Supplementary Information

Zinc ferrite-graphitic carbon nitride nanohybrid for photo-catalysis of ciprofloxacin antibiotic

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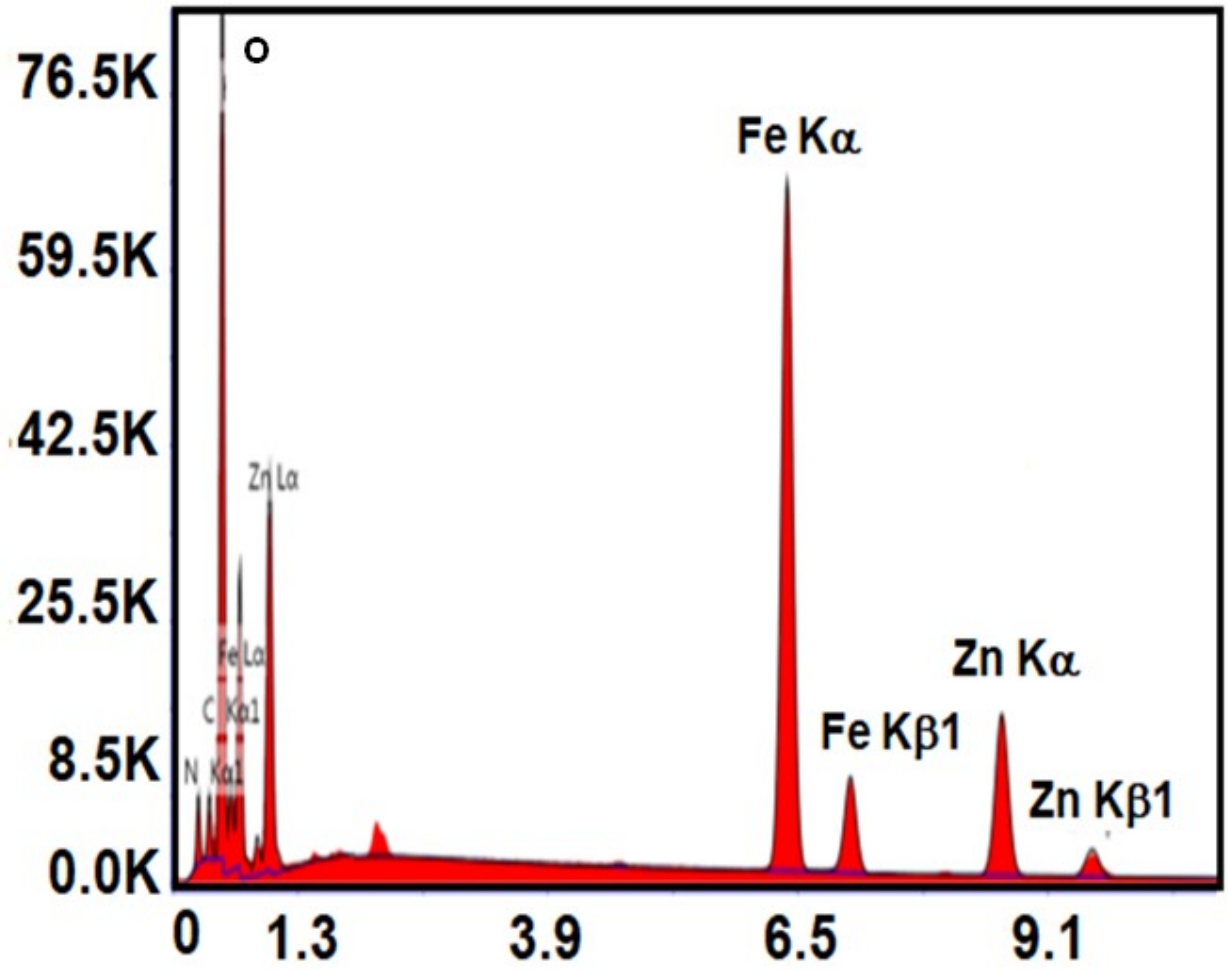


Fig. S1 SEM- EDS of ZFCN hybrid catalyst.

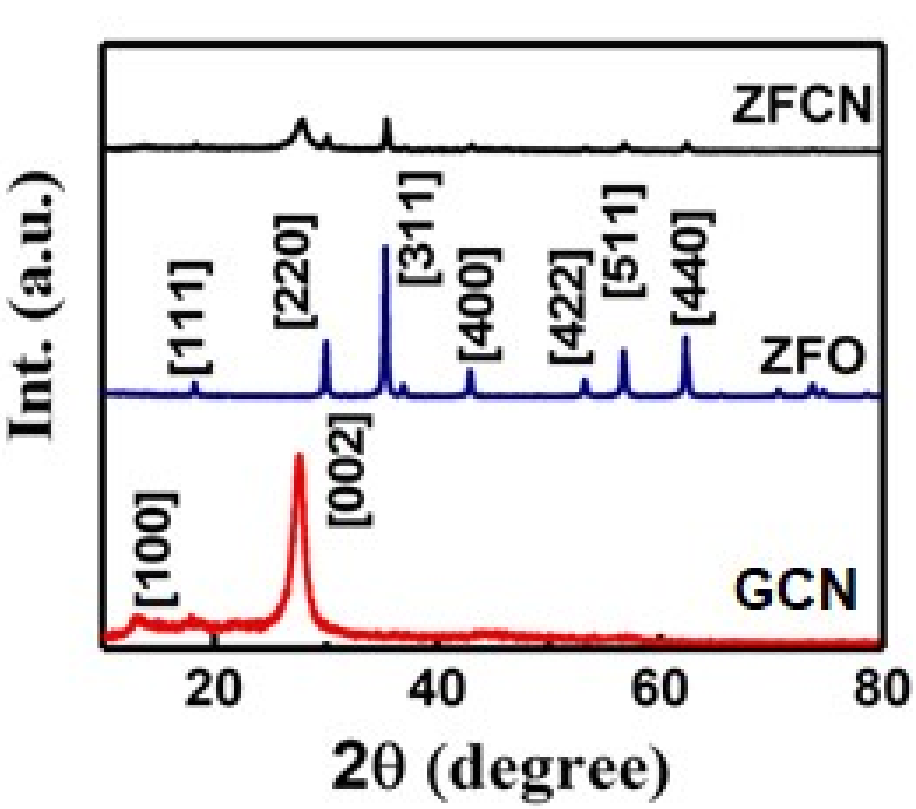


Fig. S2 XRD pattern of ZFCN (black), ZFO (blue) and GCN (red) catalyst.

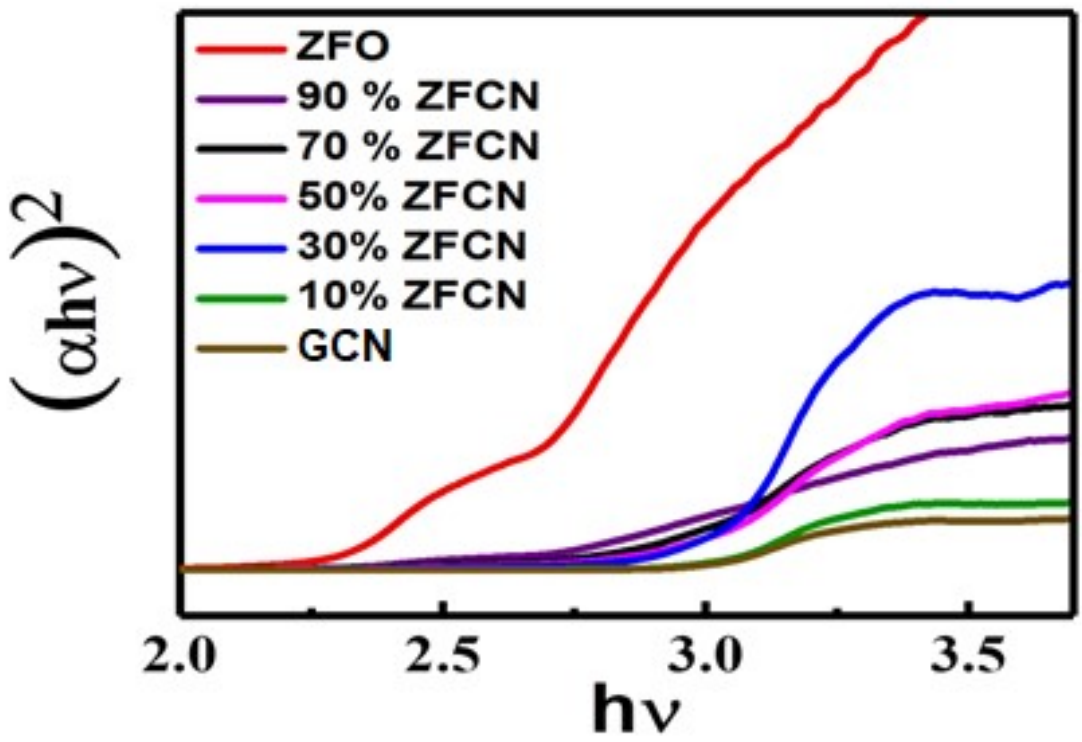


Fig. S3 DRS plot of GCN, ZFO and ZFCN as per their weight %.

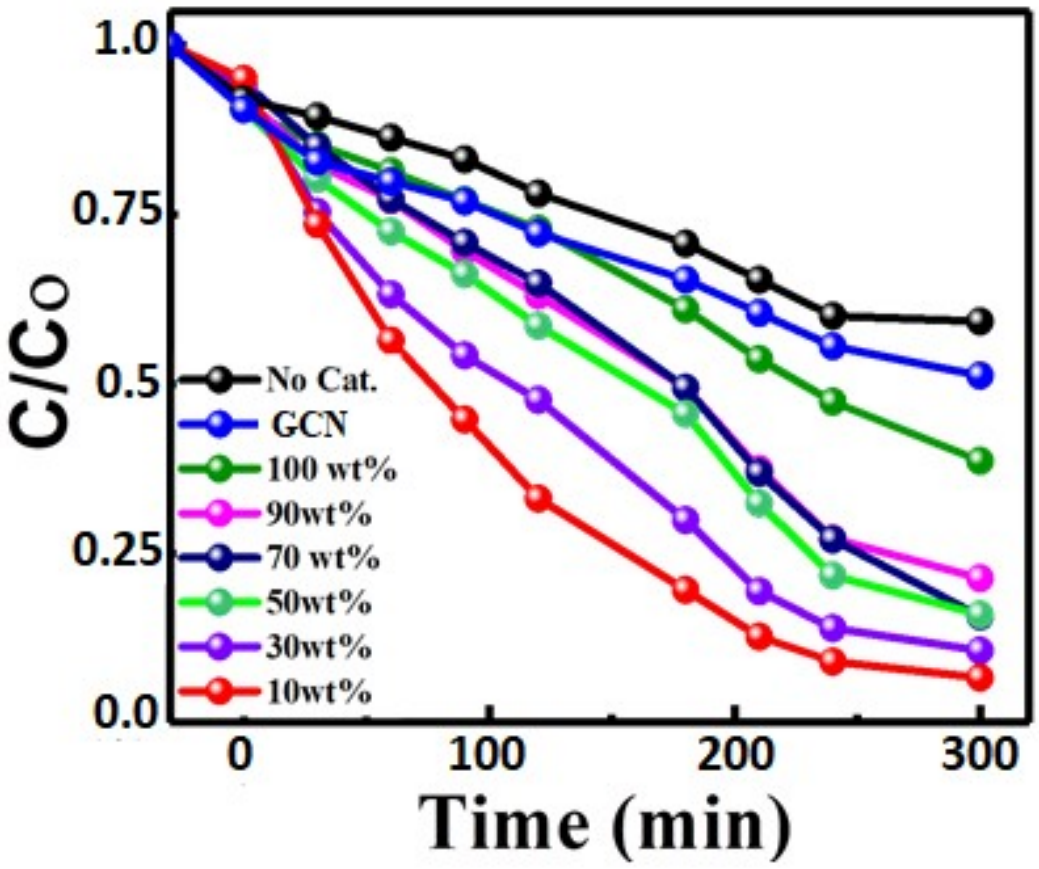


Fig. S4 Effect of weight % on the degradation of CIP.

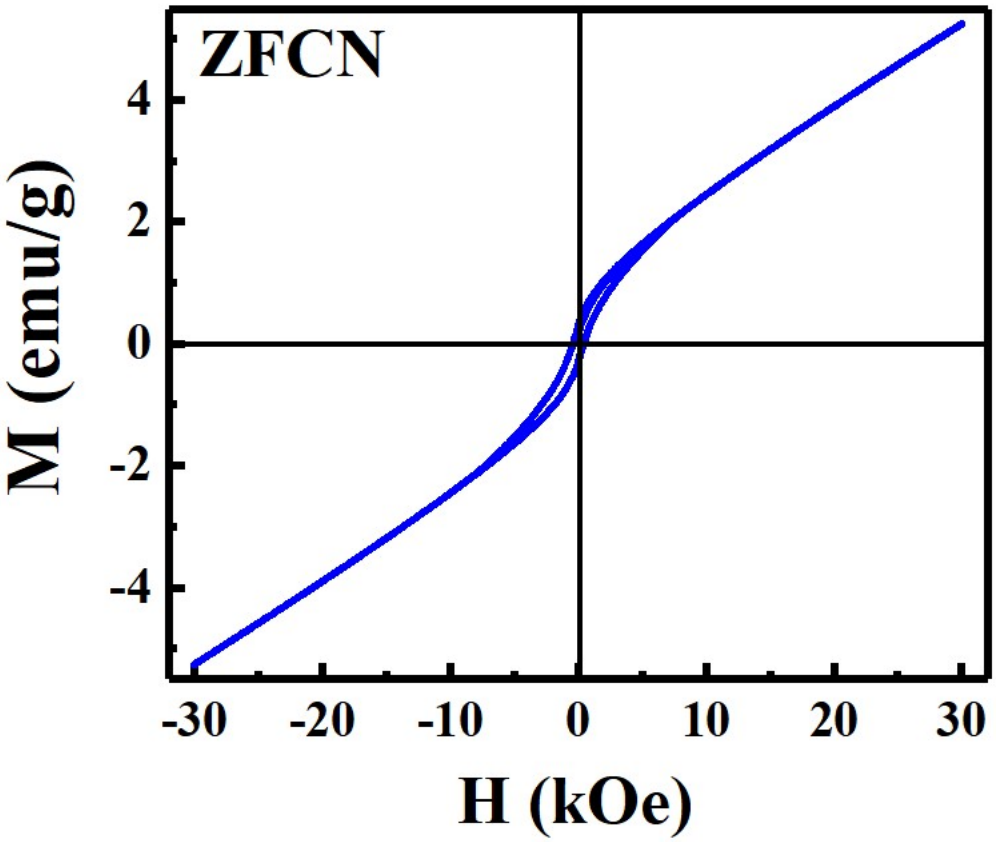


Fig. S5 M−H hysteresis loop for ZFCN sheets at room temperature.

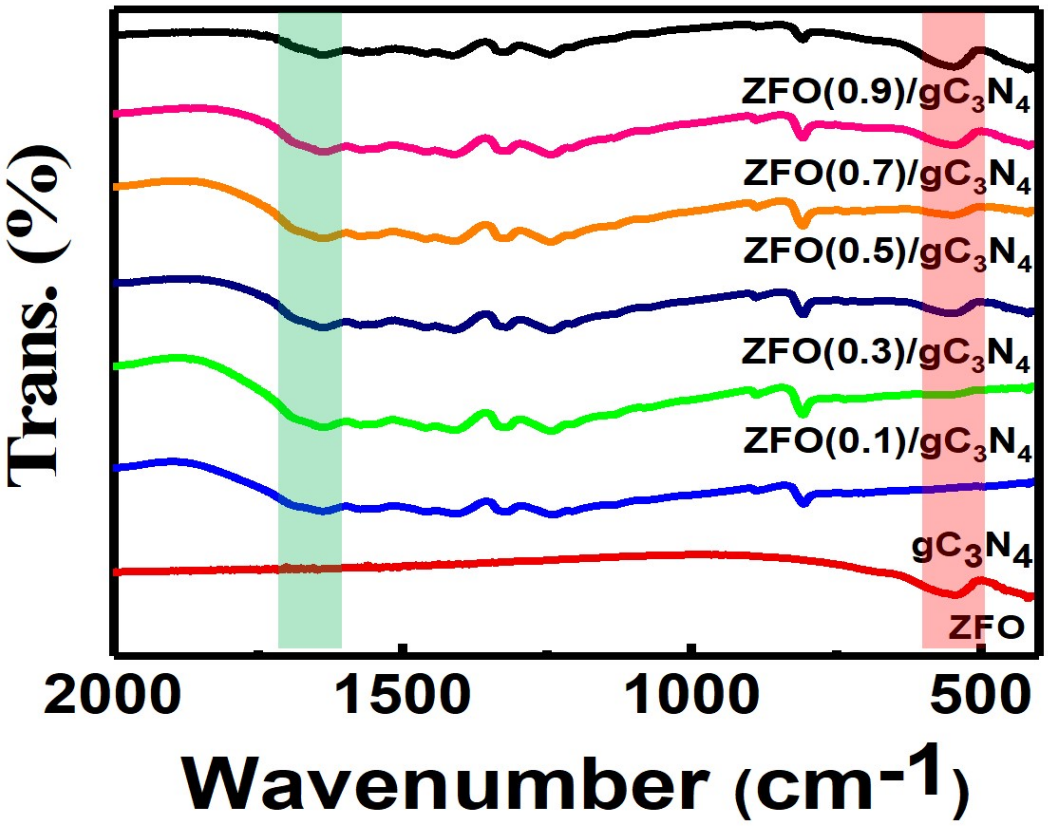


Fig. S6 FTIR spectrum of ZFCN according to their weight % ratio.

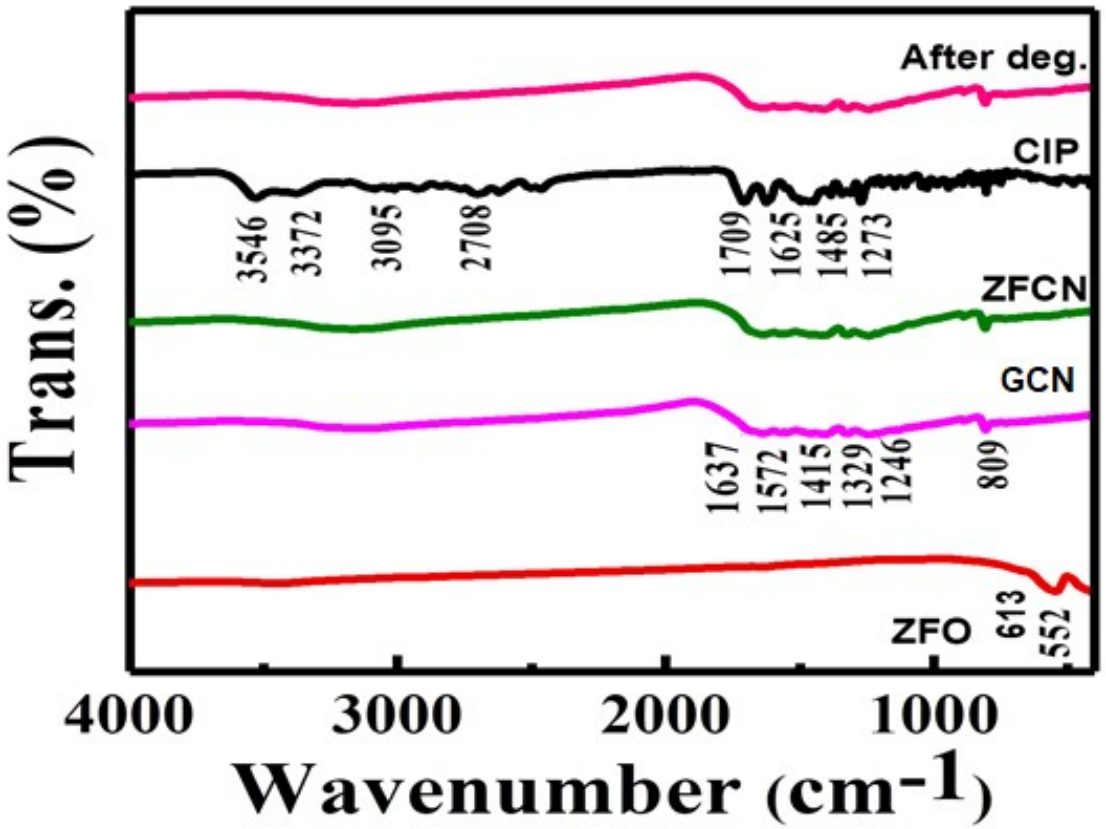


Fig. S7 FTIR spectrum of ZFO, GCN, ZFCN, CIP and after degradation of the catalyst.

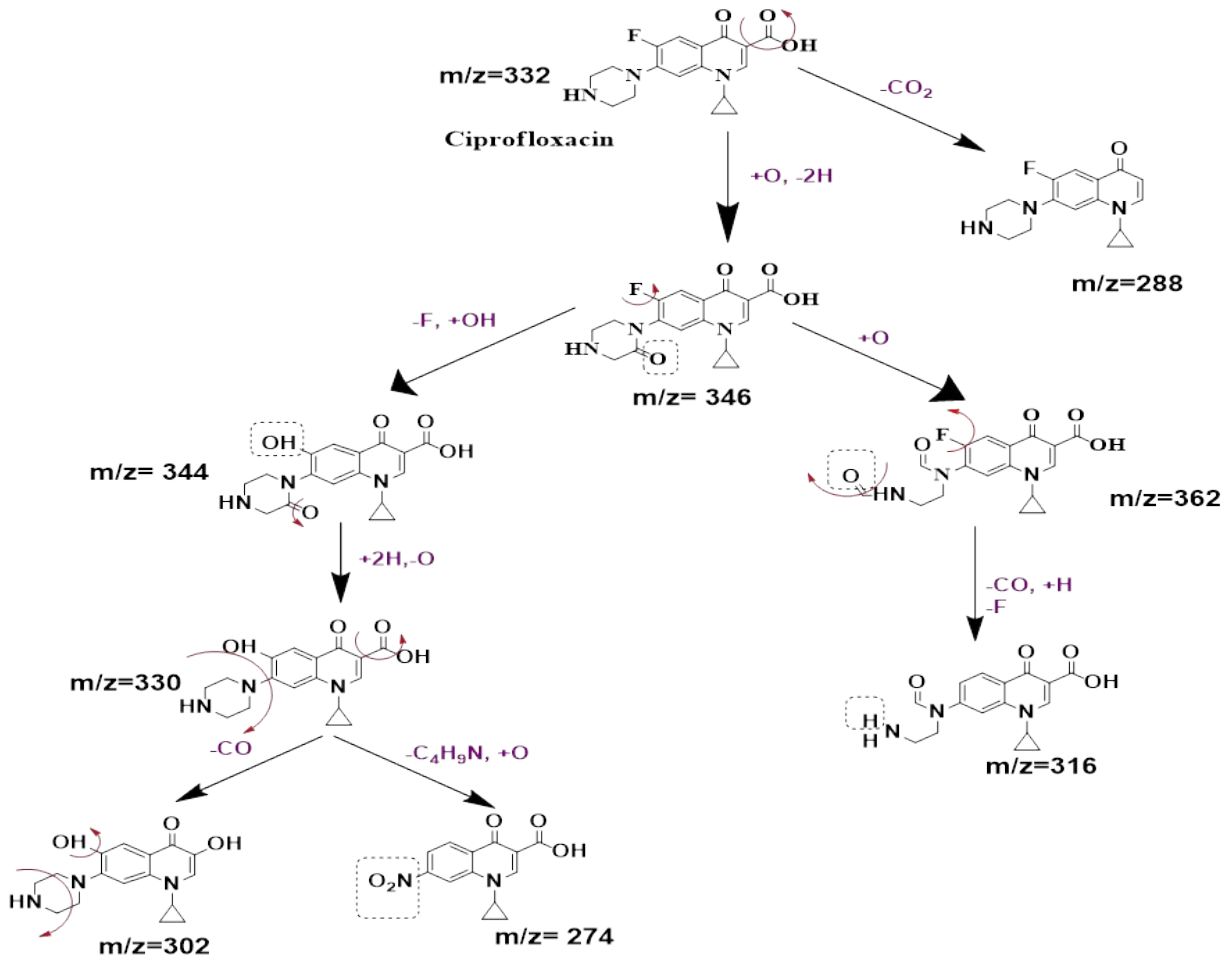
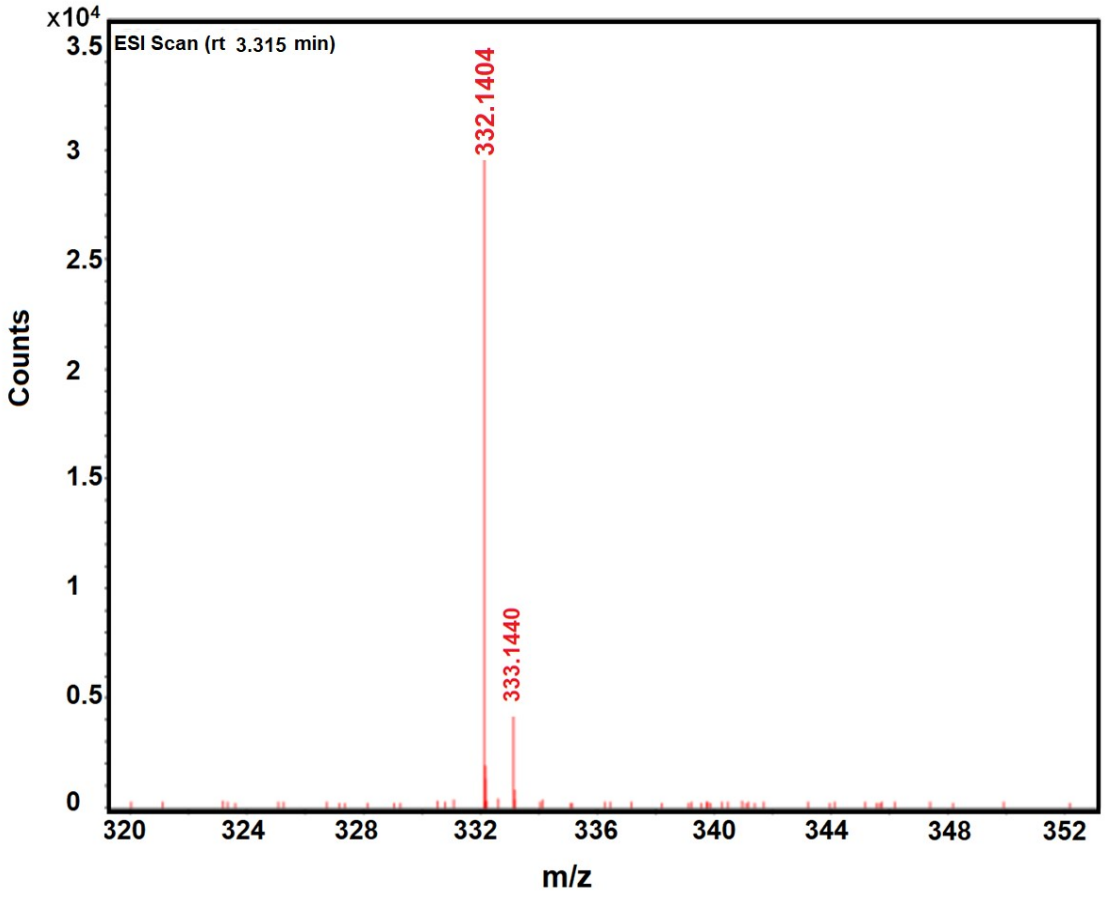


Fig. S8 Proposed pathway of CIP degradation.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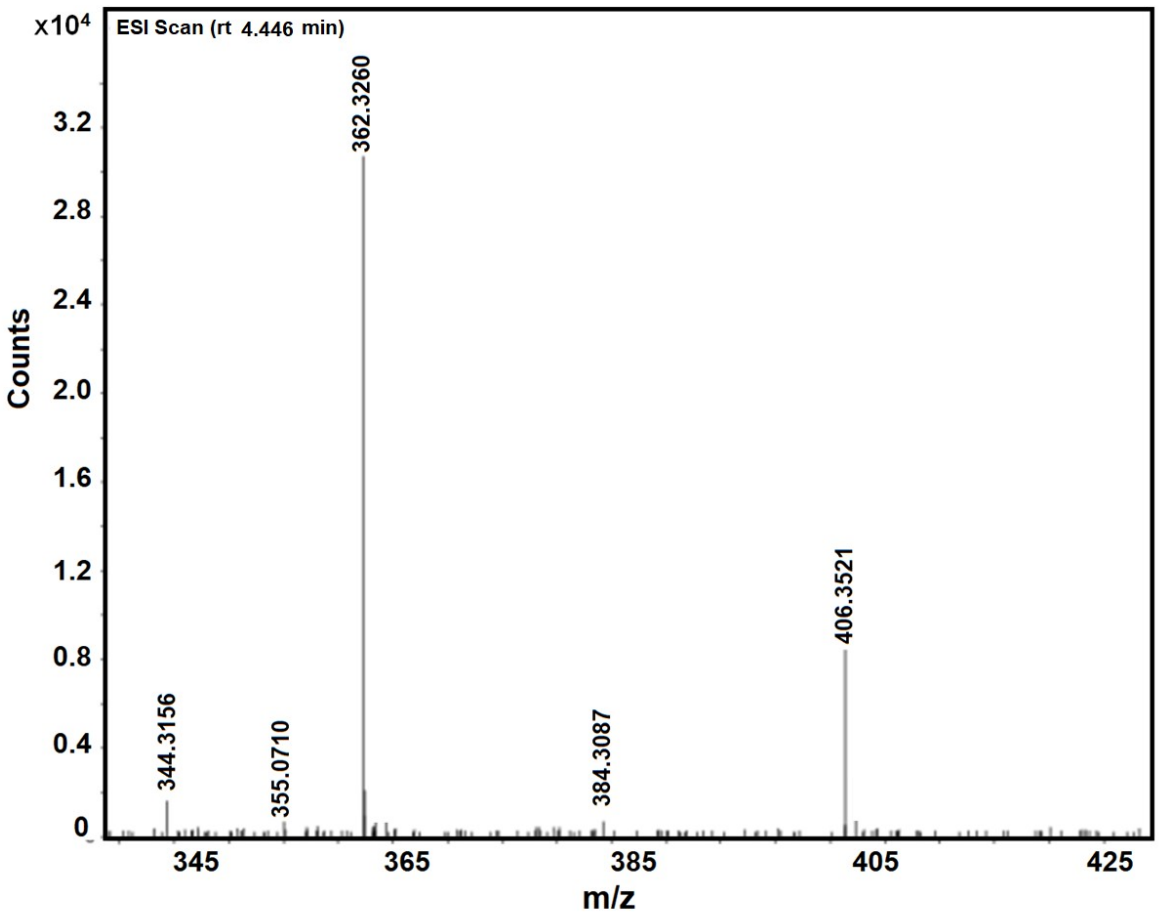
ESI Scan (rt 3.315 min)
332.1404
333.1440
Counts
m/z
3.5
3
2.5
2
1.5
1
0.5
0
320
324
328
332
336
340
344
348
352

Fig. S9 (a)


x10^4
ESI Scan (rt 4.446 min)
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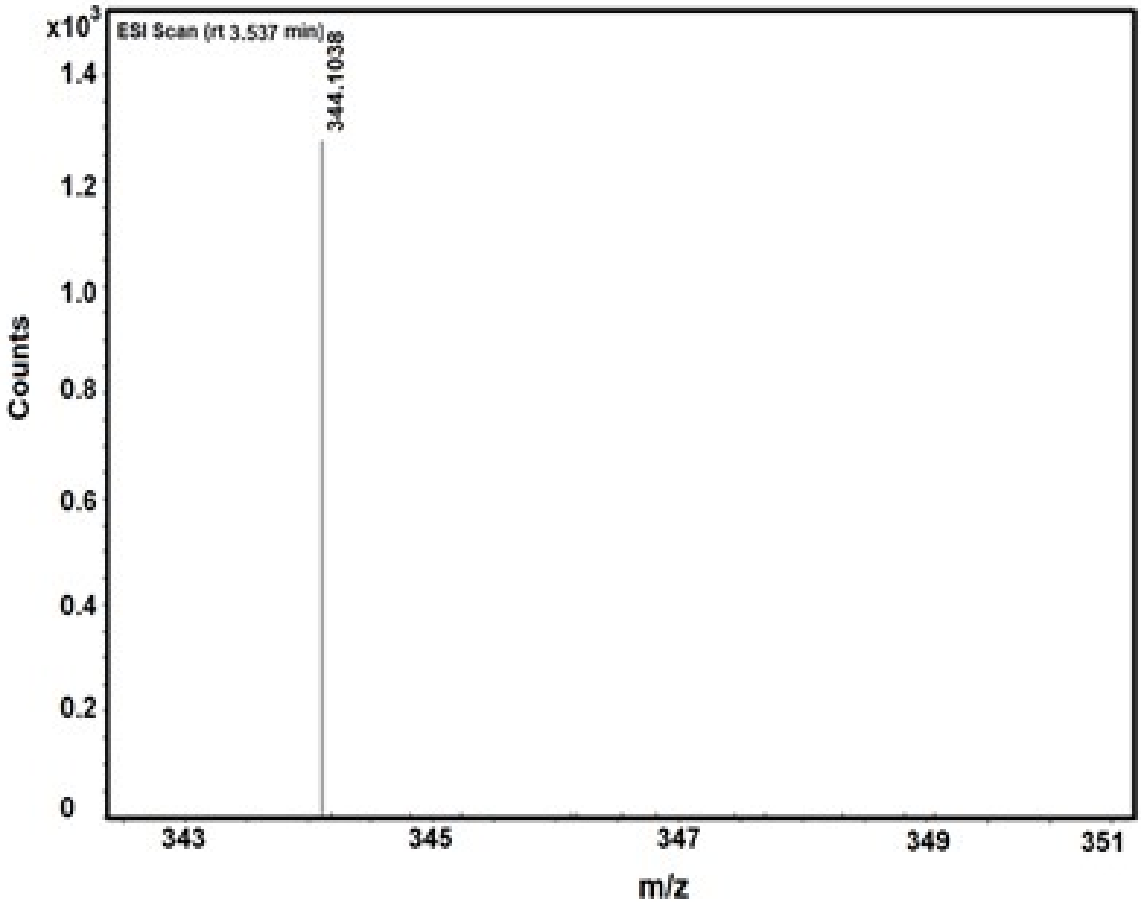
406.3521
344.3156
355.0710
384.3087
Counts
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
345
365
385
405
425
m/z

Fig. S9 (b)


x10^3
ESI Scan (rt 3.537 min)
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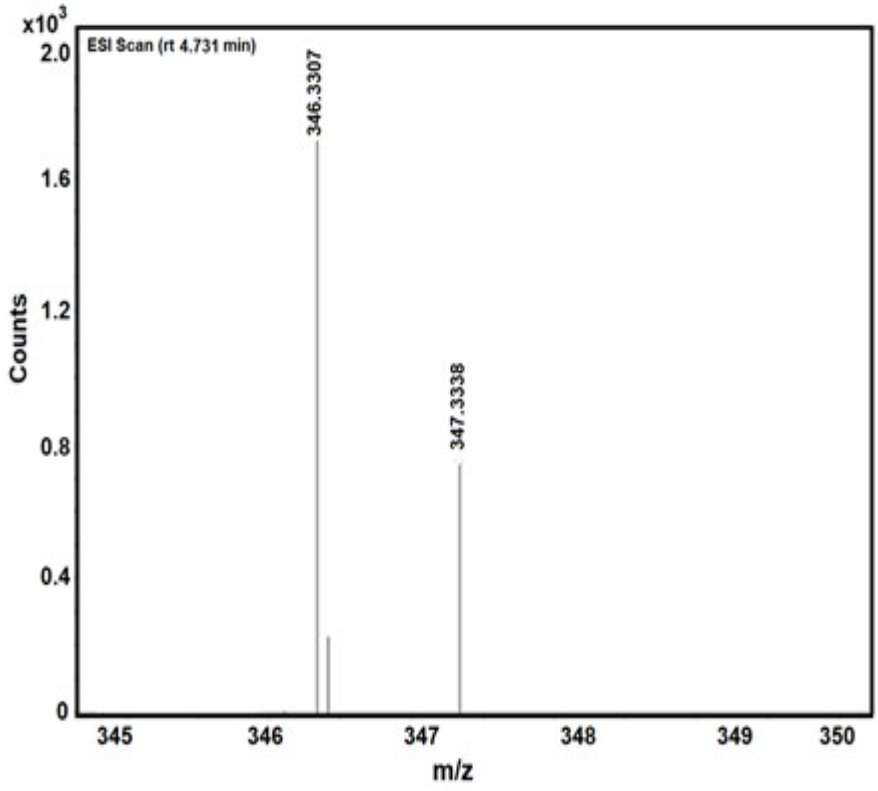
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
Counts
343
345
347
349
351
m/z

Fig. S9 (c)


x10^3
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1.6
1.2
0.8
0.4
0
Counts
ESI Scan (rt 4.731 min)
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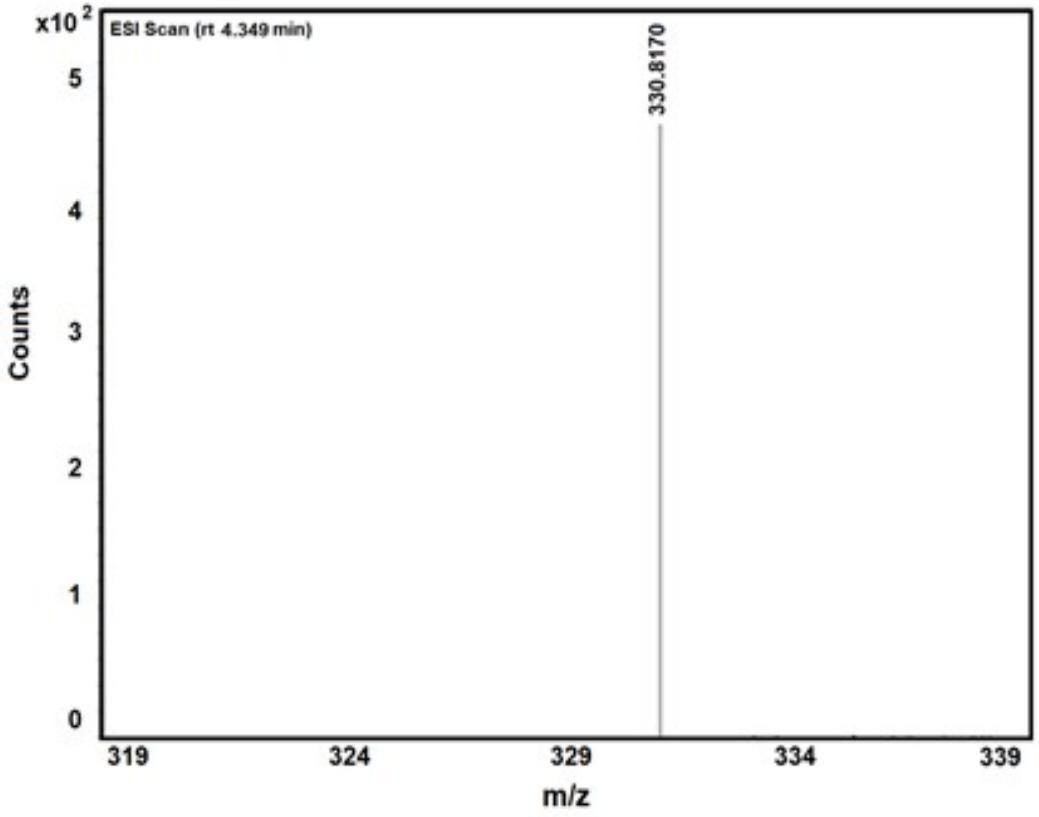
345
346
347
348
349
350
m/z

Fig. S9 (d)


x10 2
ESI Scan (rt 4.349 min)
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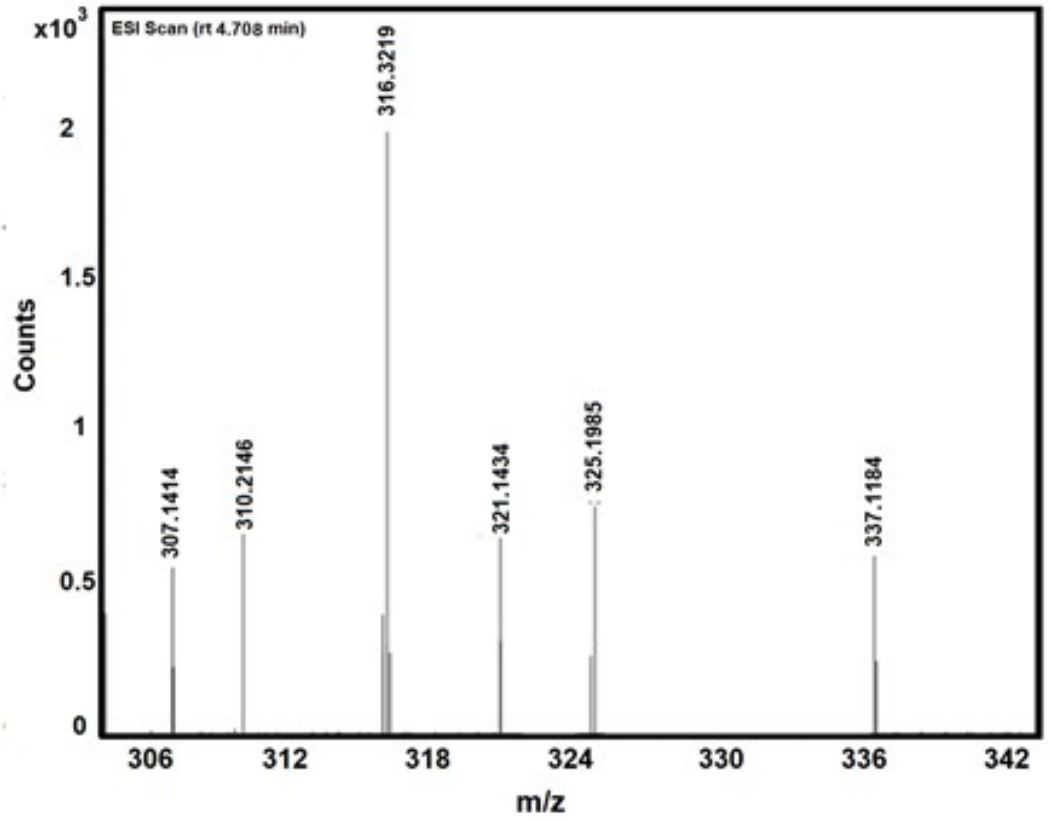
Counts
5
4
3
2
1
0
319
324
329
334
339
m/z

Fig. S9 (e)


x10^3
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307.1414
310.2146
321.1434
325.1985
337.1184
Counts
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1.5
1
0.5
0
306
312
318
324
330
336
342
m/z

Fig. S9 (f)

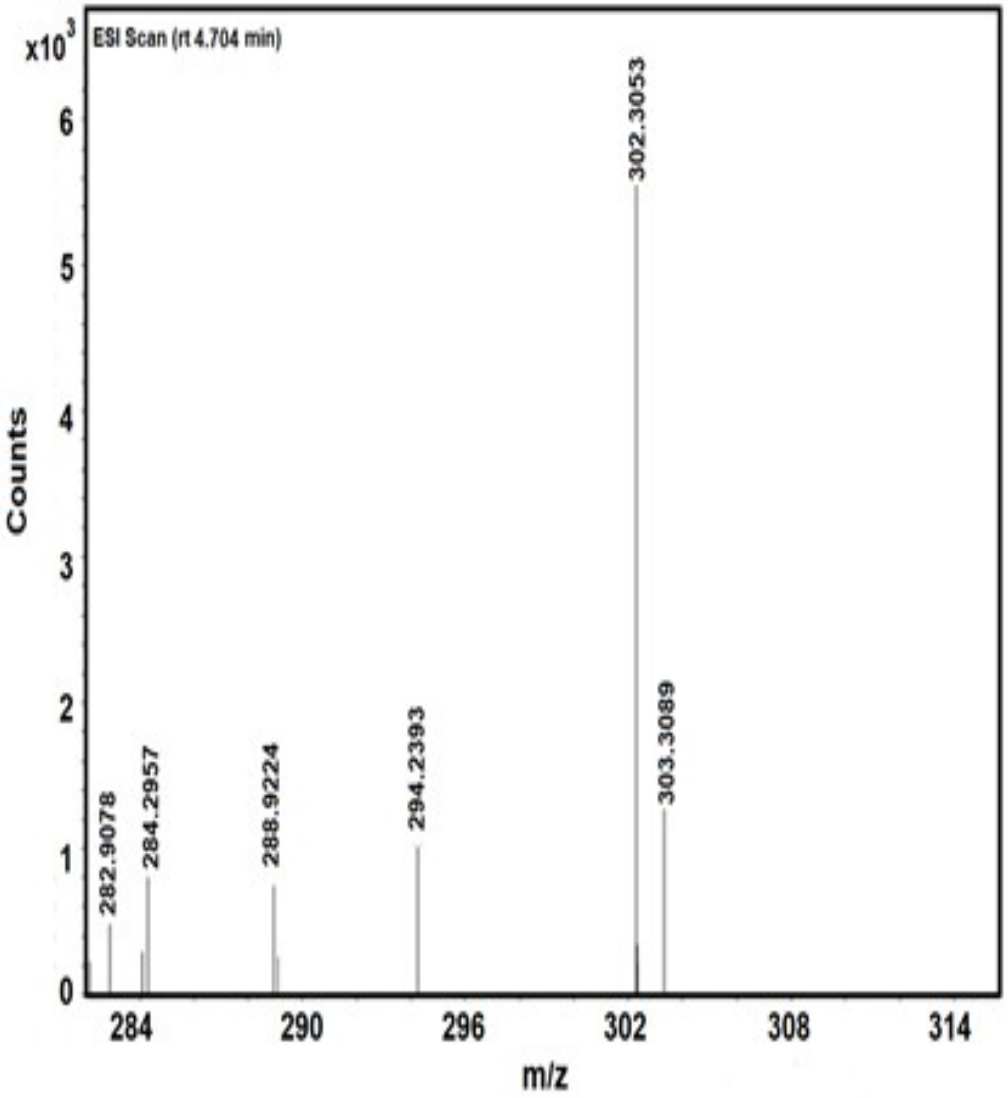
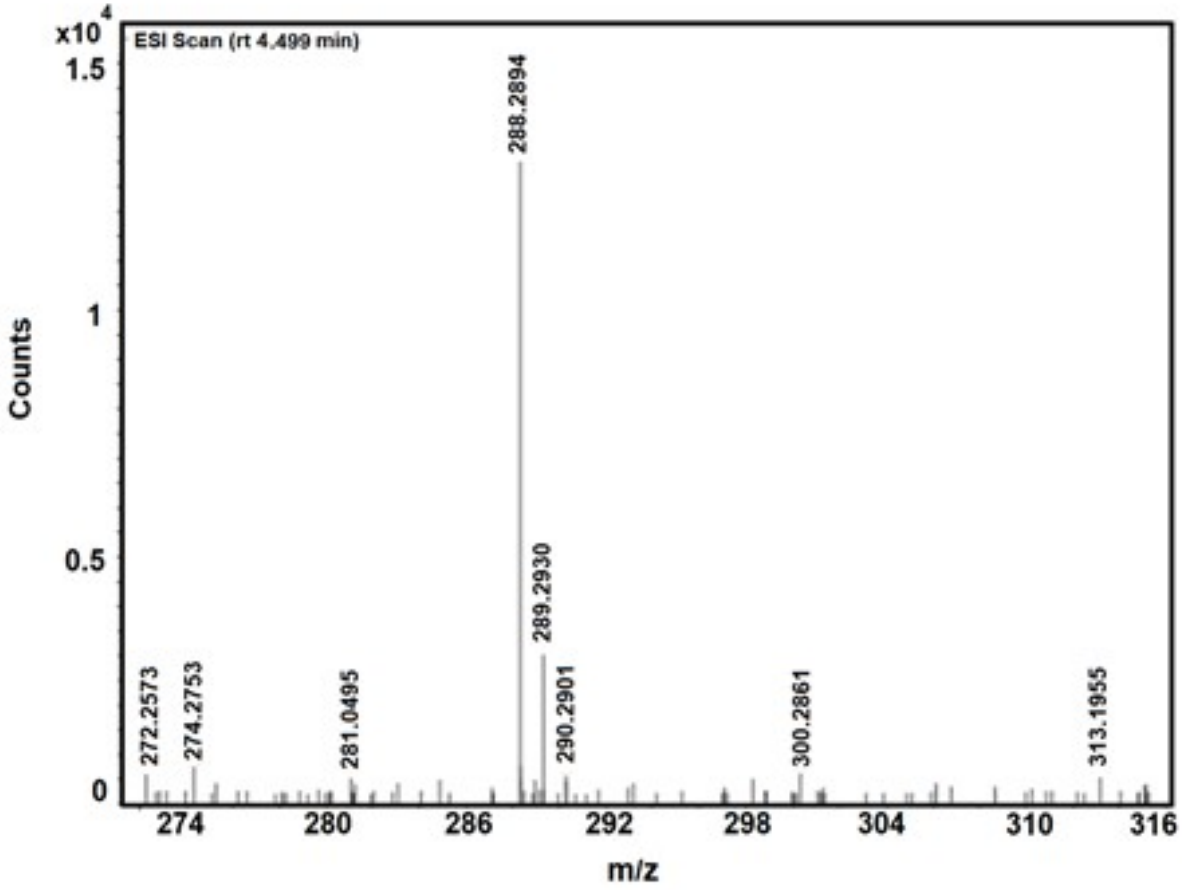

ESI Scan (rt 4.704 min)
x10^3
Counts
6
5
4
3
2
1
0
282.9078
284.2957
288.9224
294.2393
302.3053
303.3089
284
290
296
302
308
314
m/z

Fig. S9 (g)


ESI Scan (rt 4.499 min)
x10^4
1.5
1
0.5
0
Counts
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289.2930
272.2573
274.2753
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290.2901
300.2861
313.1955
274
280
286
292
298
304
310
316
m/z

Fig. S9 (h)

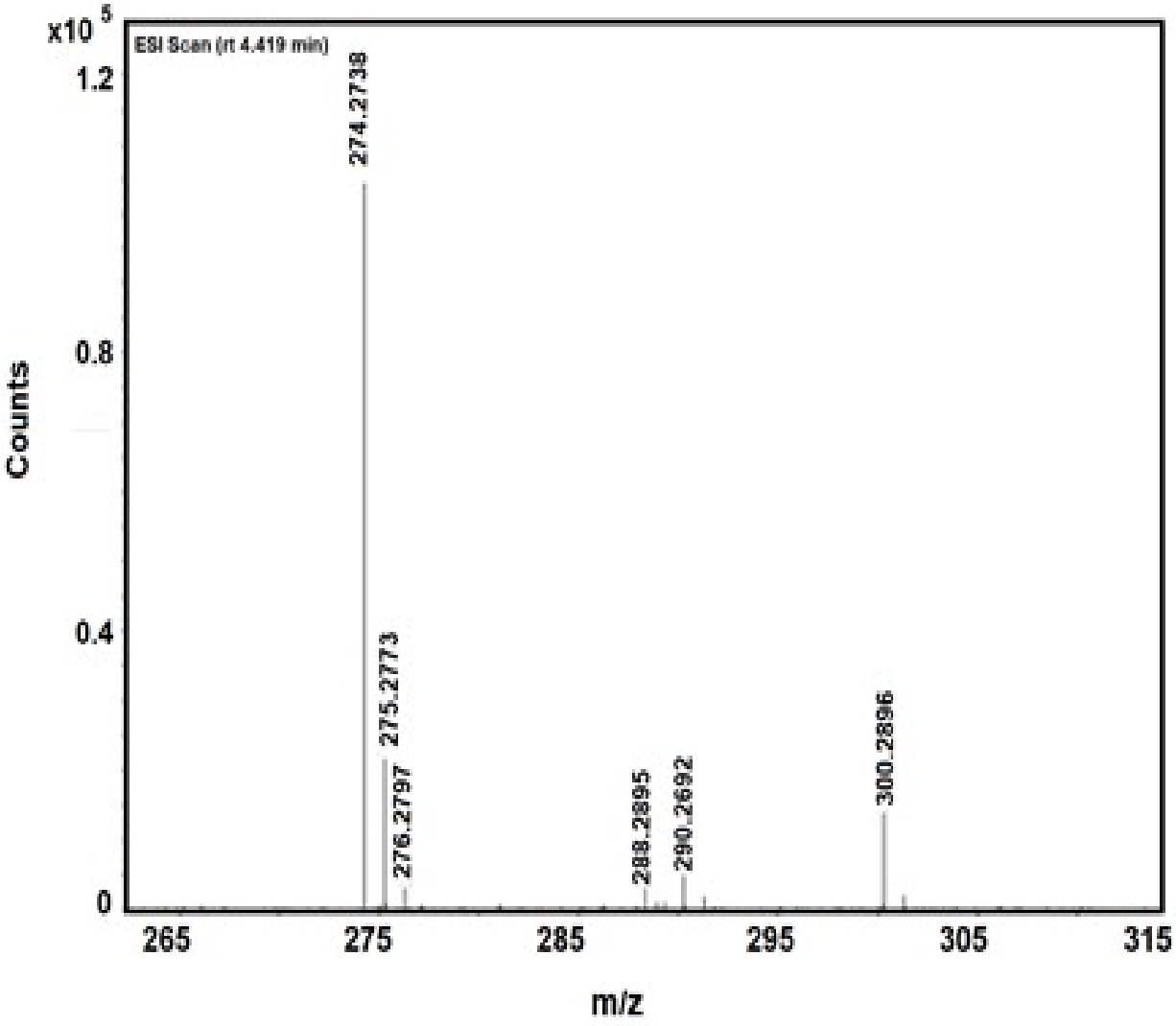
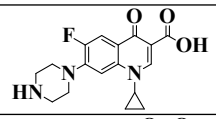
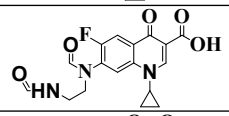
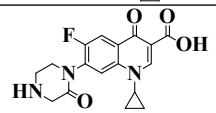
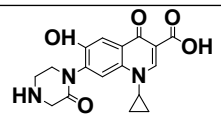
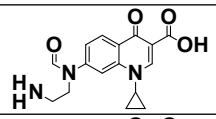
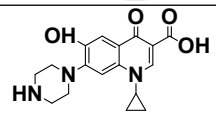
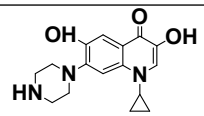
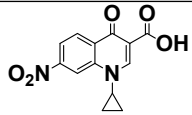
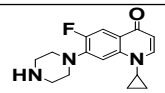


Fig. S9 (i)

Fig. S9 Mass spectra for intermediates are shown for (a-i) at various time points during the degradation of ciprofloxacin.

Table S1- The possible intermediates of CIP degradation in the ZFCN/UV system

Number	Formula	RT (min)	m/z	Proposed structure
CIP	$C_{17}H_{18}FN_3O_3$	3.31	332	
P1	$C_{17}H_{16}FN_3O_5$	4.46	362	
P2	$C_{17}H_{16}FN_3O_4$	4.73	346	
P3	$C_{17}H_{17}N_3O_5$	3.57	344	
P4	$C_{16}H_{17}N_3O_4$	4.70	316	
P5	$C_{17}H_{19}N_3O_4$	4.34	330	
P6	$C_{16}H_{19}N_3O_3$	4.02	302	
P7	$C_{13}H_{10}N_2O_5$	4.41	274	
P8	$C_{16}H_{18}FN_3O$	4.49	288	

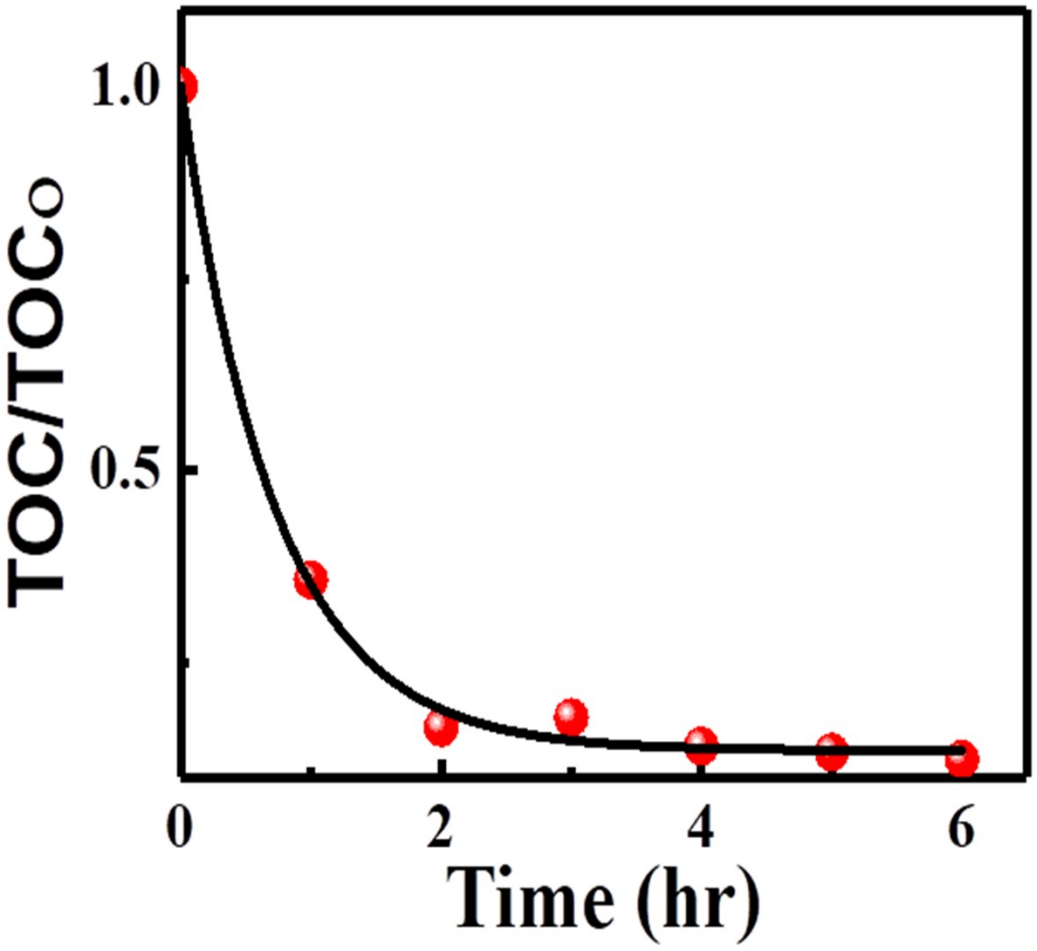


Fig. S10 Kinetic fitting of TOC of CIP degradation

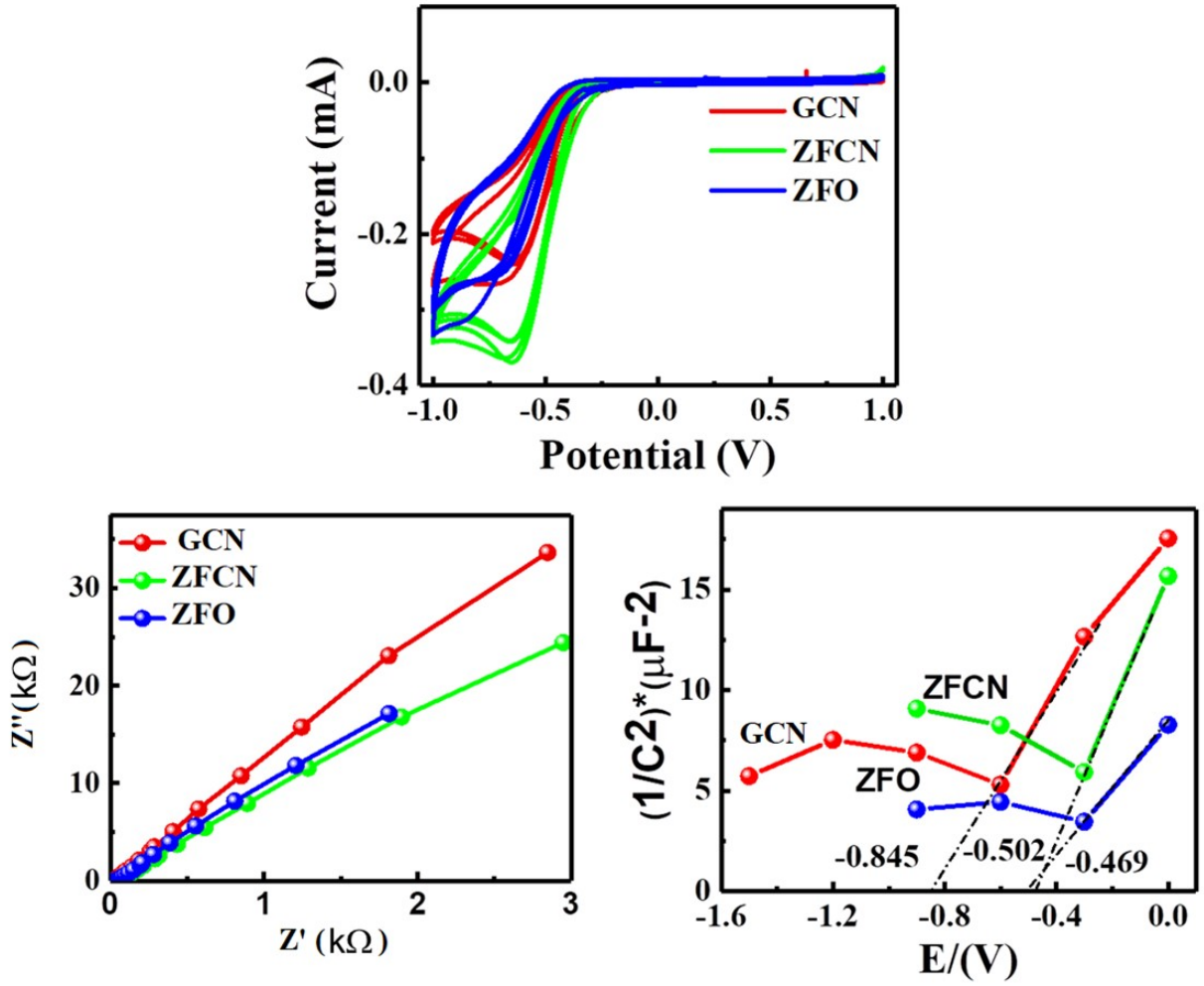


Fig. S11 Electrochemical study of GCN, ZFCN and ZFO (a) cyclic voltammetry, (b) Nyquist plot and (c) Mott-schottky plot.

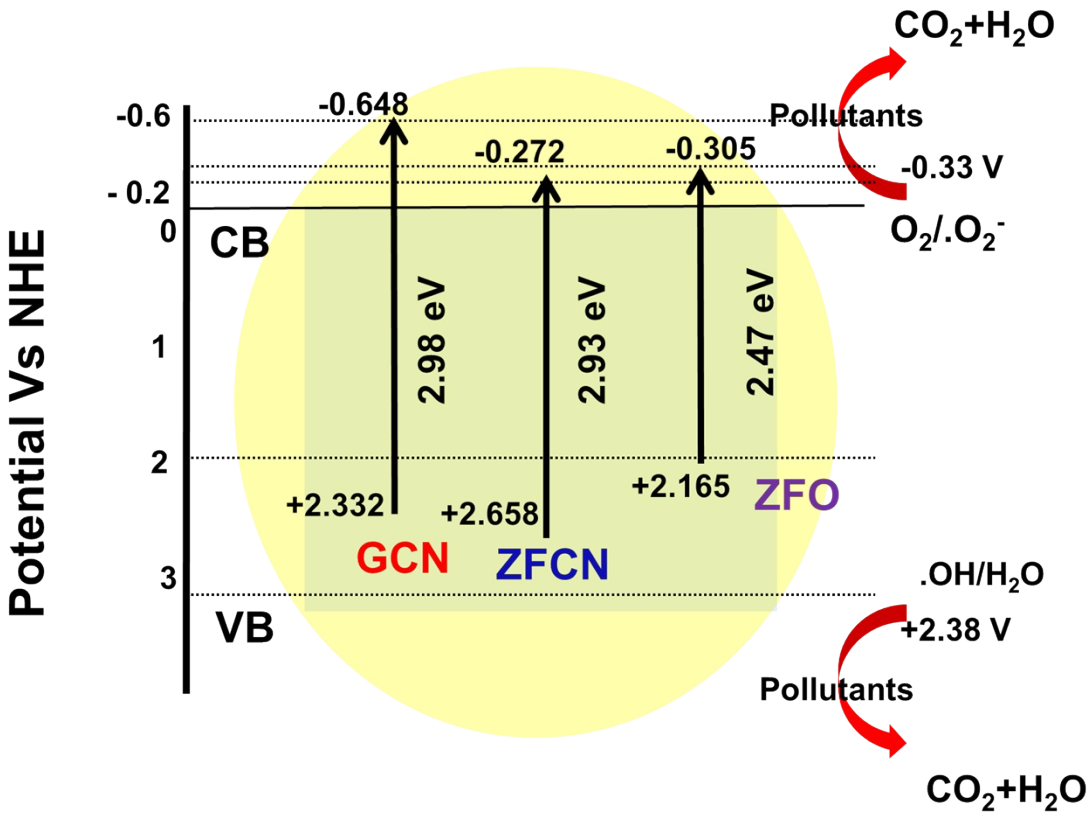


Fig. S12 Band structure of GCN, ZFCN and ZFO.

Table S2 BET surface area of the catalyst.

Samples	**BET Surface Area ($m^2 g^{-1}$)**
GCN	24.80
ZFO	6.06
ZFCN	12.90

Table S3. Comparisons between the present method's degradation efficiency and that of other methods for the degradation of the CIP that have been published in the literature.

Method/Catalyst	**pH**	**Initial Concentration**	**Degradation efficiency (%)**	**References**
Ozonation	5	20 mg/L	90	Hassani et al., 2016
Ionization Radiation	4.8	10 mg/L	70	Tegze et al., 2019
Photocatalysis (TiO_2)	5.6	10 mg/L	89.62	Verma et al. 2017
Solar Light (TiO_2/Ti)	6.3	10 mg/L	88.86	Sayed et al., 2018
Ferrate/ Persulfate	4	30 mg/L	91.5	Li et al., 2019
Electro-chemical	4.5	20 mg/L	84	Matzek et al., 2018
Membrane	8.63	50 mg/L	90	Vinu et al., 2010
Photocatalysis	**5**	**10 mg/L**	**95**	**Present Work**

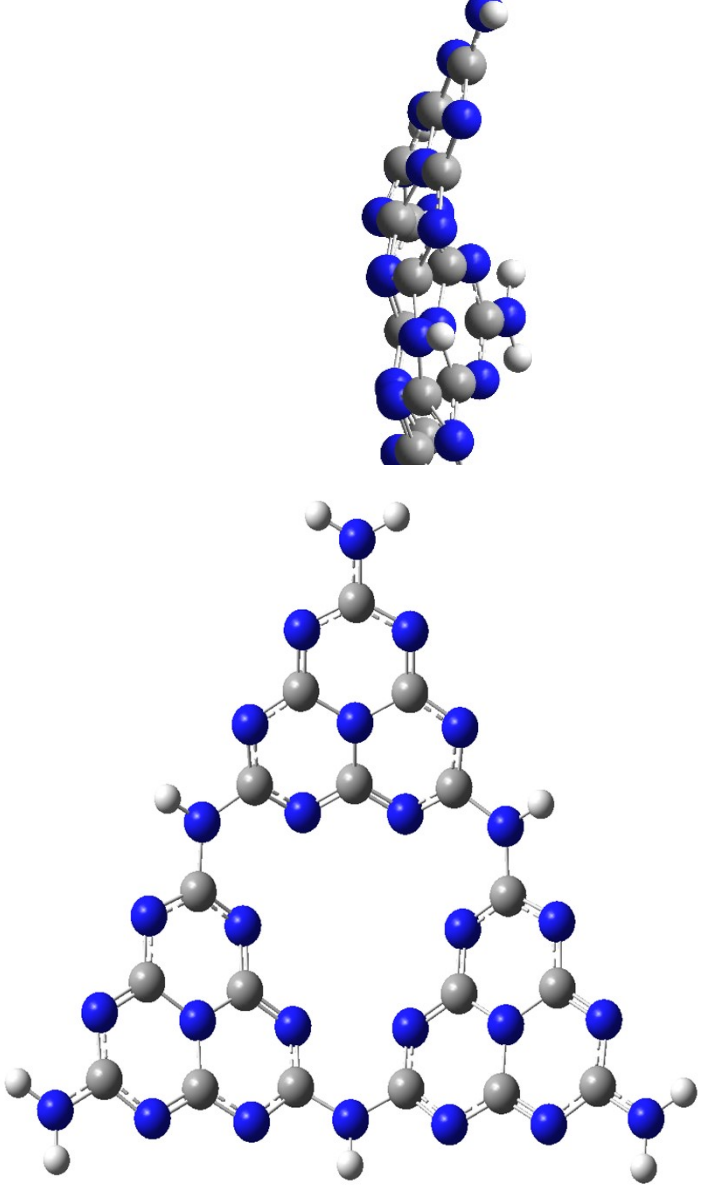


Fig. S13 Optimized structure of GCN sheet (Left: side view, Right: front view).

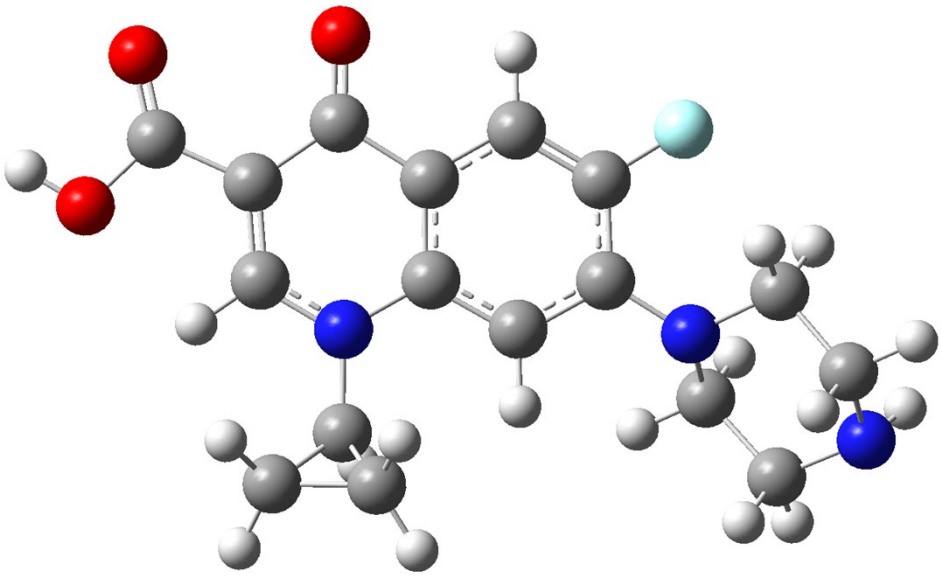


Fig. S14 Optimized structure of ciprofloxacin molecule.