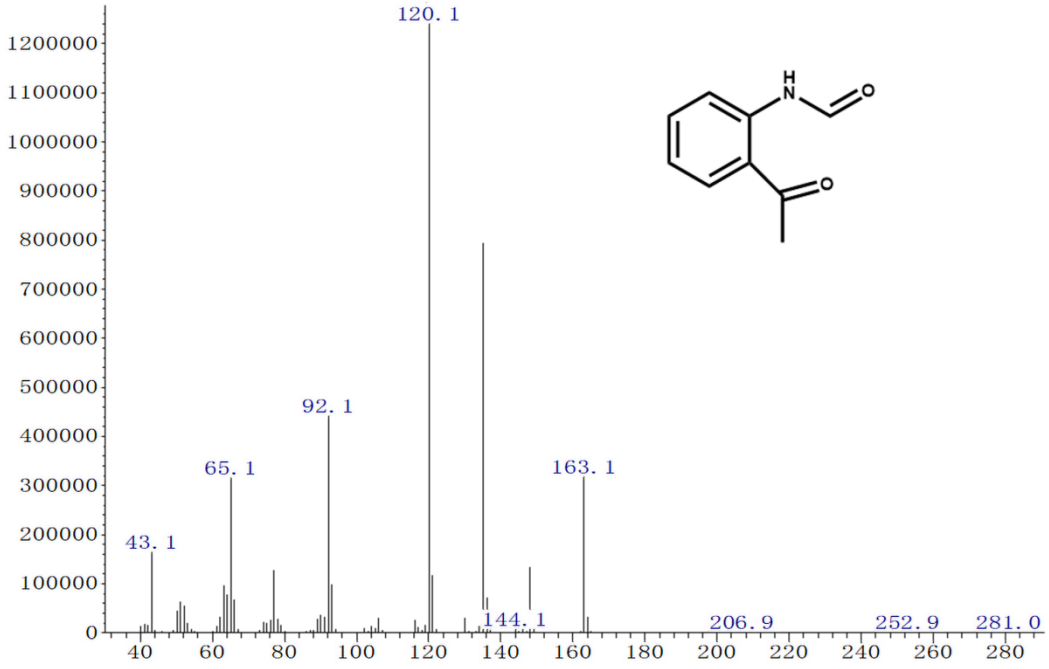
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