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Supporting Information

Nickel (II) complex covalently anchored on core shell structured SiO_2@Fe_3O_4 nanoparticles: A robust and magnetically retrievable catalyst for direct one-pot reductive amination of ketones

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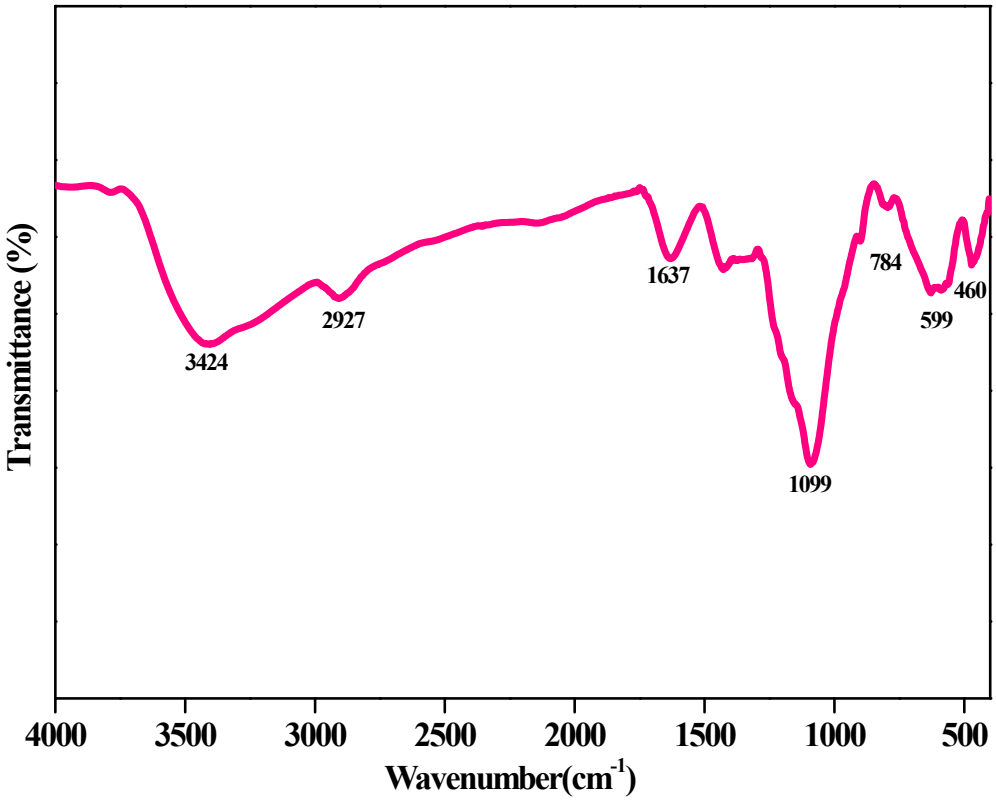


Fig. S1 FTIR spectrum of recovered catalyst (obtained after 8 runs).

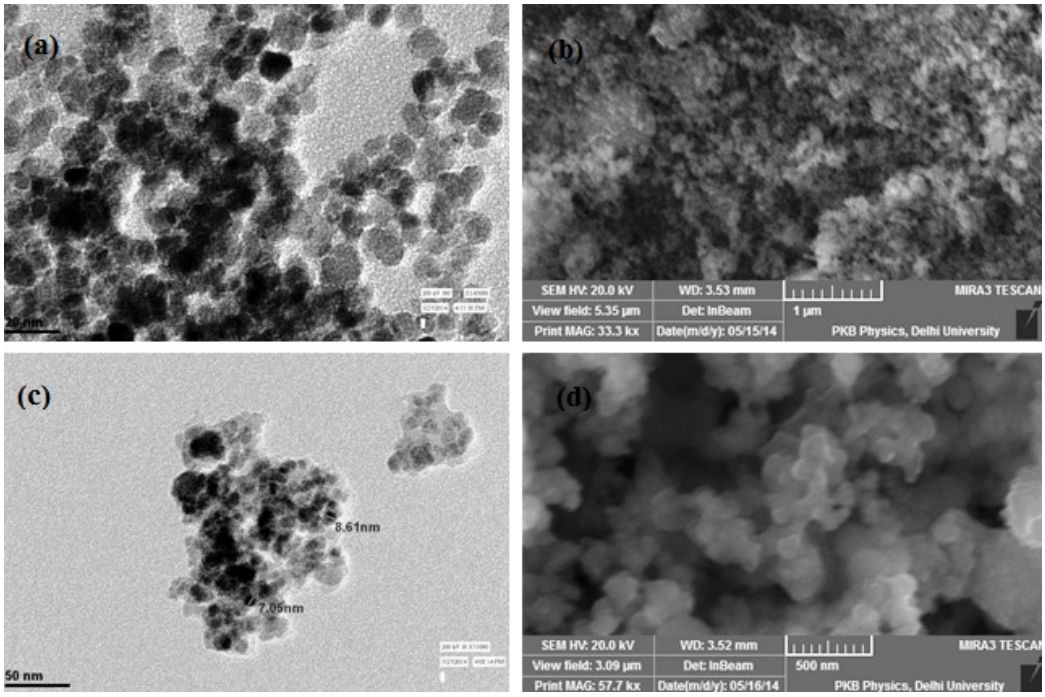


Fig. S2 TEM images of (a) $SiO_2@Fe_3O_4$, (c) recovered Ni-2AF@Am-$SiO_2@Fe_3O_4$ nanocatalyst (obtained after 8 runs) and SEM images of (b) $SiO_2@Fe_3O_4$, (d) recovered Ni-2AF@Am-$SiO_2@Fe_3O_4$ nanocatalyst (obtained after 8 runs).

Table S1 Screening of various catalysts for the synthesis of secondary amines *via* direct one-pot reductive amination of ketones[a]

Entry	Catalyst	Conversion (%)[b]
1.	No catalyst	-
2.	$NiSO_4.6H_2O$	58
3.	$NiCl_2$	87
4.	$NiBr_2$	82
5.	$Ni(NO_3)_2.6H_2O$	65
6.	$Ni(OAc)_2.4H_2O$	99
7.	Ni-ACF@Am-$SiO_2@Fe_3O_4$	100

[a]Reaction Conditions: [Aniline (1mmol), acetone (1 mmol), $NaBH_4$ (1 mmol), catalyst (25 mg), r.t.].

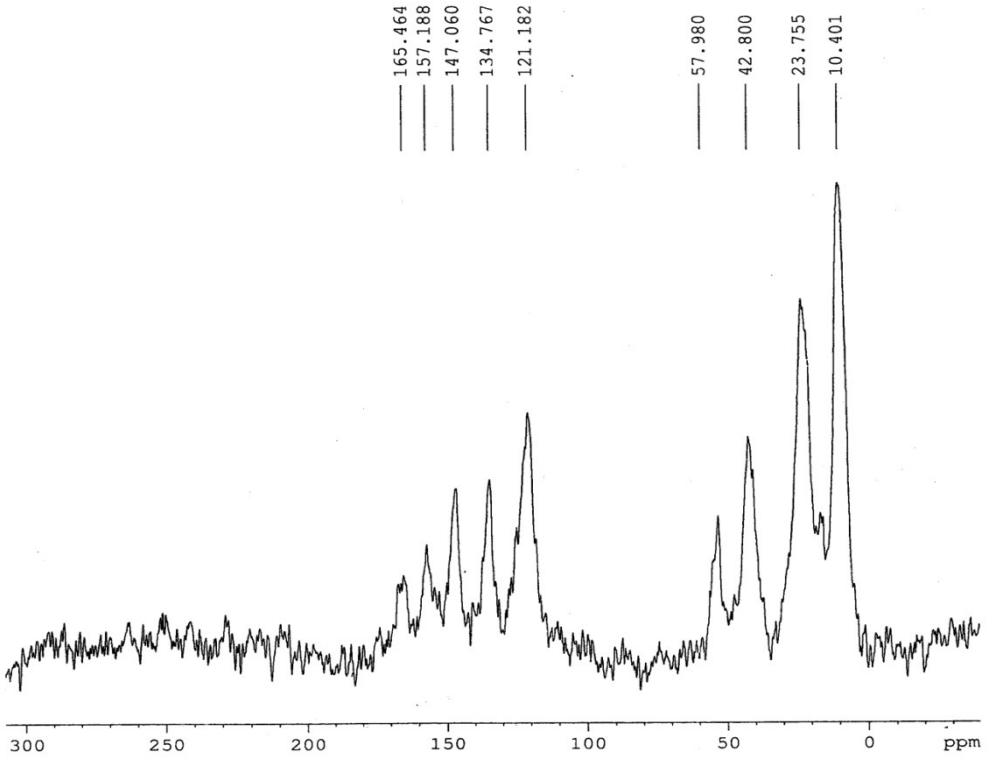
[b]Conversion % was determined by GC-MS.

Table S2 Effect of reductant on the synthesis of secondary amines *via* direct one-pot reductive amination of ketones[a]

Sl. No	Reductant	Conversion (%)[b]
1.	DIBAL	Trace
2.	Glucose	NR[c]
3.	Zinc	40
4.	$NaBH(OAc)_3$	95
5.	$NaBH_4$	100

[a]Reaction Conditions: [Aniline (1 mmol), acetone (1 mmol), reductant (1 mmol), Ni-ACF@Am-SiO_2@Fe_3O_4 (25 mg), r.t.].
[b]Conversion % was determined using GC-MS.
[c]No reaction.

^{13}C CPMAS SOLID-STATE NMR of non-magnetic silica analog



^{13}C cross-polarization-magic angle spinning (CP-MAS) solid-state NMR spectroscopy provides information regarding the coordination environment of carbon atoms present in the silica based organic-inorganic hybrid materials. The above figure depicts the ^{13}C CPMAS NMR spectrum of non magnetic silica analog containing organonickel complex. The

spectrum exhibits signals at δ = 10.4, 23.7 and 57.9 ppm which are assigned to the three methylene groups (Si–CH_2–, –CH_2– and –N–CH_2–) of the propyl chain of APTES. The peak at 42.8 ppm refers to the uncomplexed –N–CH_2– group. In addition to these peaks, the peaks appearing in the range of 120-160 ppm are attributed to the various aromatic carbons. Furthermore, the appearance of a new predominant peak at 165.4 ppm can be assigned to the carbon of C=N which clearly confirms the covalent grafting of organo nickel complex on the surface of the amine functionalized support material.

Mass spectra of synthesized amine products

Table 1 in the manuscript

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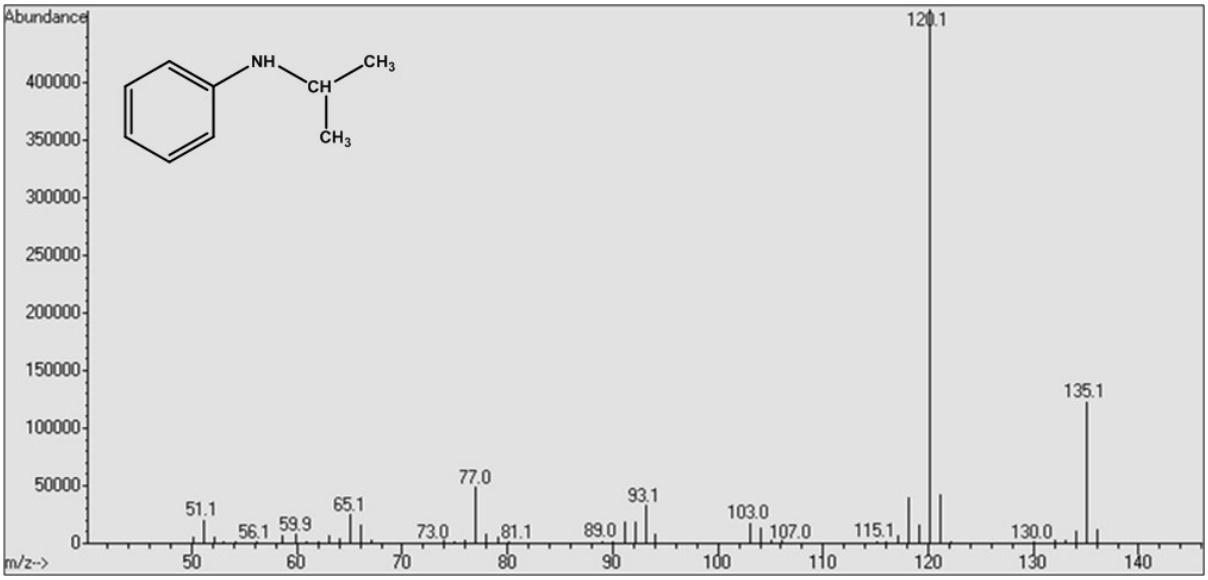

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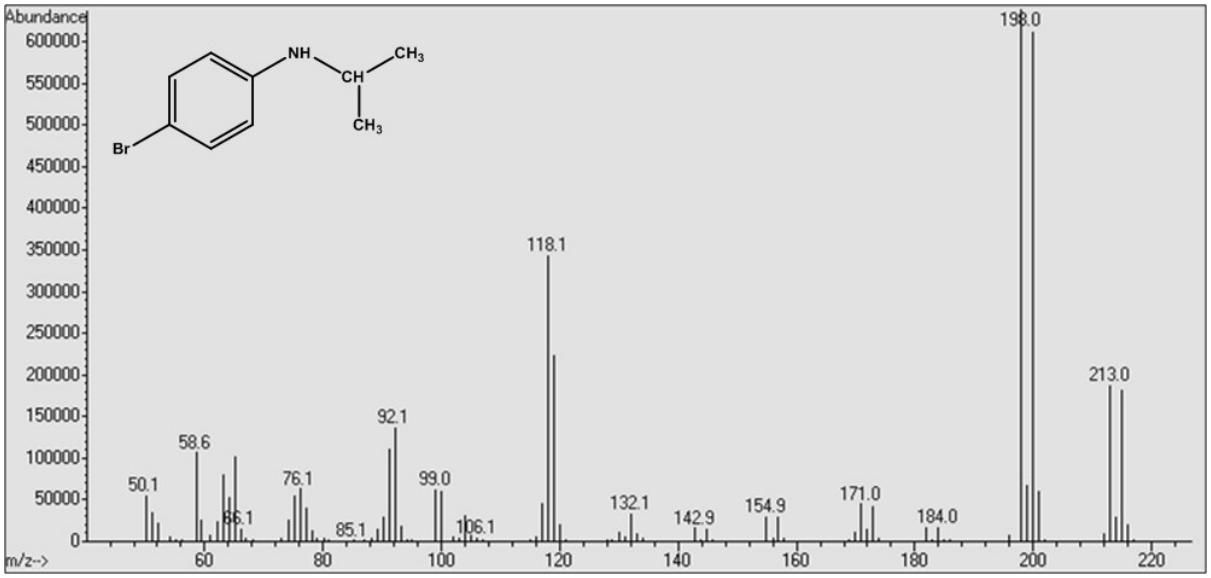

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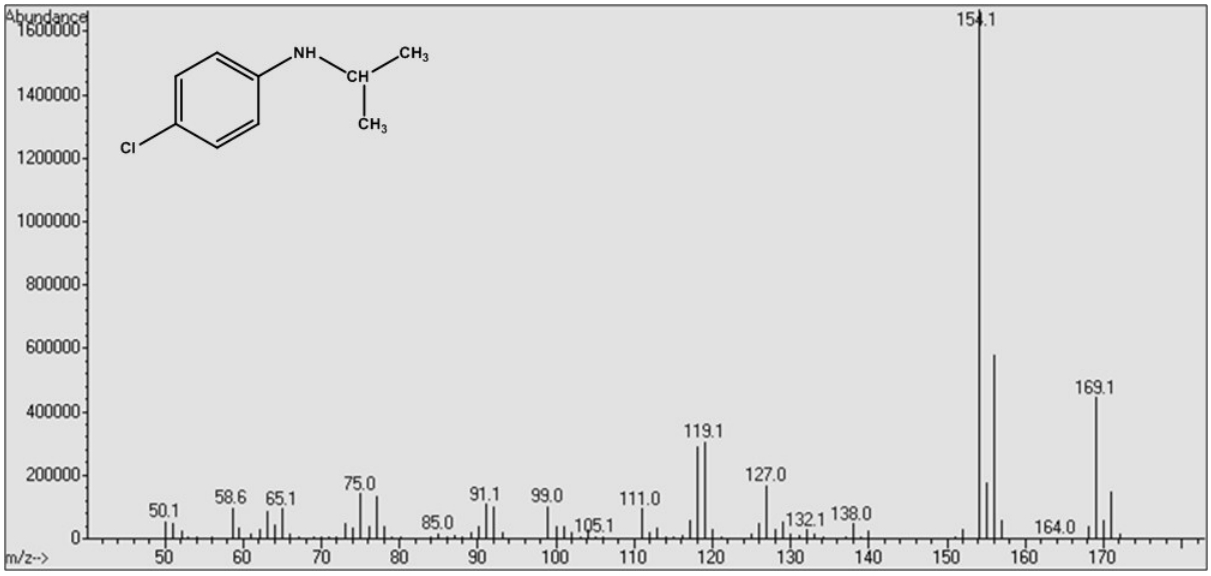

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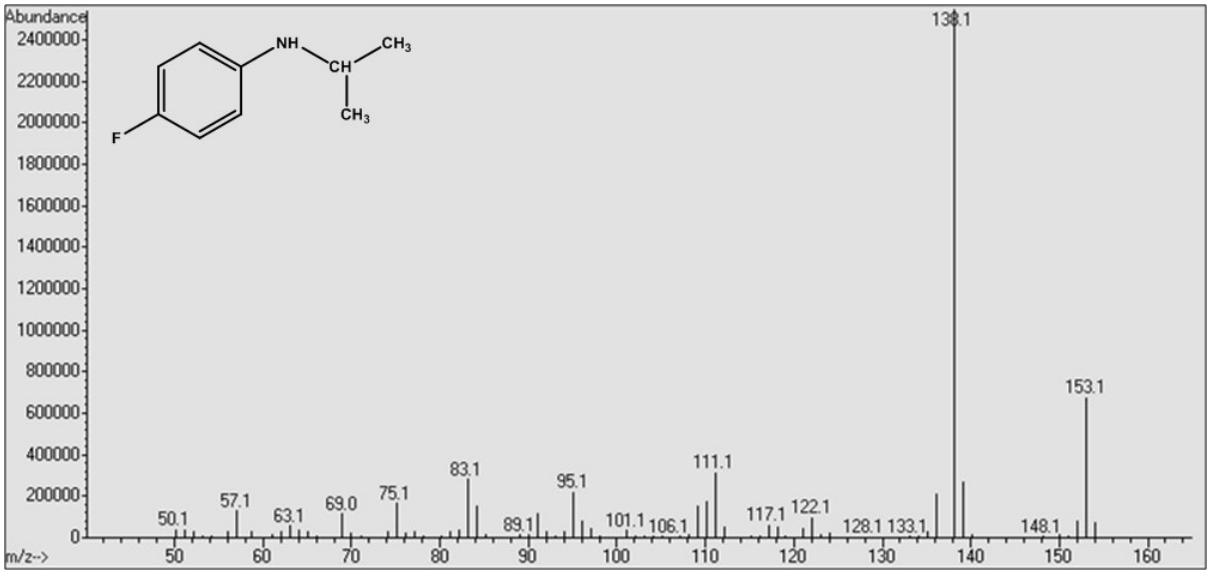
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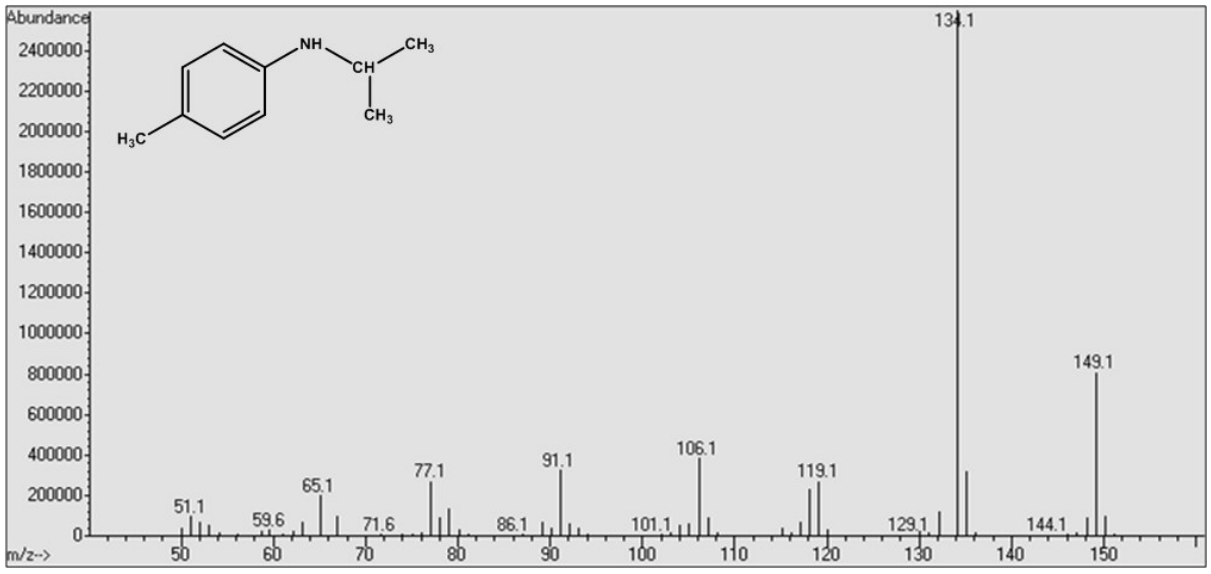
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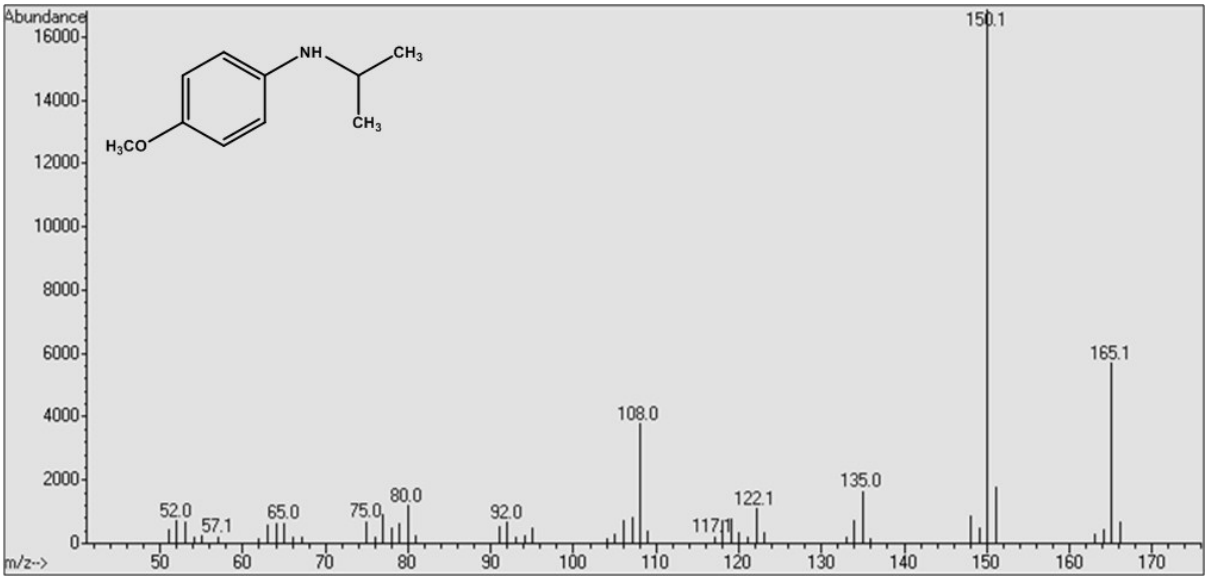

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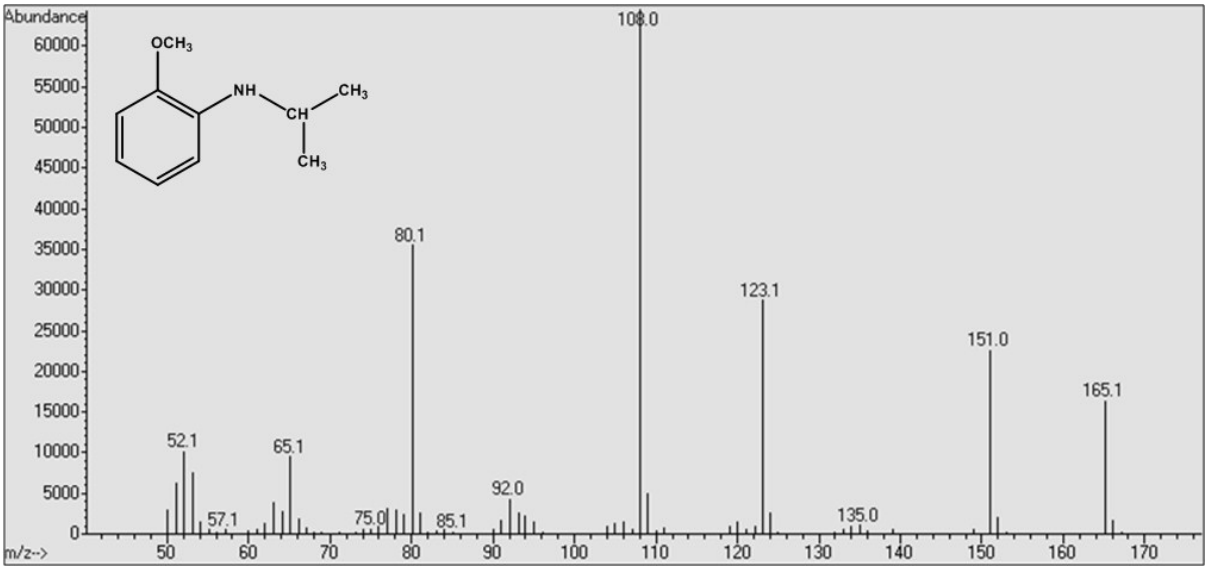

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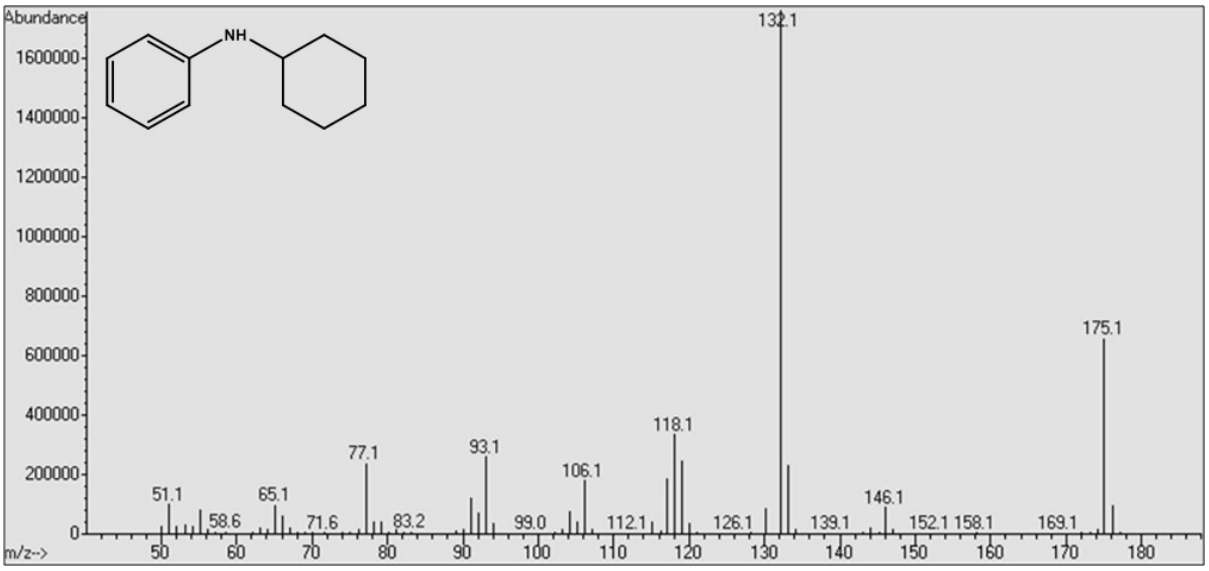

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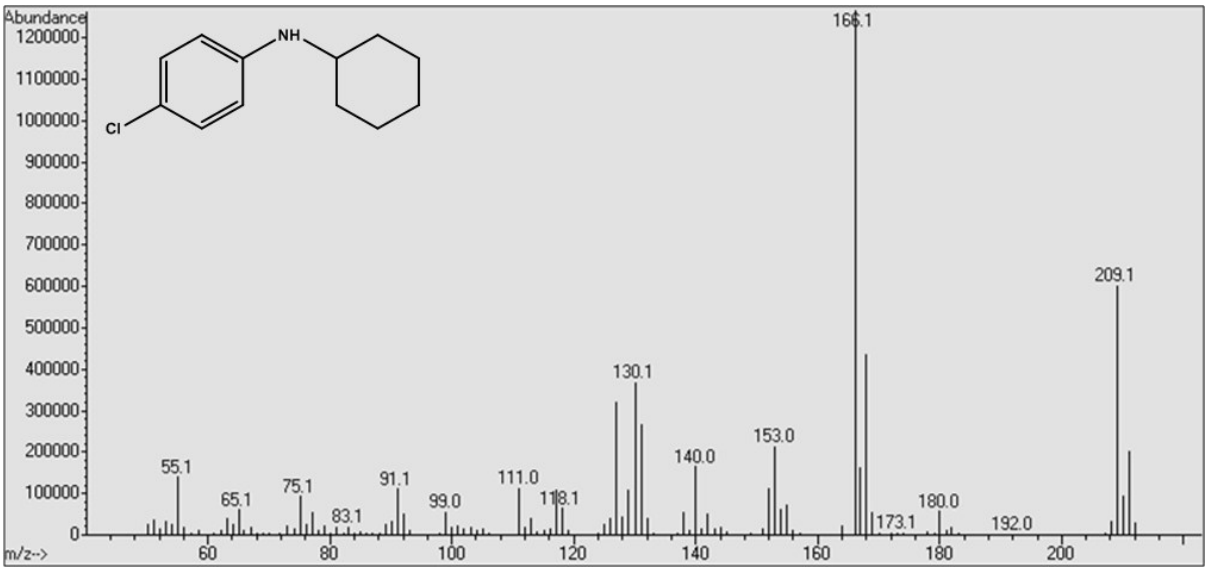

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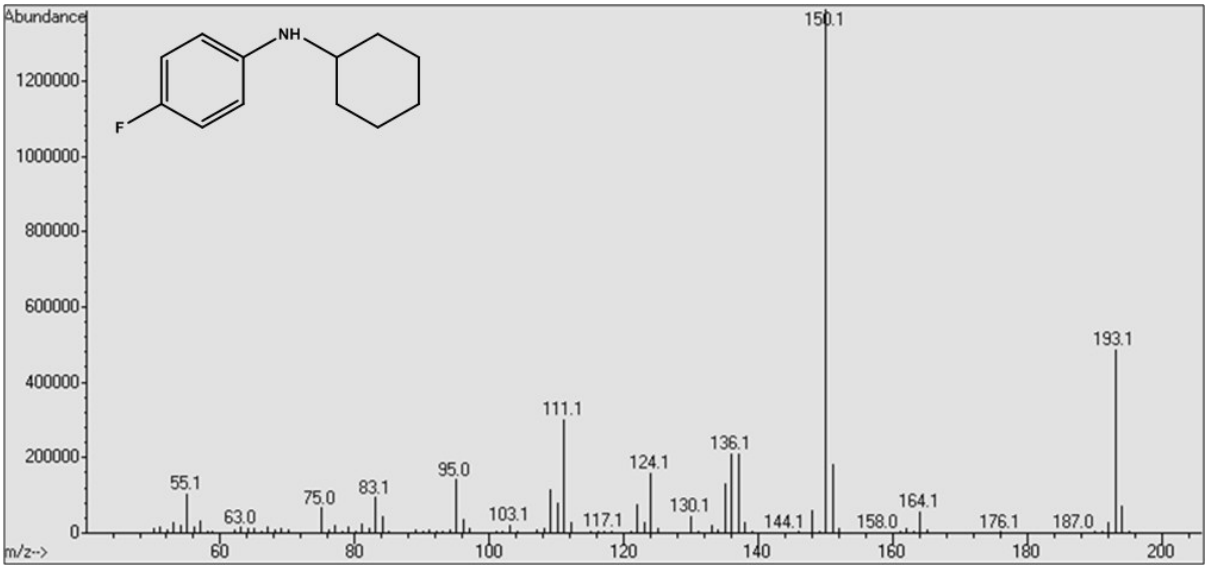

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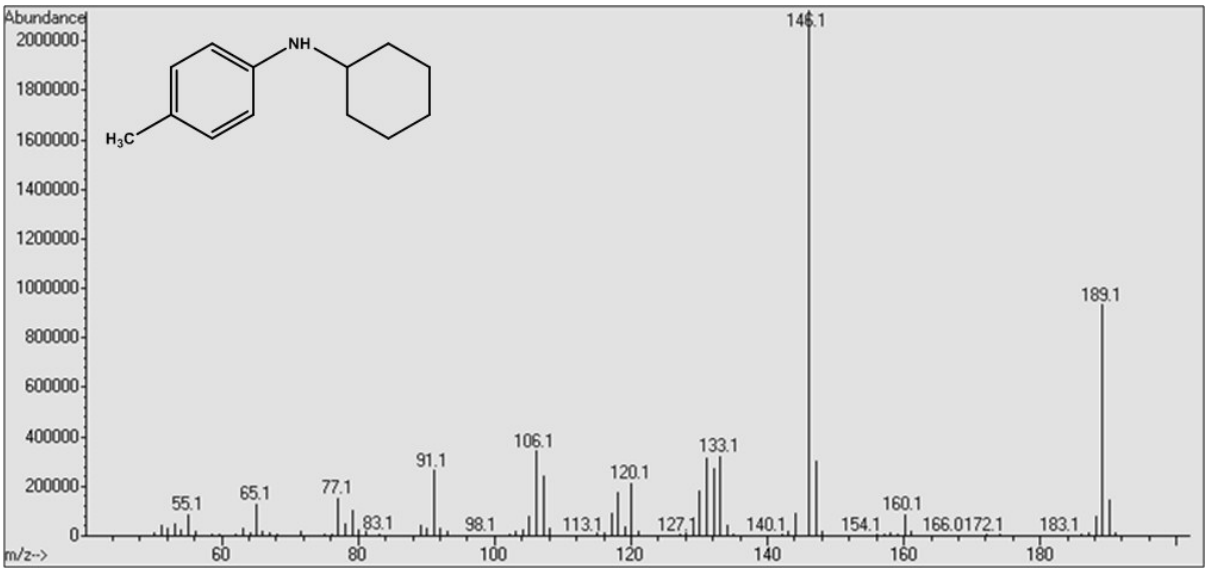

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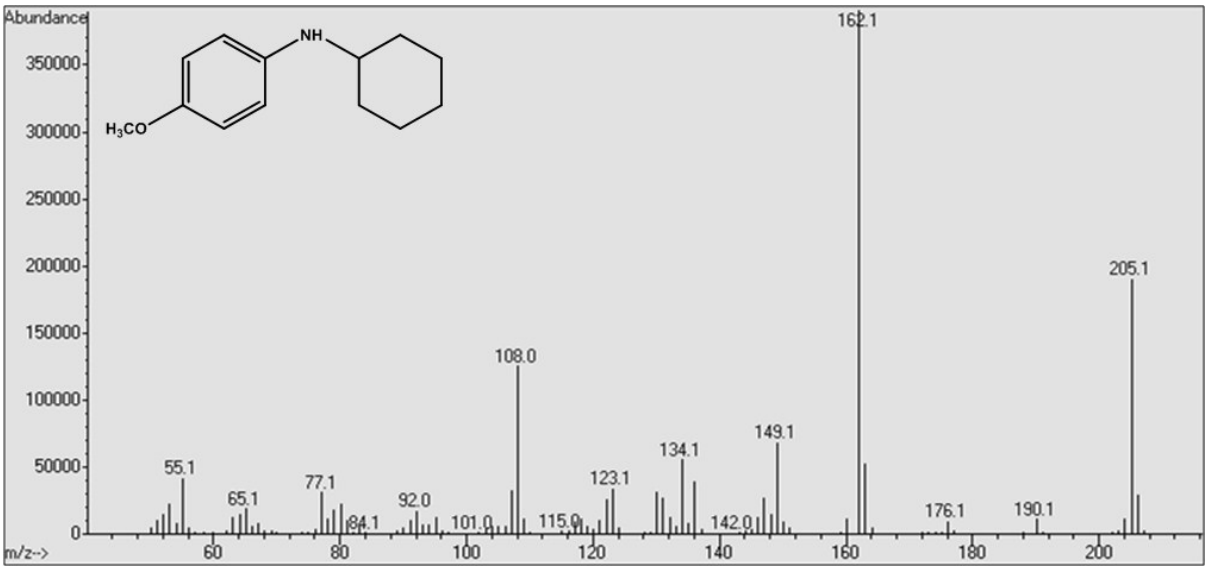

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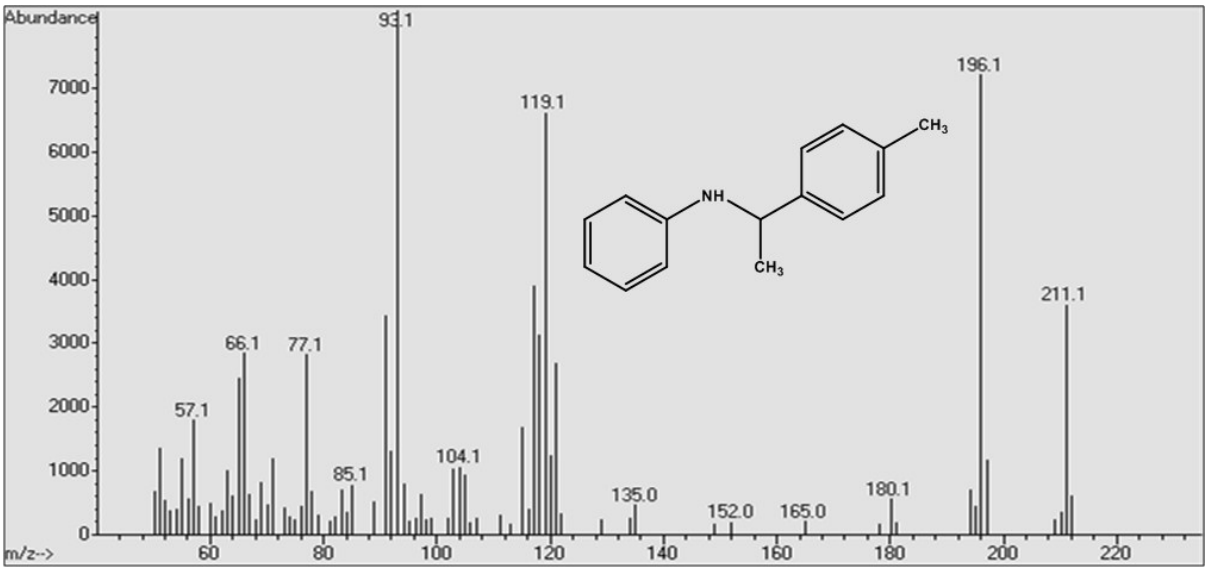

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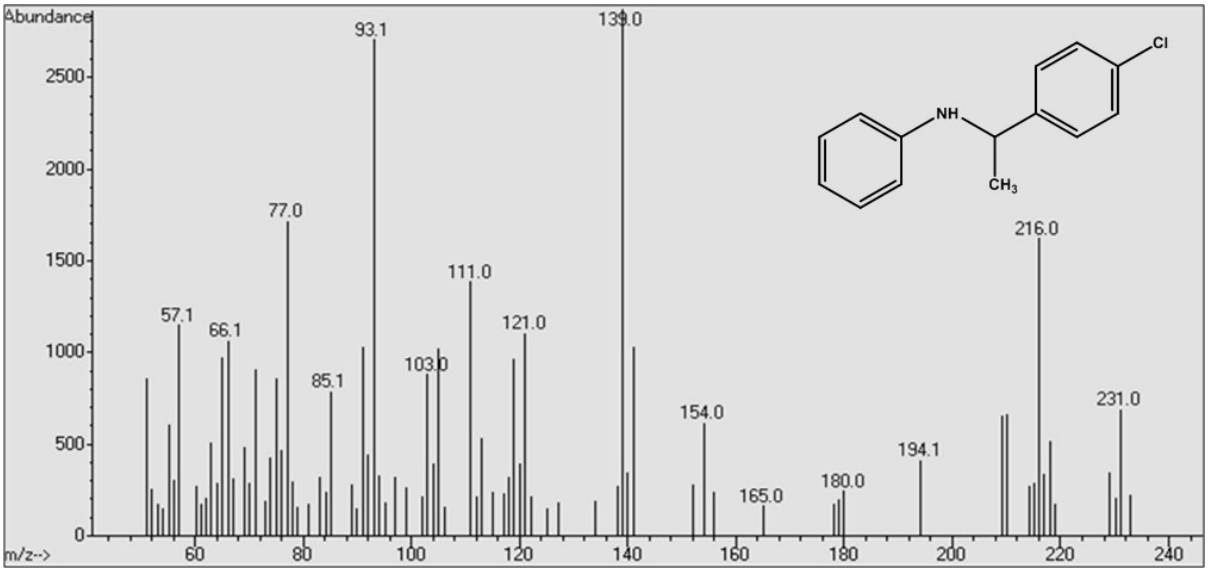

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