

**Unprecedented formation of 2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline] derivatives from
reaction of 3-phenacylideneoxindole with malononitrile or ethyl cyanoacetate**

Ya-Jing Xie, Jing Sun, Chao-Guo Yan*

Supporting Information

Figures 1-s3	2
¹H and ¹³C NMR spectra of the obtained compounds	3-20

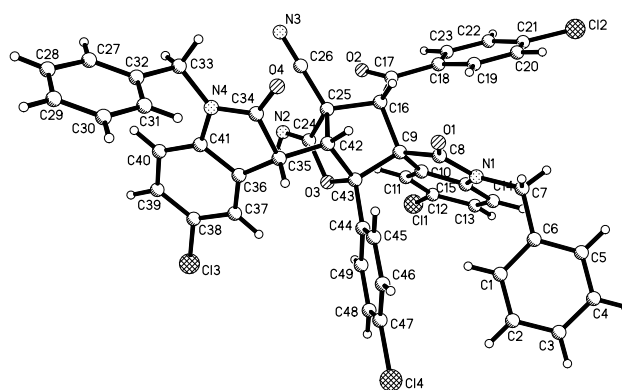


Fig. s1 Molecular structure of spiro compound 1e (major isomer)

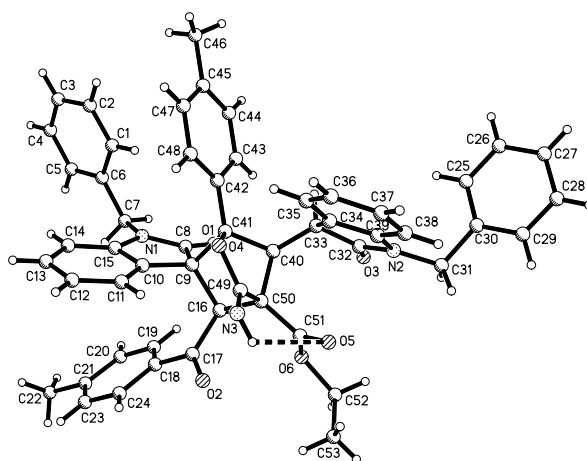


Fig. s2 Molecular structure of spiro compound 1i (major isomer)

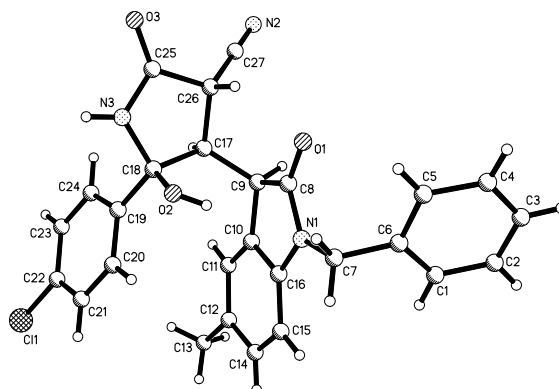
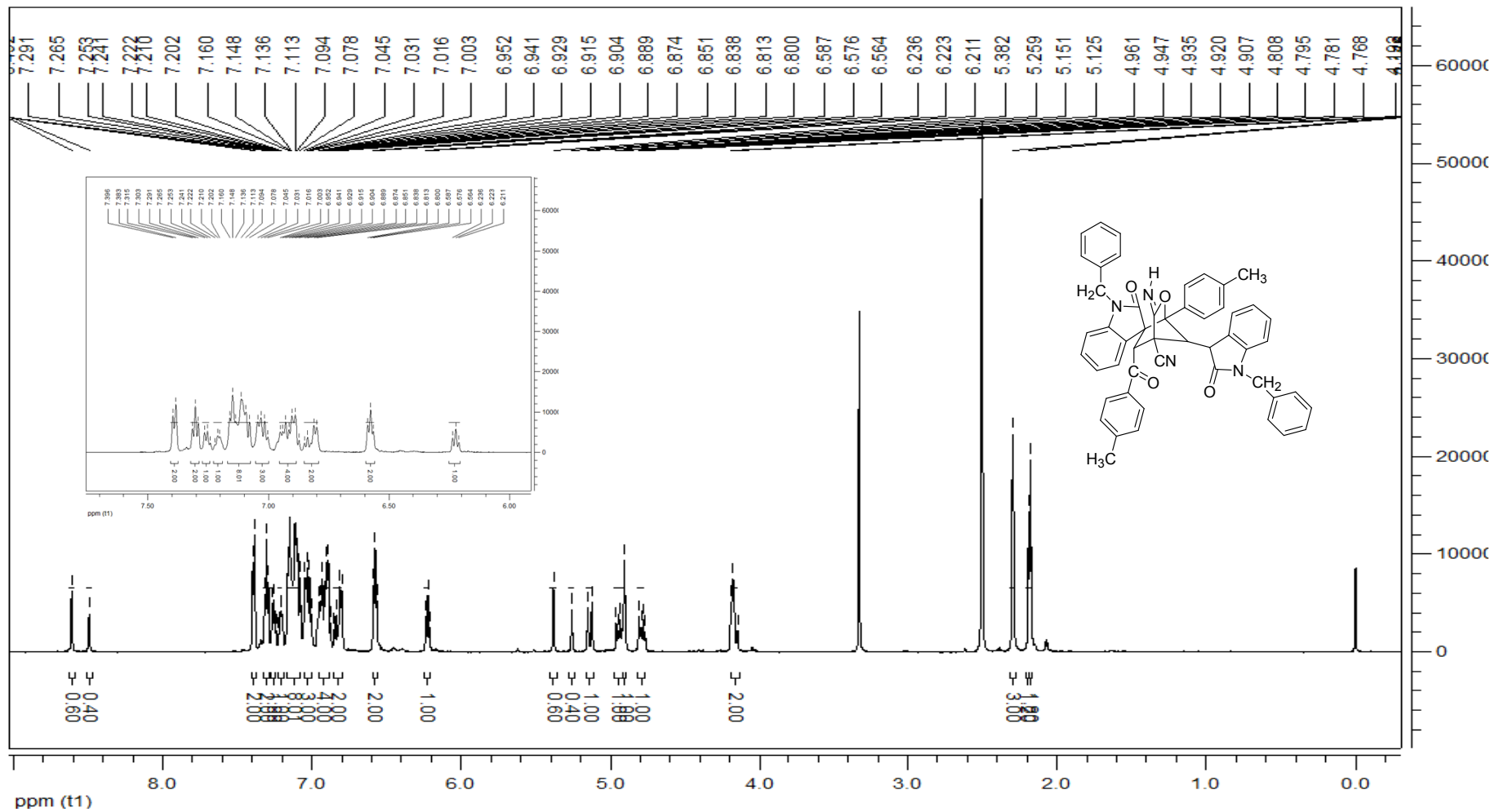
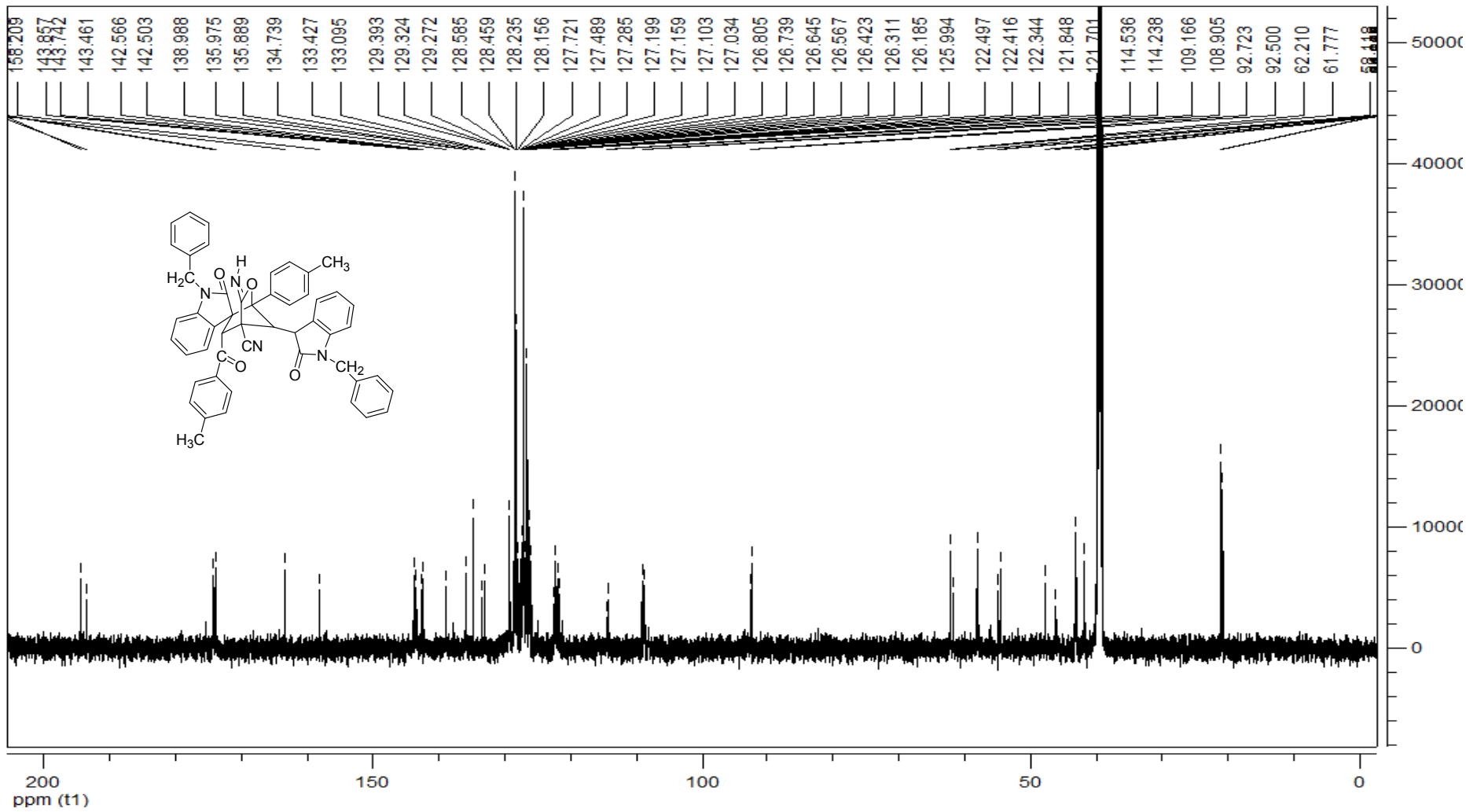


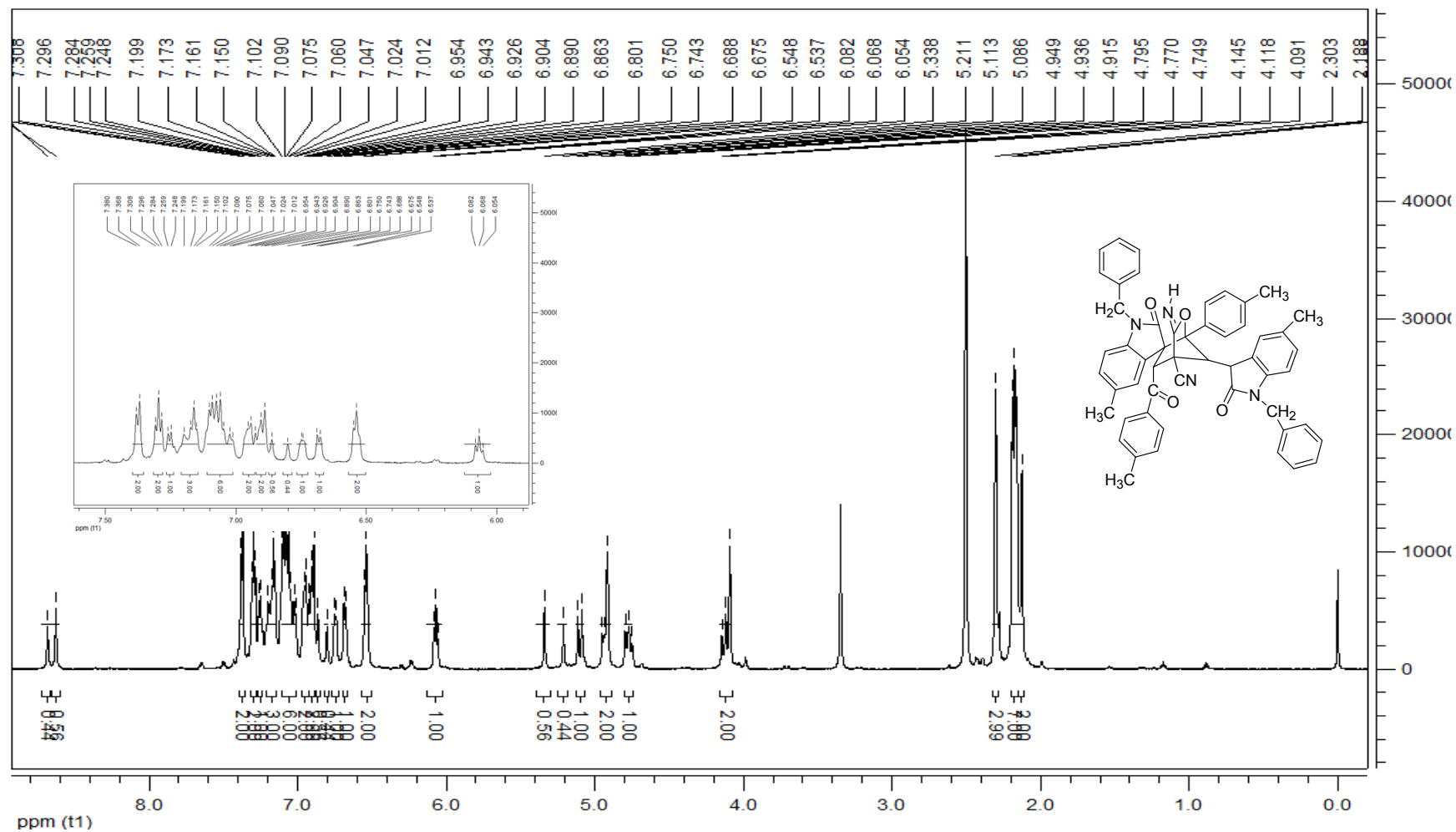
Fig. s3 Molecular structure of spiro compound 3d

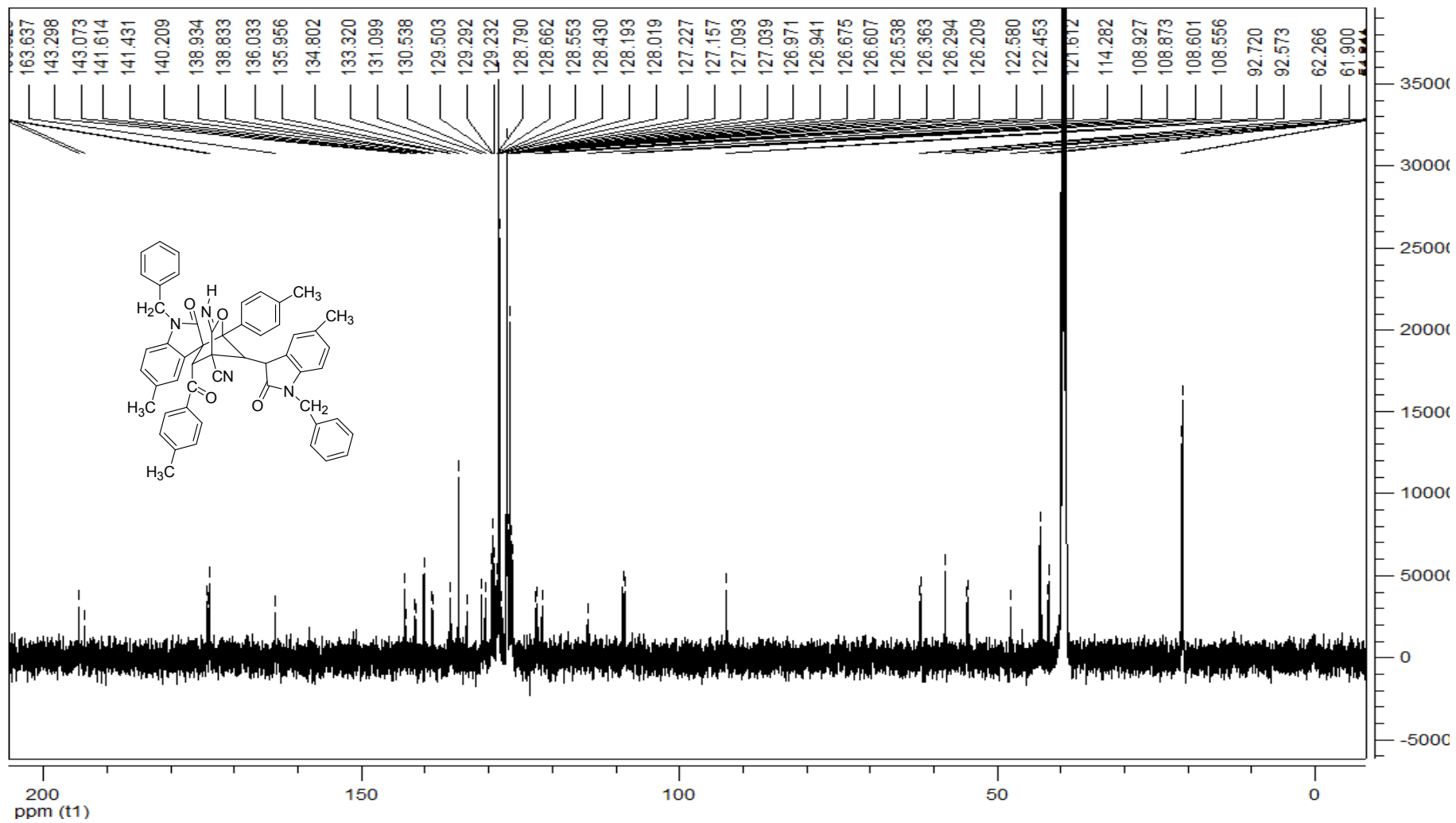
1'-benzyl-7-(1-benzyl-2-oxindolin-3-yl)-3-imino-1-(4-methylphenyl)-5-(4-methylbenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1a):



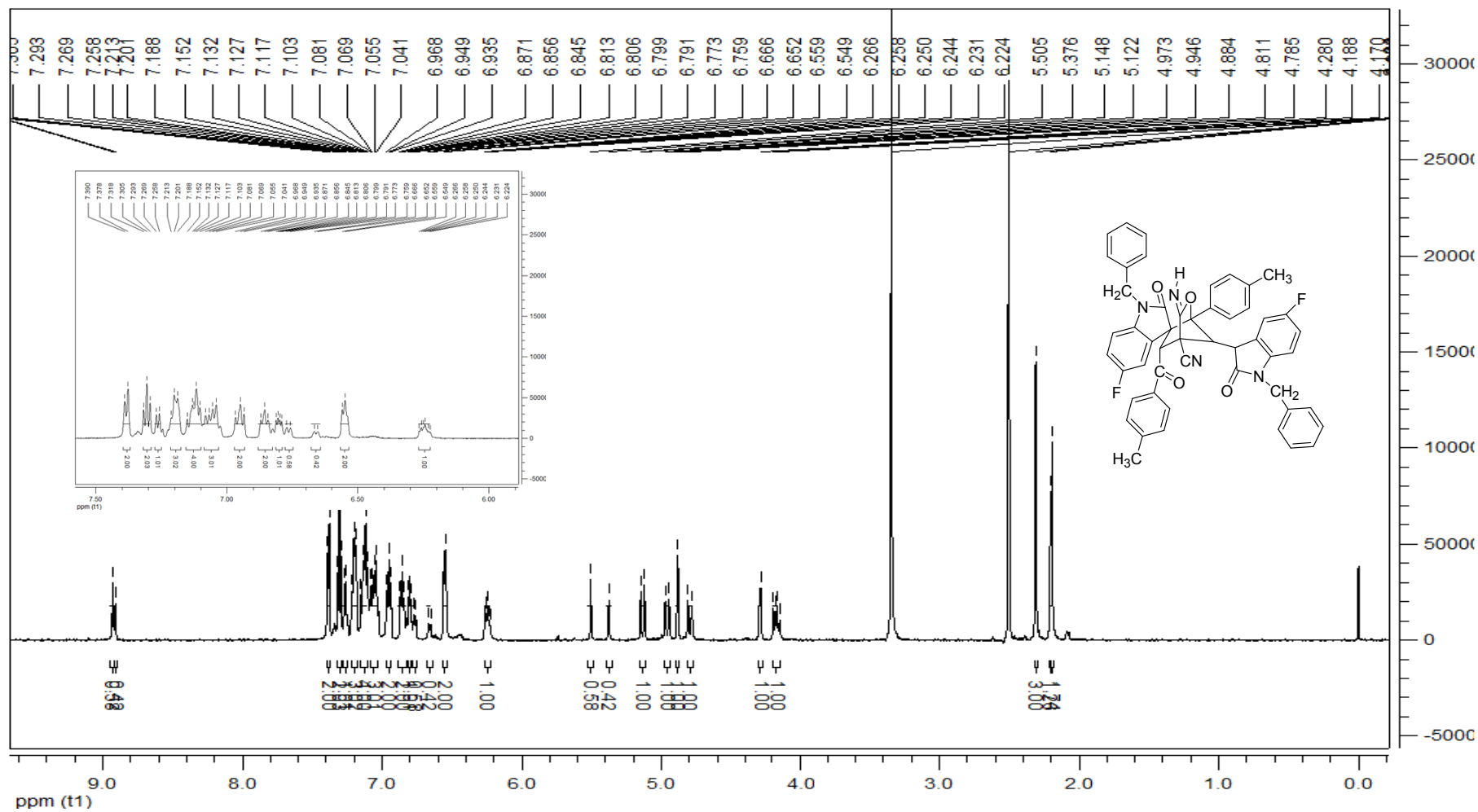


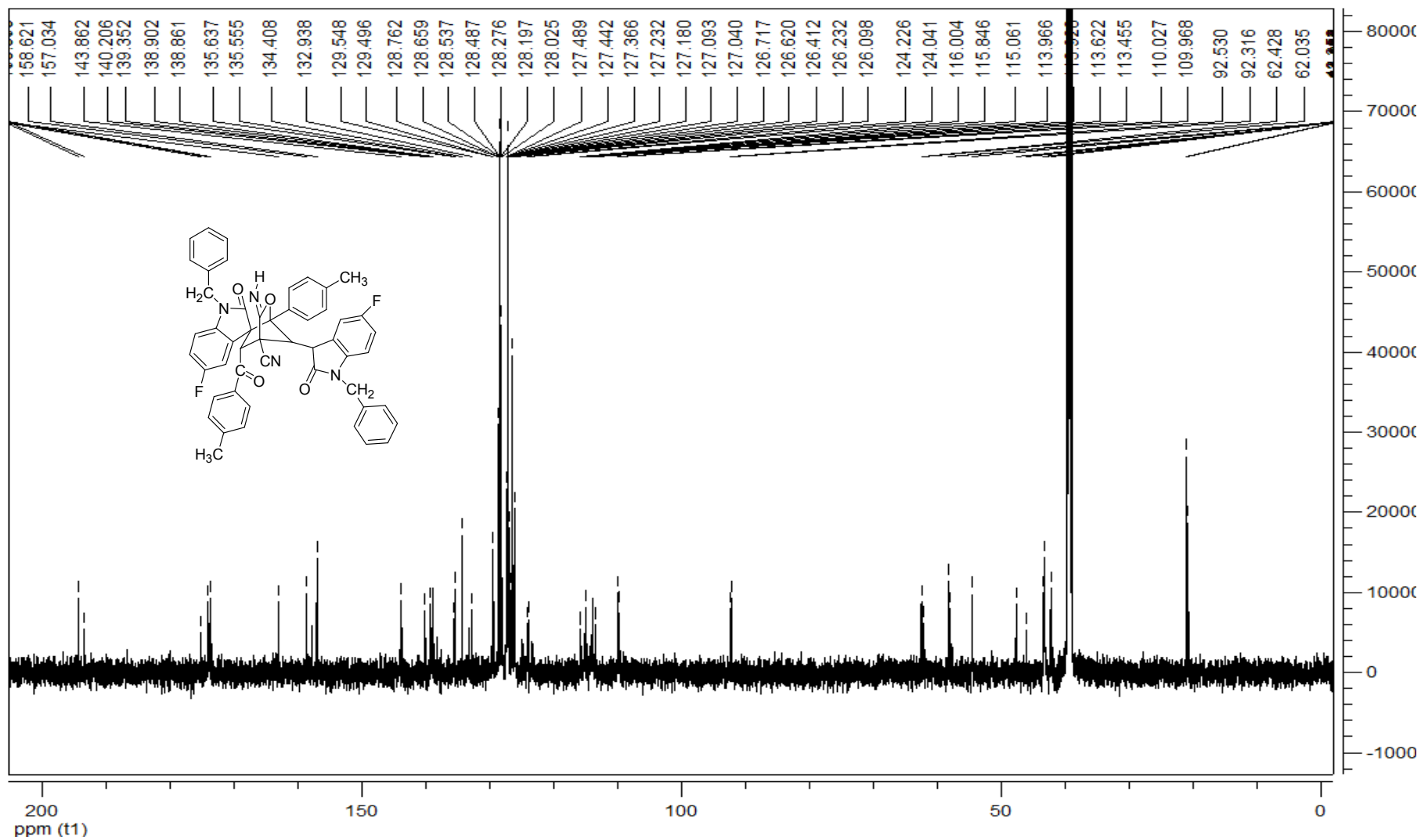
1'-benzyl-7-(1-benzyl-5-methyl-2-oxindolin-3-yl)-3-imino-1-(4-methylphenyl)-5'-methyl-5-(4-methylbenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1b):



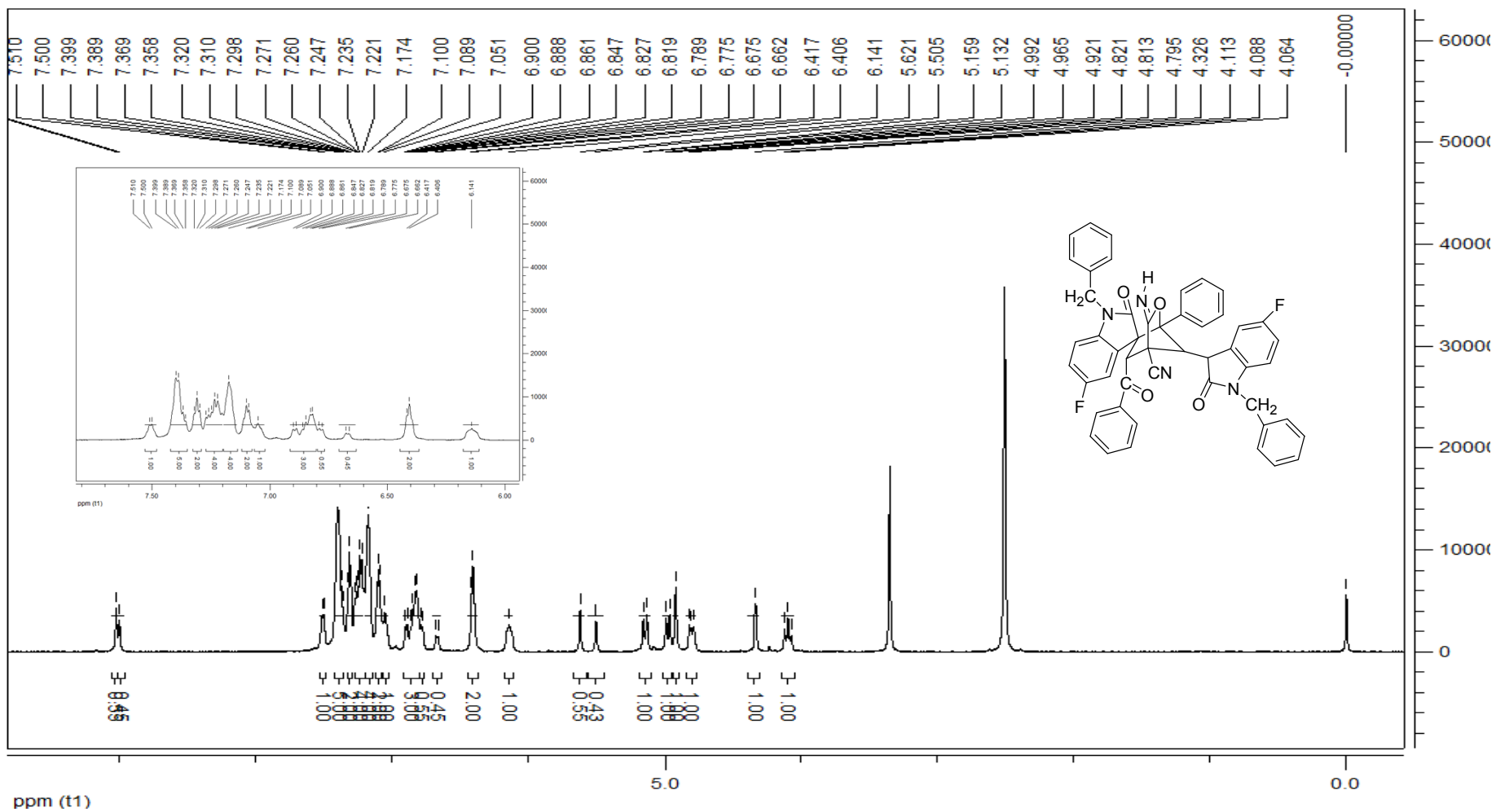


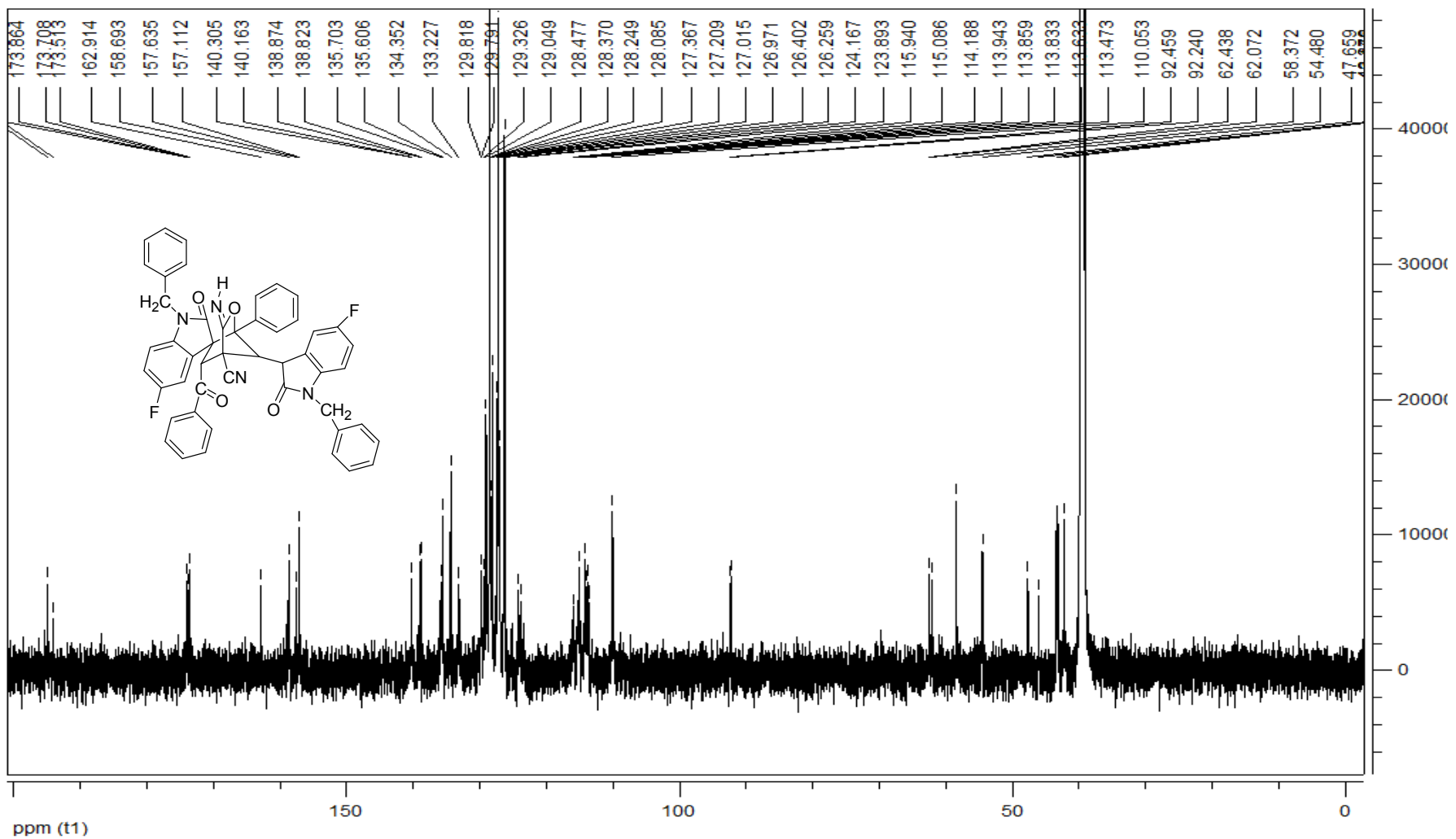
1'-benzyl-7-(1-benzyl-5-fluoro-2-oxindolin-3-yl)-5'-fluoro-3-imino-1-(4-methylphenyl)-5-(4-methylbenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1c):



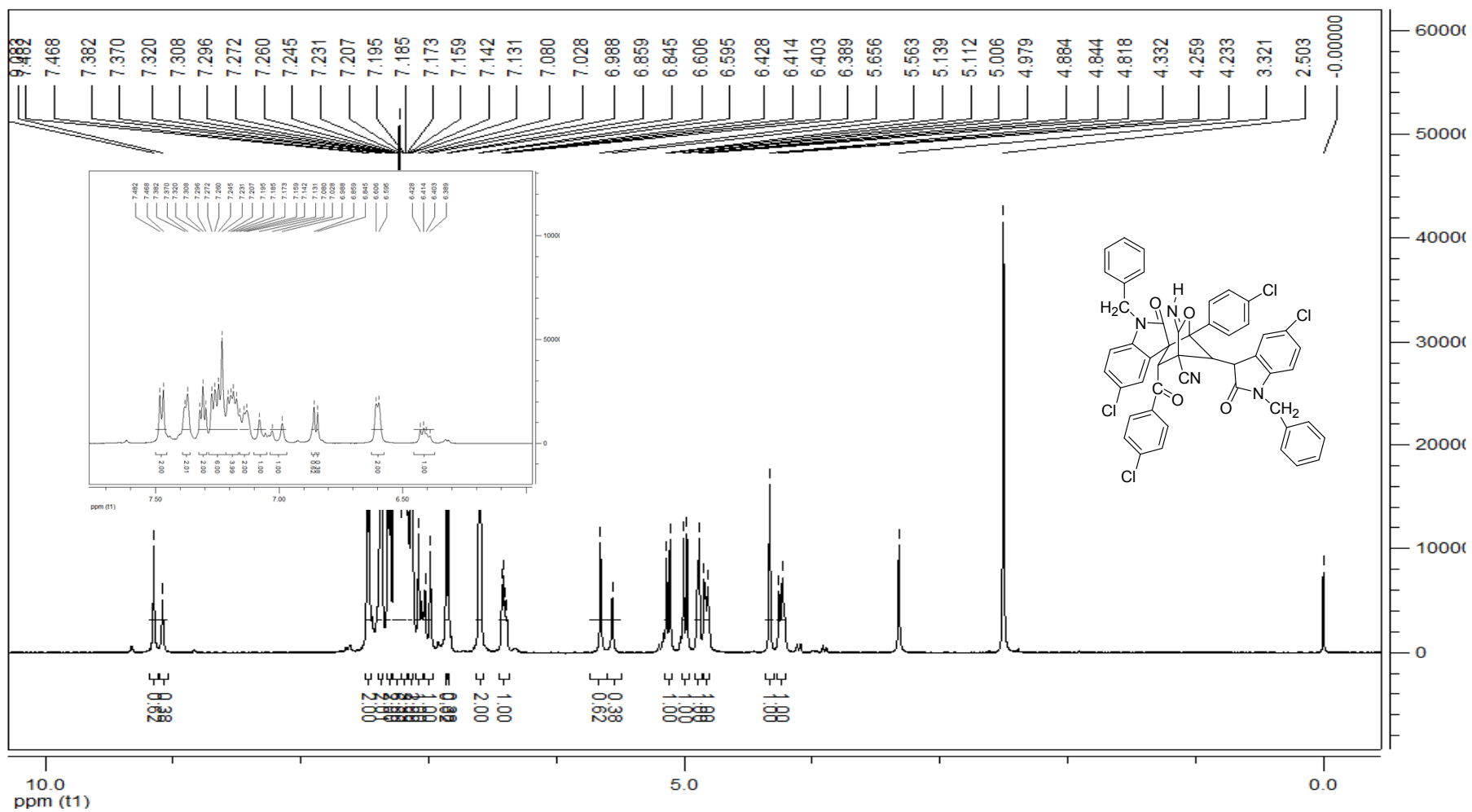


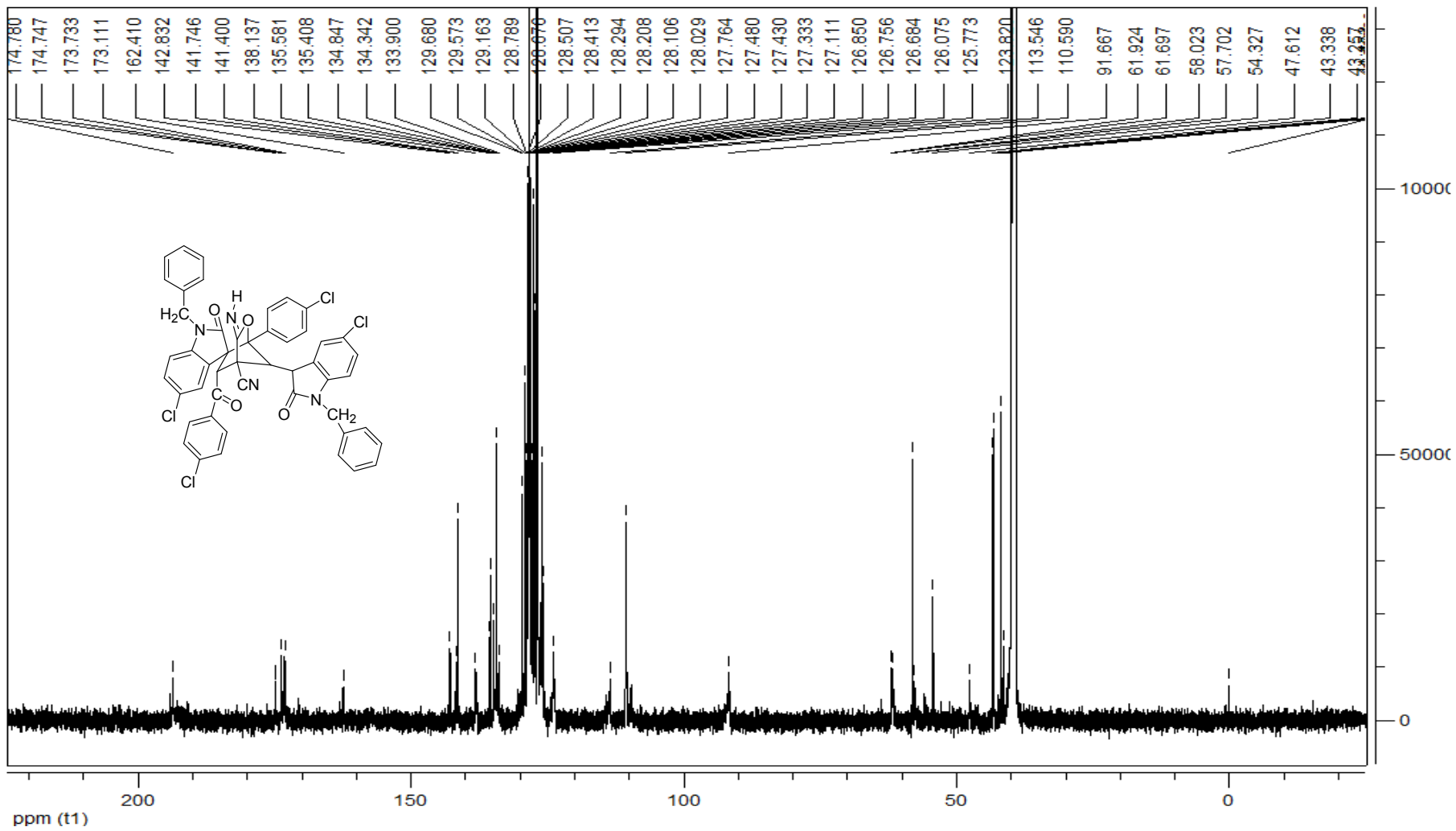
5-benzoyl-1'-benzyl-7-(1-benzyl-5-fluoro-2-oxindolin-3-yl)-5'-fluoro-3-imino-1-phenyl-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1d):



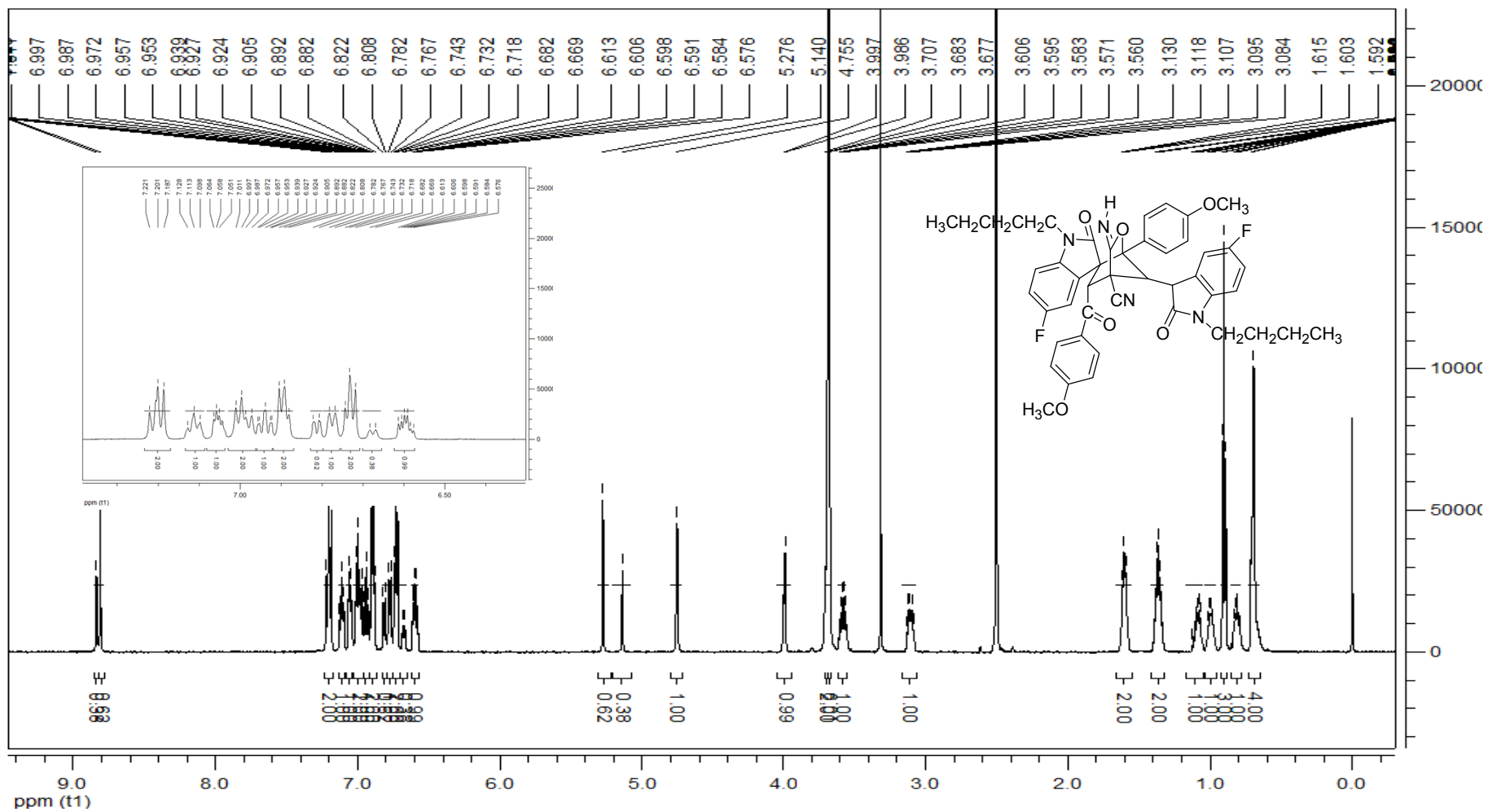


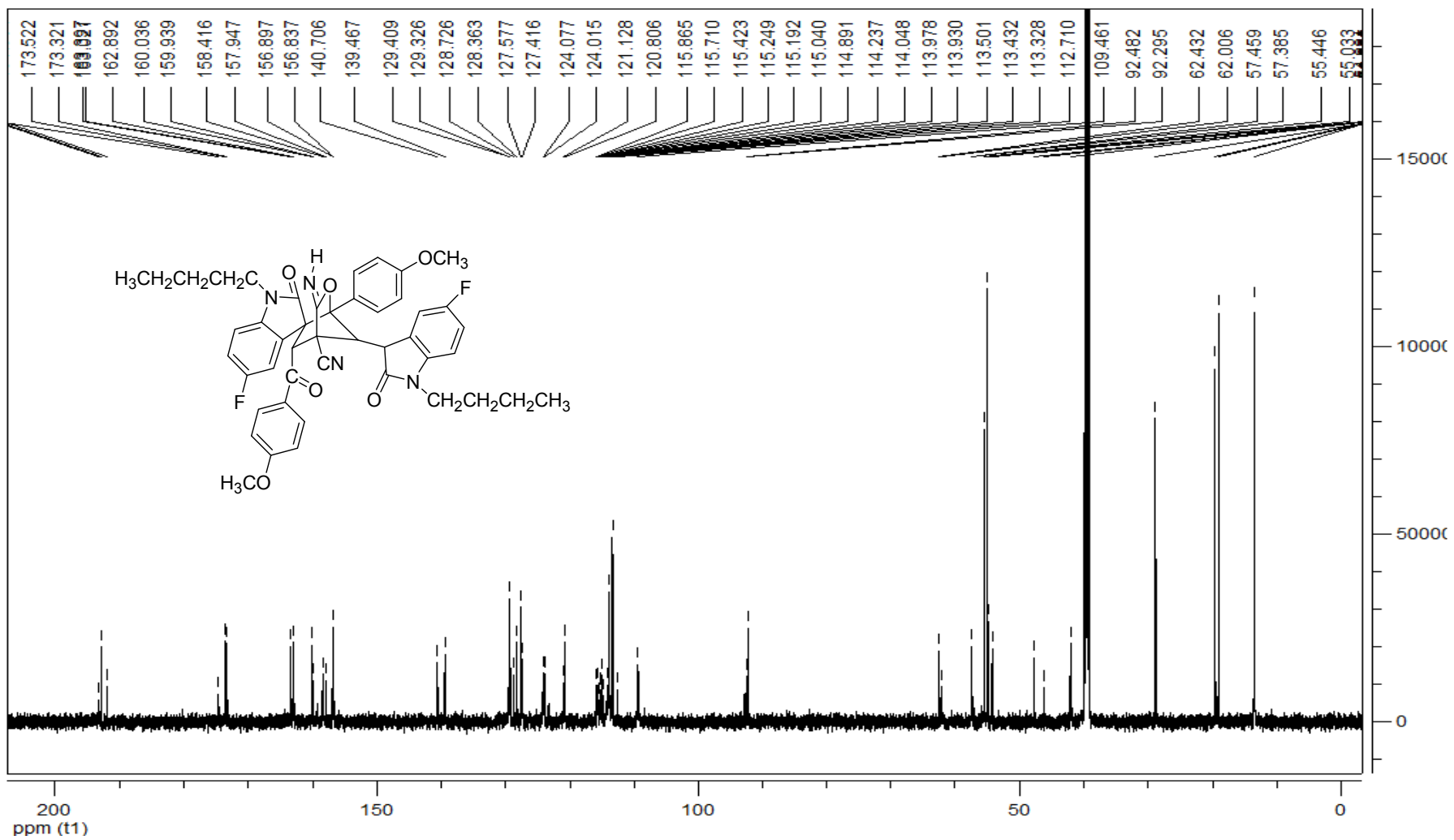
1'-benzyl-7-(1-benzyl-5-chloro-2-oxindolin-3-yl)-5'-chloro-5-(4-chlorobenzoyl)-1-(4-chlorophenyl)-3-imino-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1e):



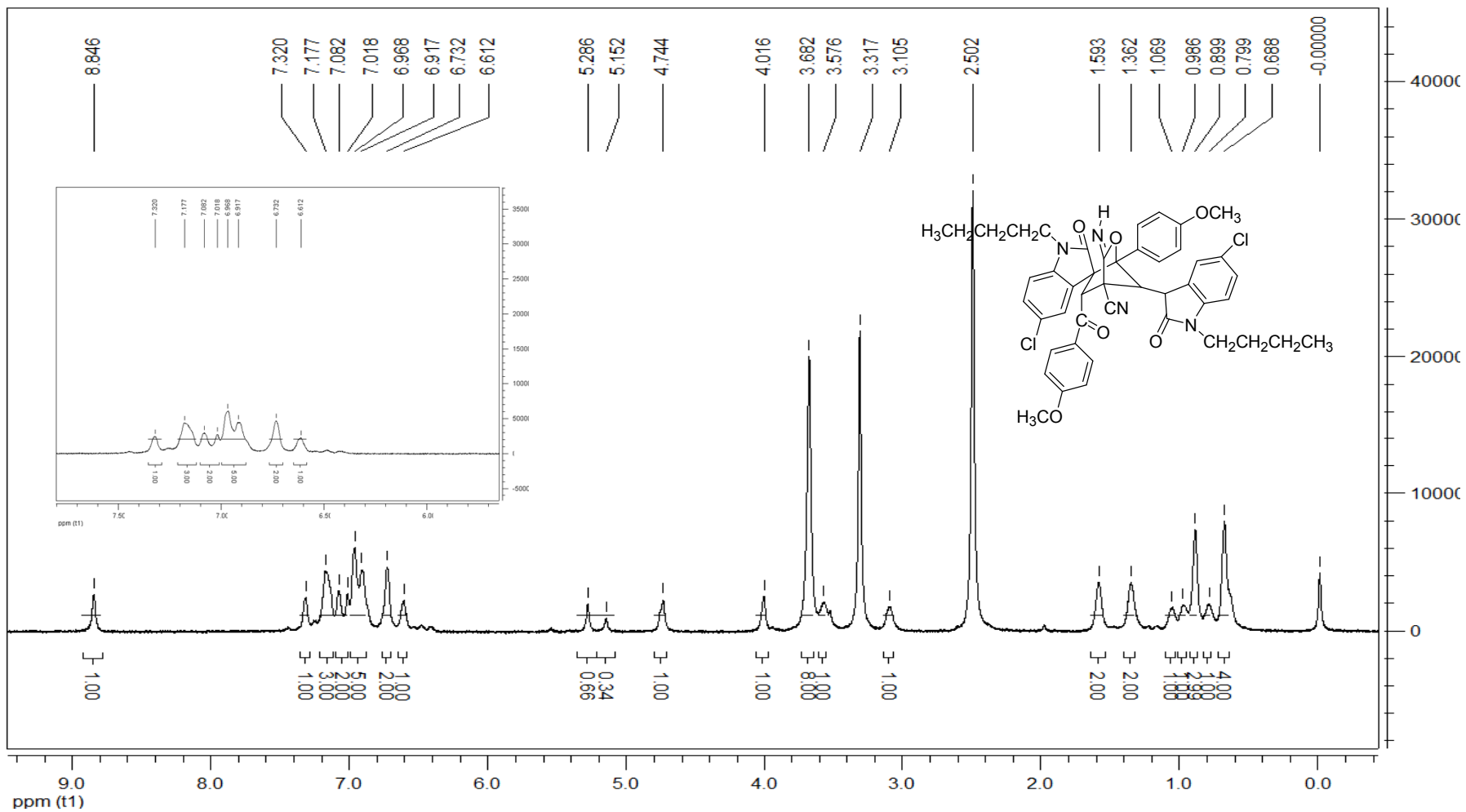


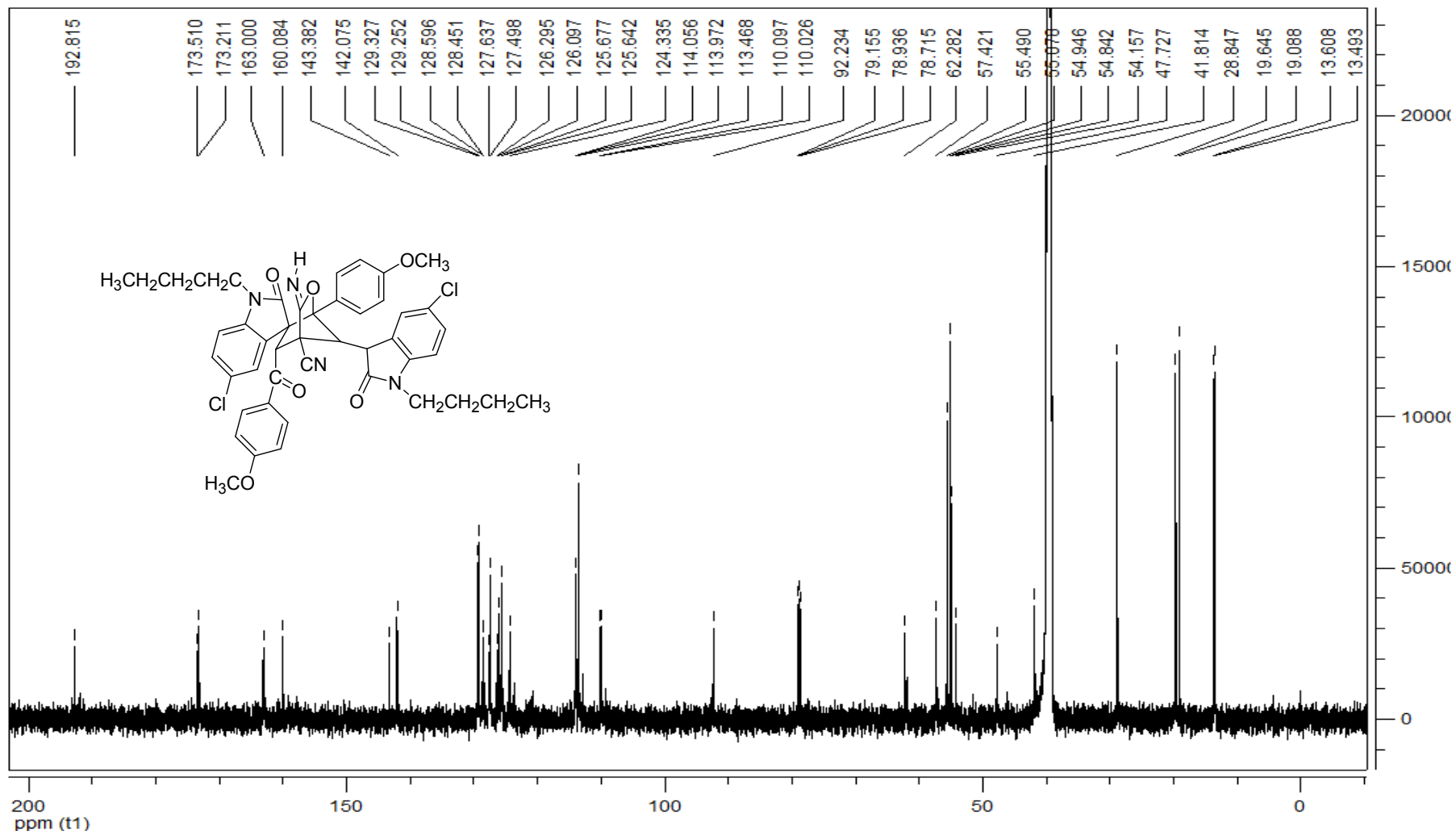
1'-butyl-7-(1-butyl-5-fluoro-2-oxindolin-3-yl)-5'-fluoro-3-imino-1-(4-methoxyphenyl)-5-(4-methoxybenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1f):



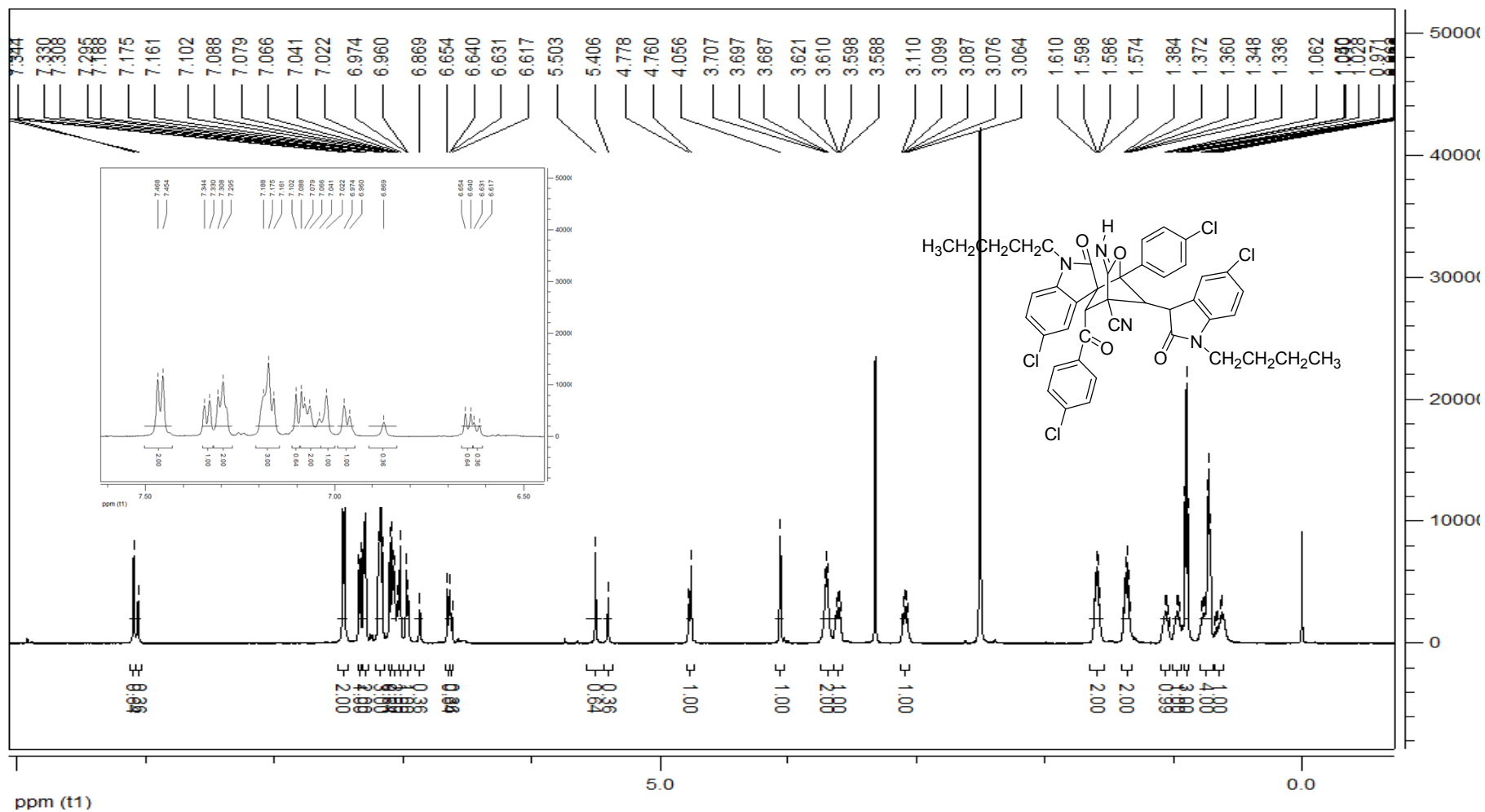


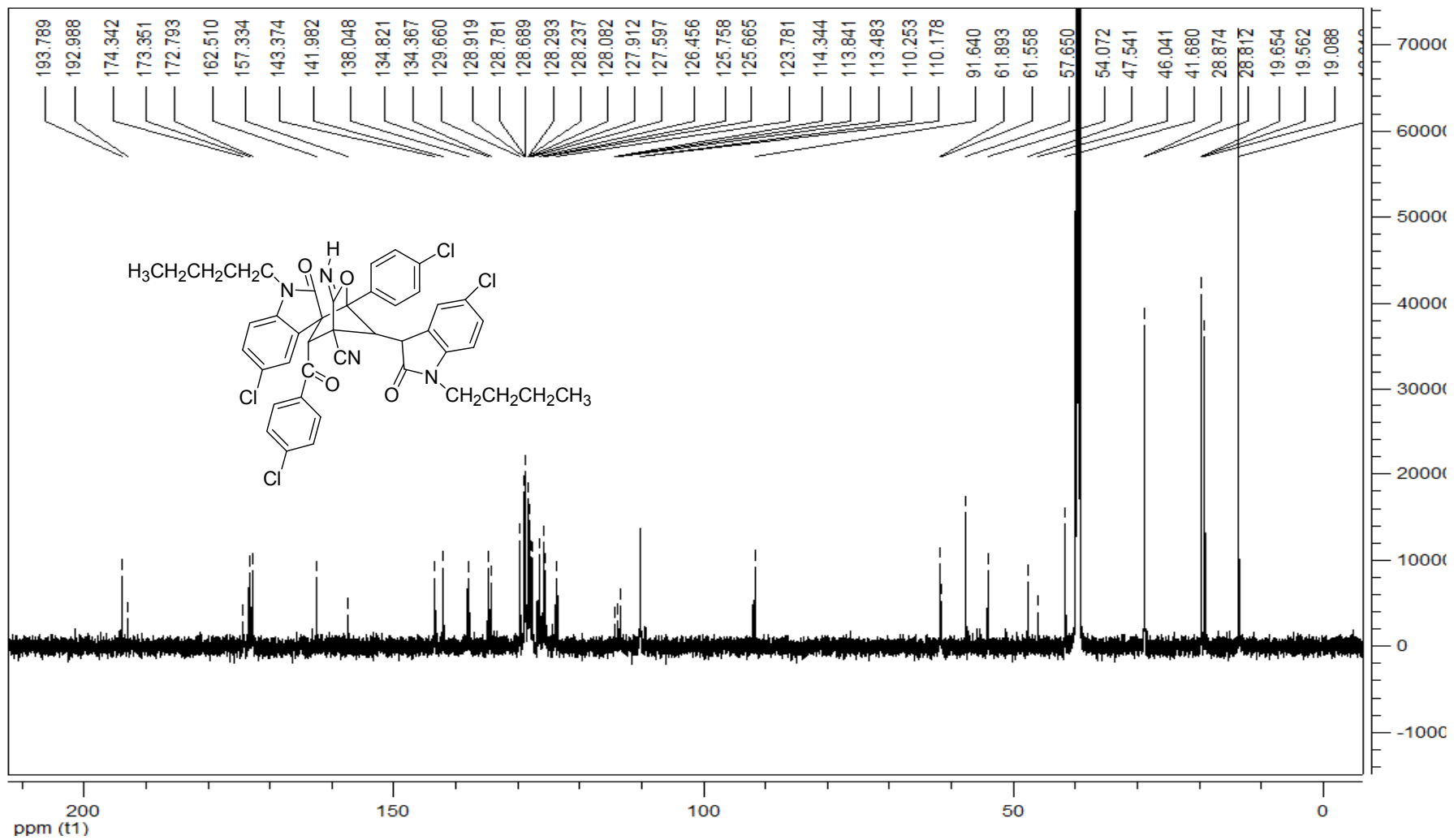
1'-butyl-7-(1-butyl-5-chloro-2-oxindolin-3-yl)-5'-chloro-3-imino-1-(4-methoxyphenyl)-5-(4-methoxybenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1g):



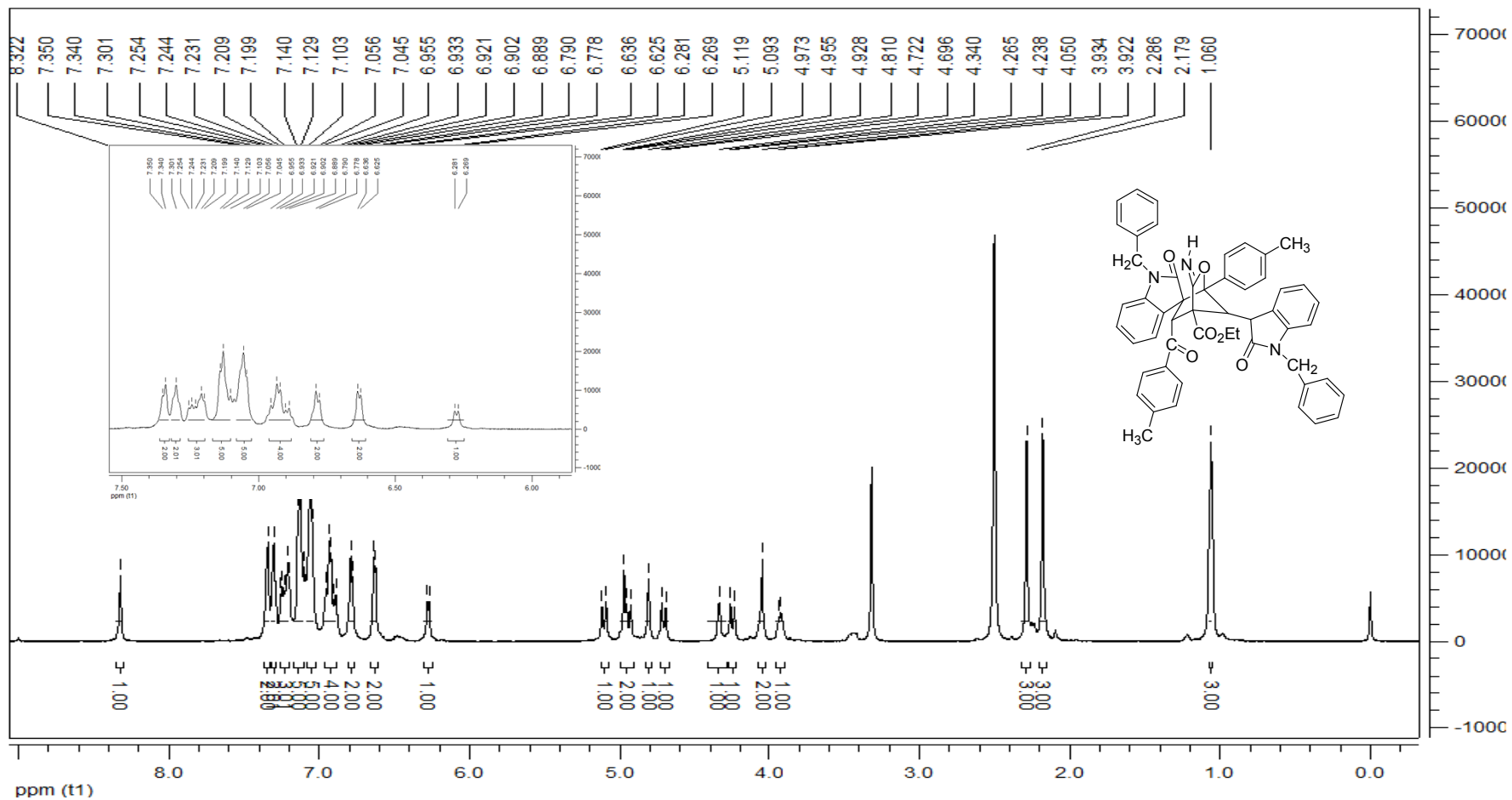


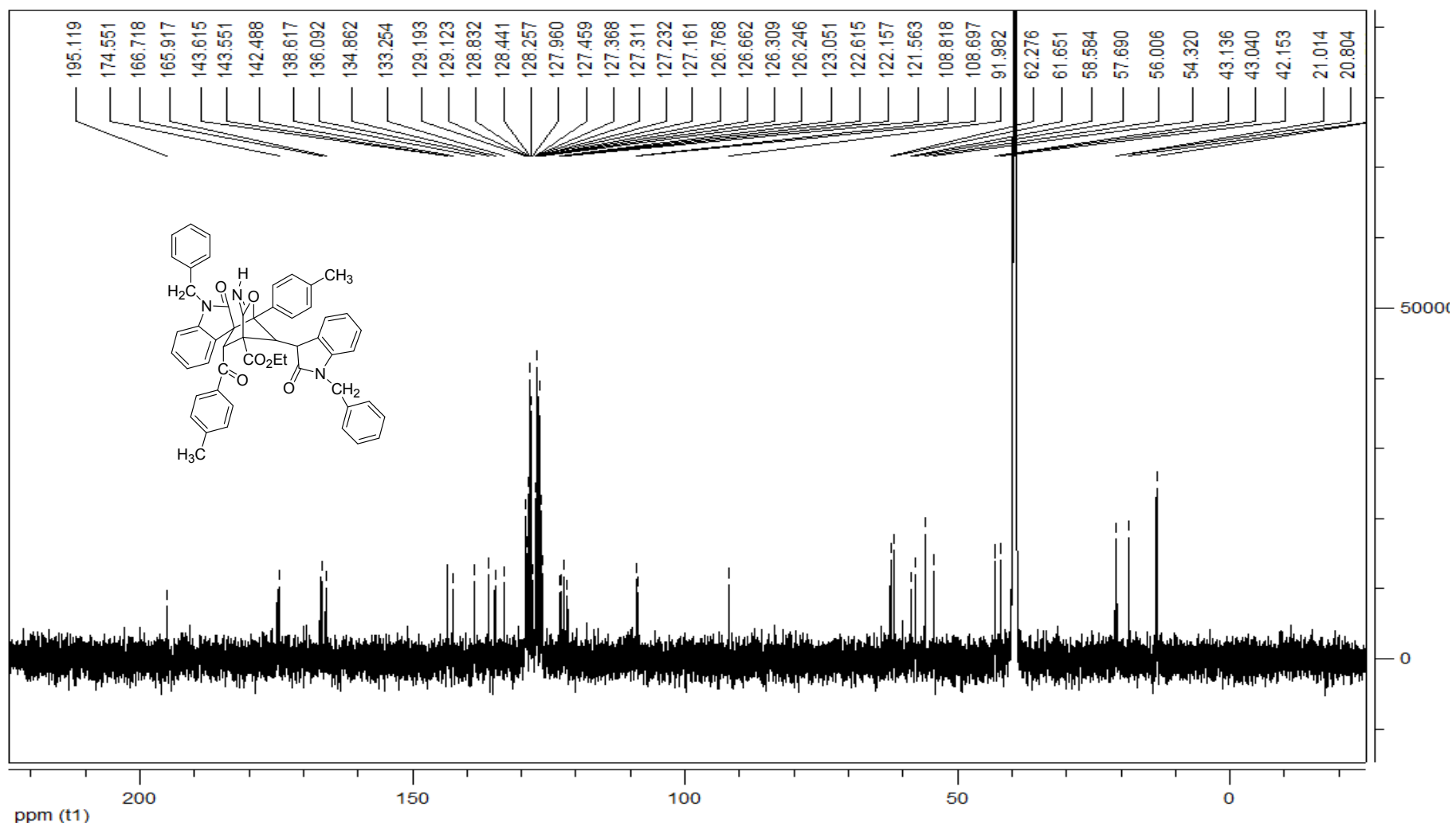
1'-butyl-7-(1-butyl-5-chloro-2-oxindolin-3-yl)-5'-chloro-5-(4-chlorobenzoyl)-1-(4-chlorophenyl)-3-imino-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carbonitrile (1h):





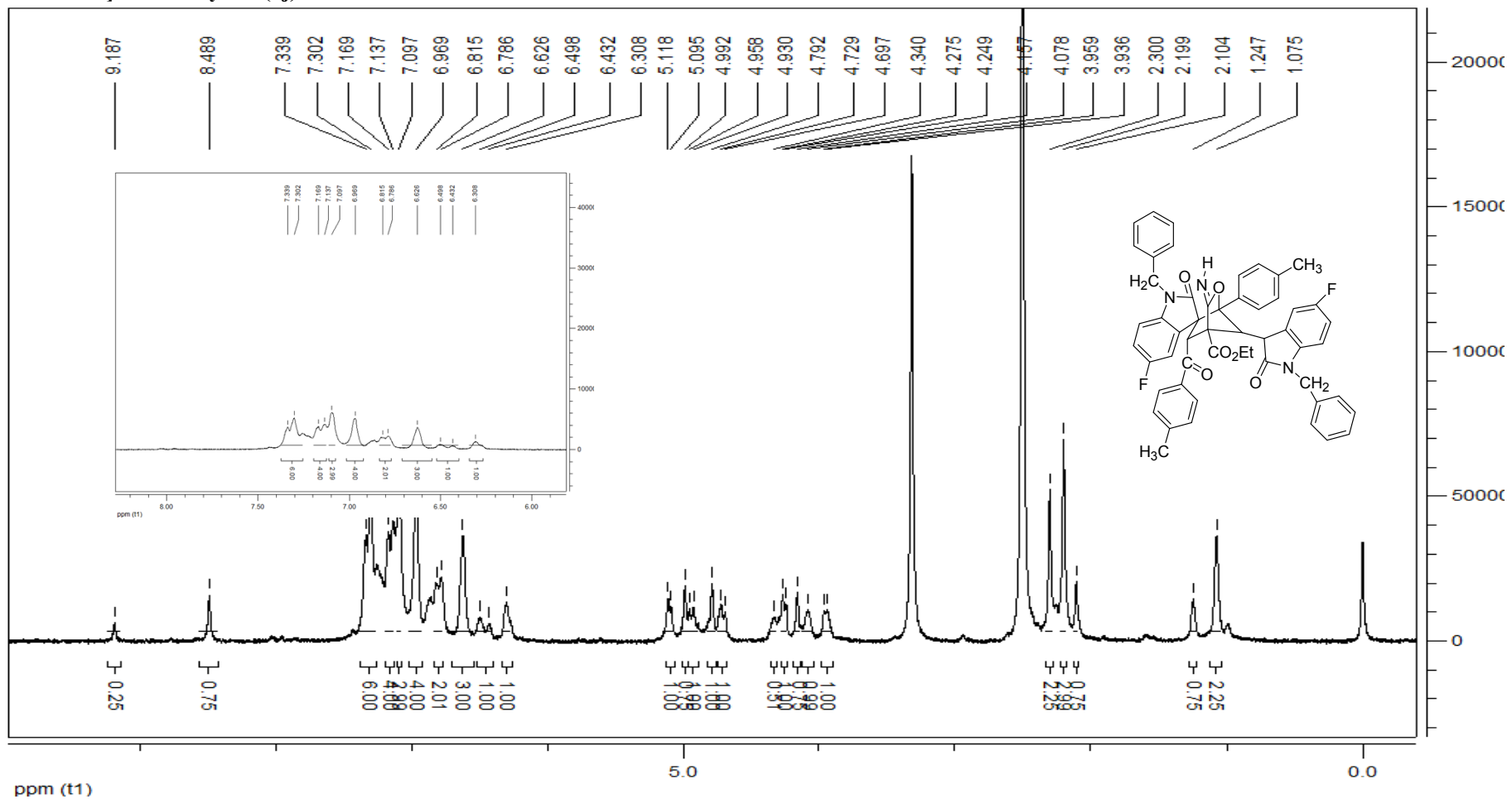
Ethyl 1'-benzyl-7-(1-benzyl-2-oxindolin-3-yl)-3-imino-1-(methylphenyl)-5-(4-methylbenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-6,3'-indoline]-4-carboxylate (1i):

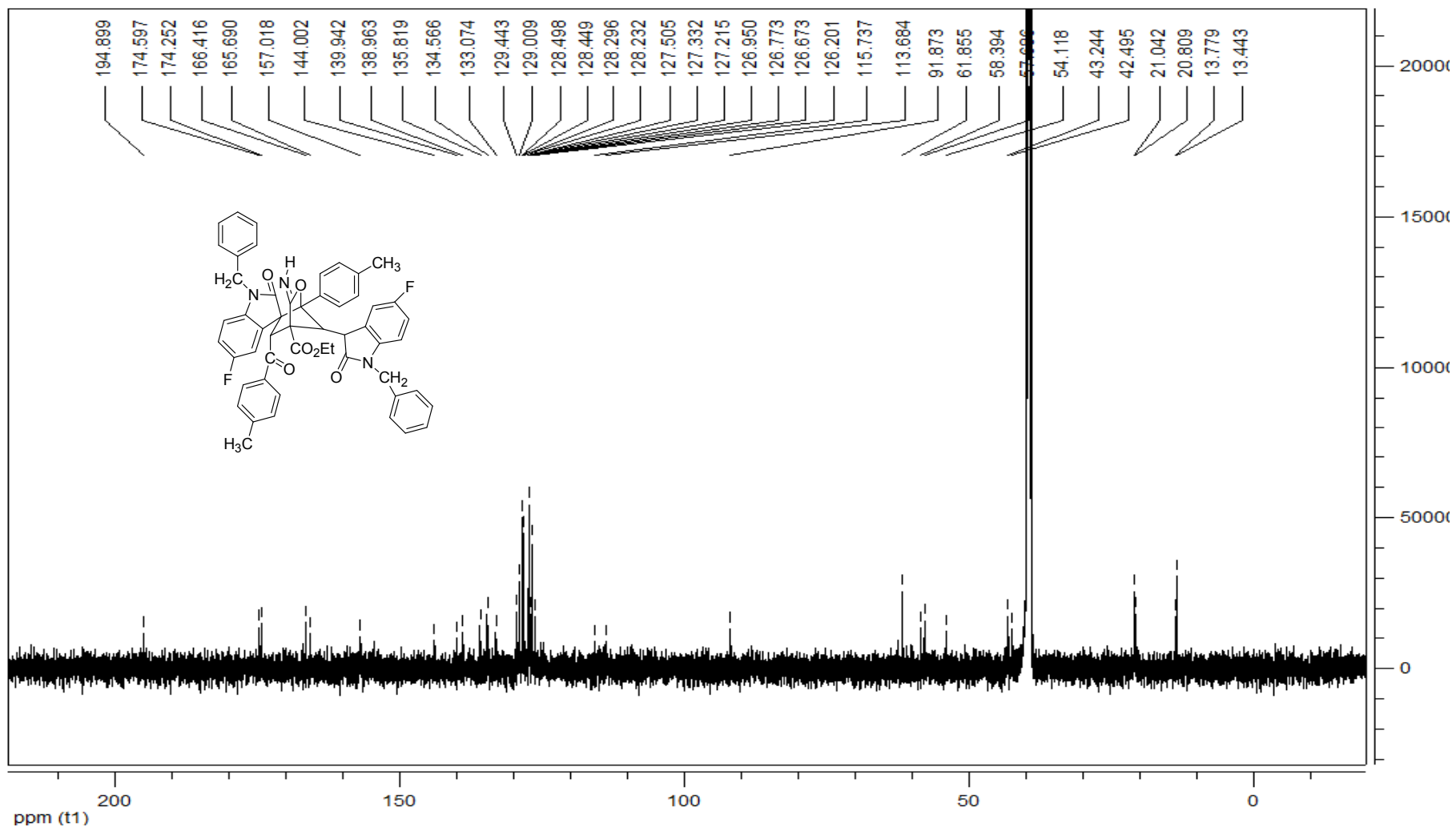




ethyl 1'-benzyl-7-(1-benzyl-5-fluoro-2-oxindolin-3-yl)-5'-fluoro-3-imino-1-(4-methylphenyl)-5-(4-methylbenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-

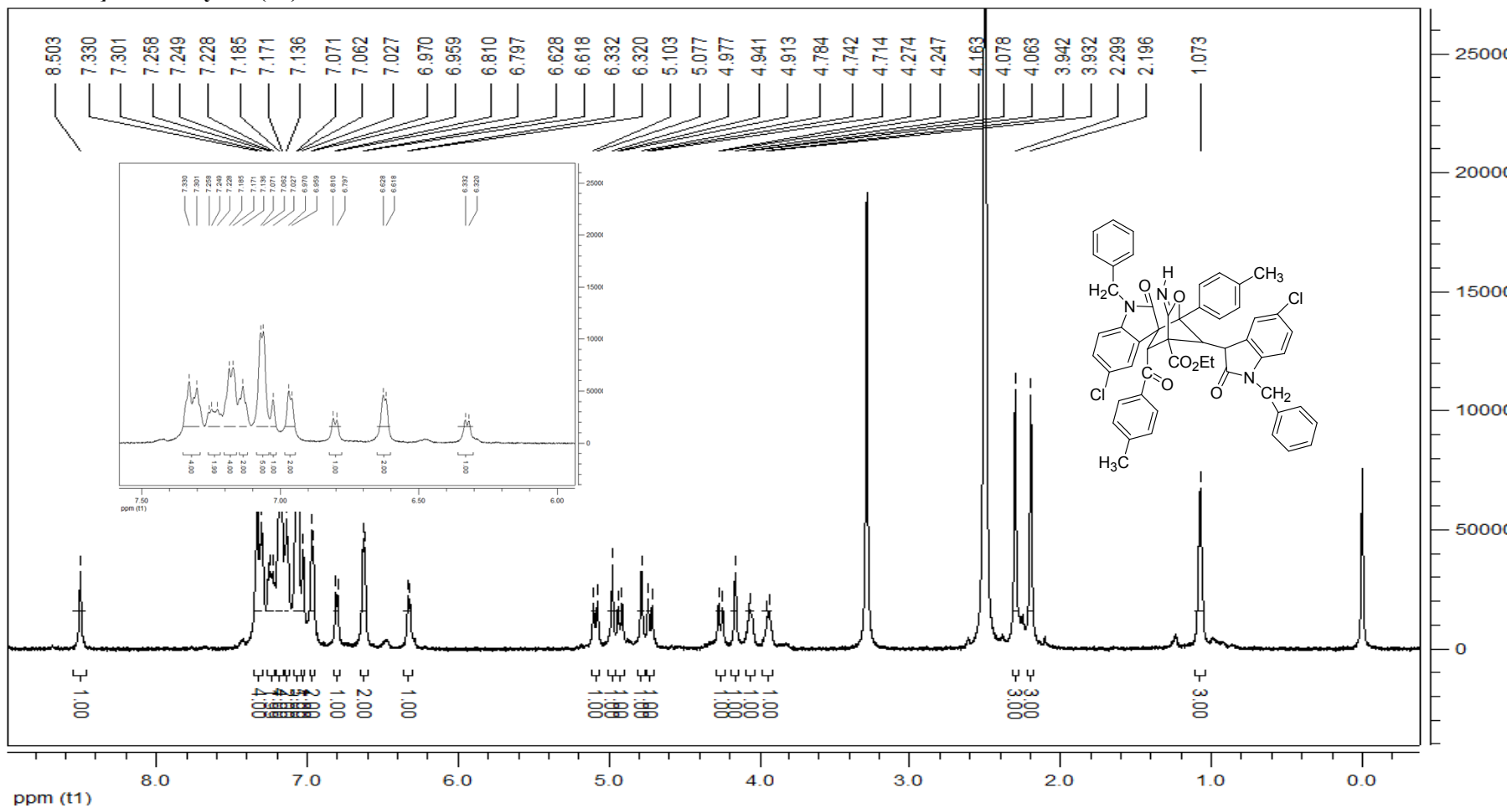
6,3'-indoline-4-carboxylate (1j):

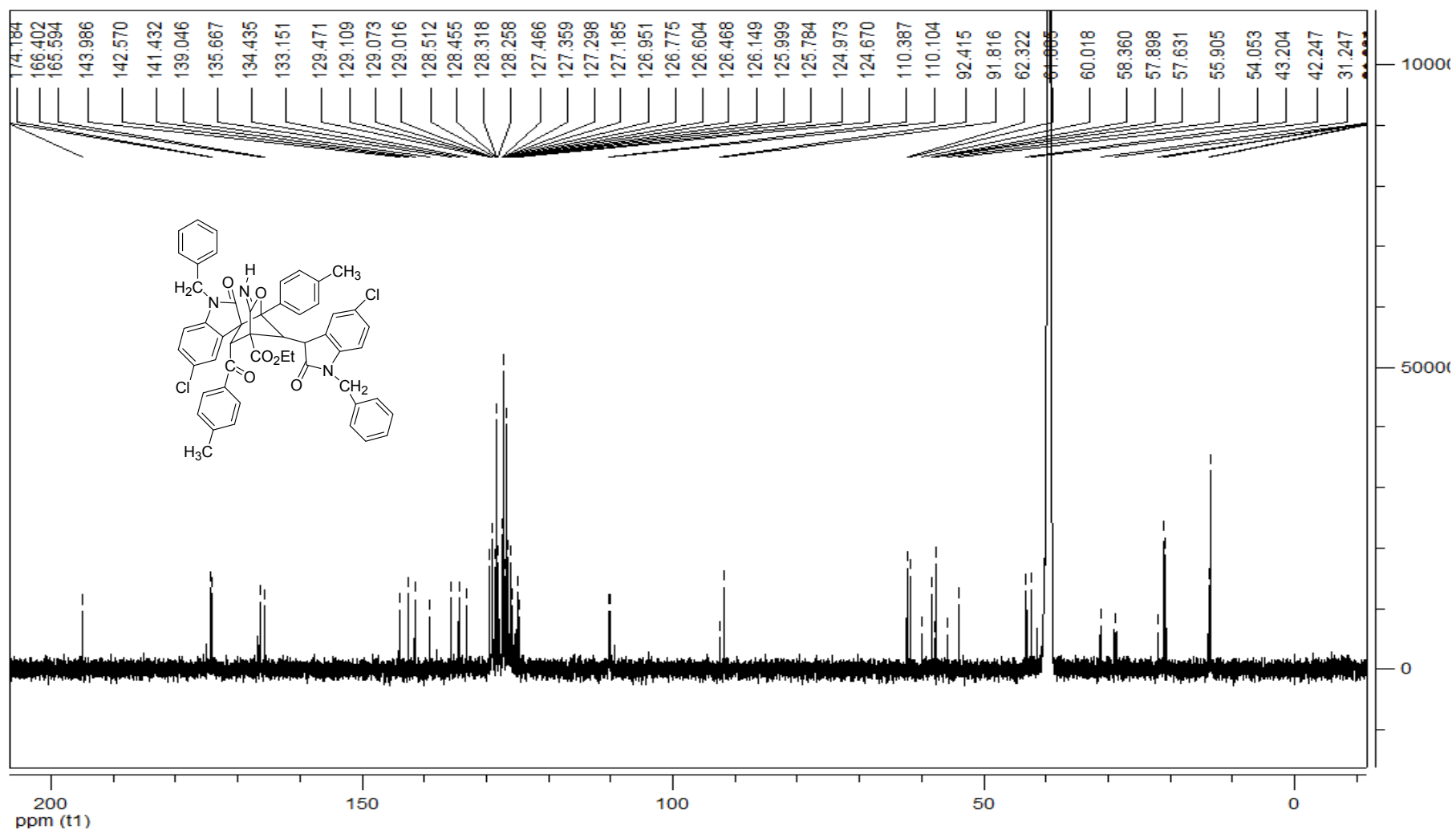




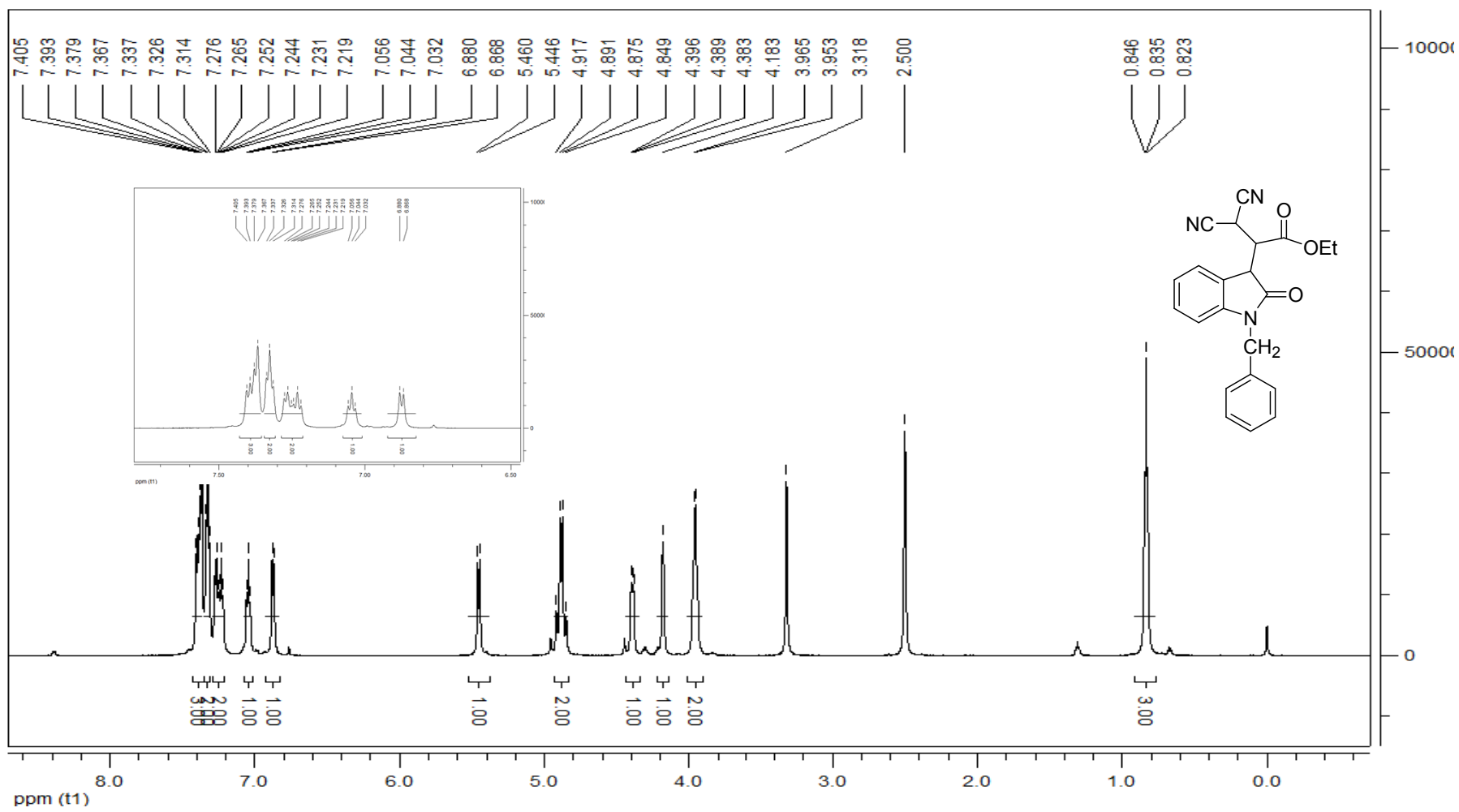
ethyl 1'-benzyl-7-(1-benzyl-5-chloro-2-oxindolin-3-yl)-5'-chloro-3-imino-1-(4-methylphenyl)-5-(4-methylbenzoyl)-2'-oxo-2-oxaspiro[bicyclo[2.2.1]heptane-

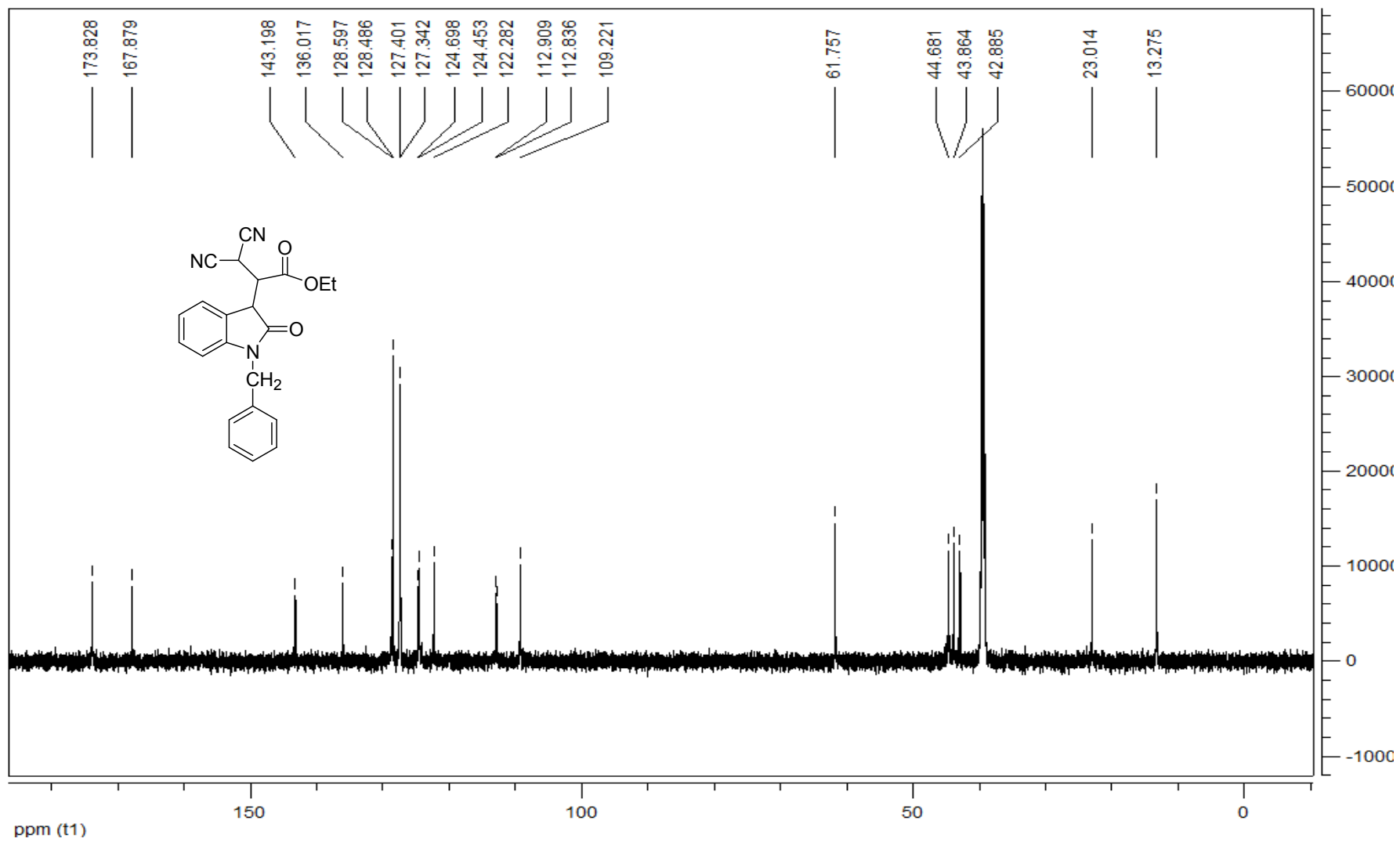
6,3'-indoline]-4-carboxylate (1k):



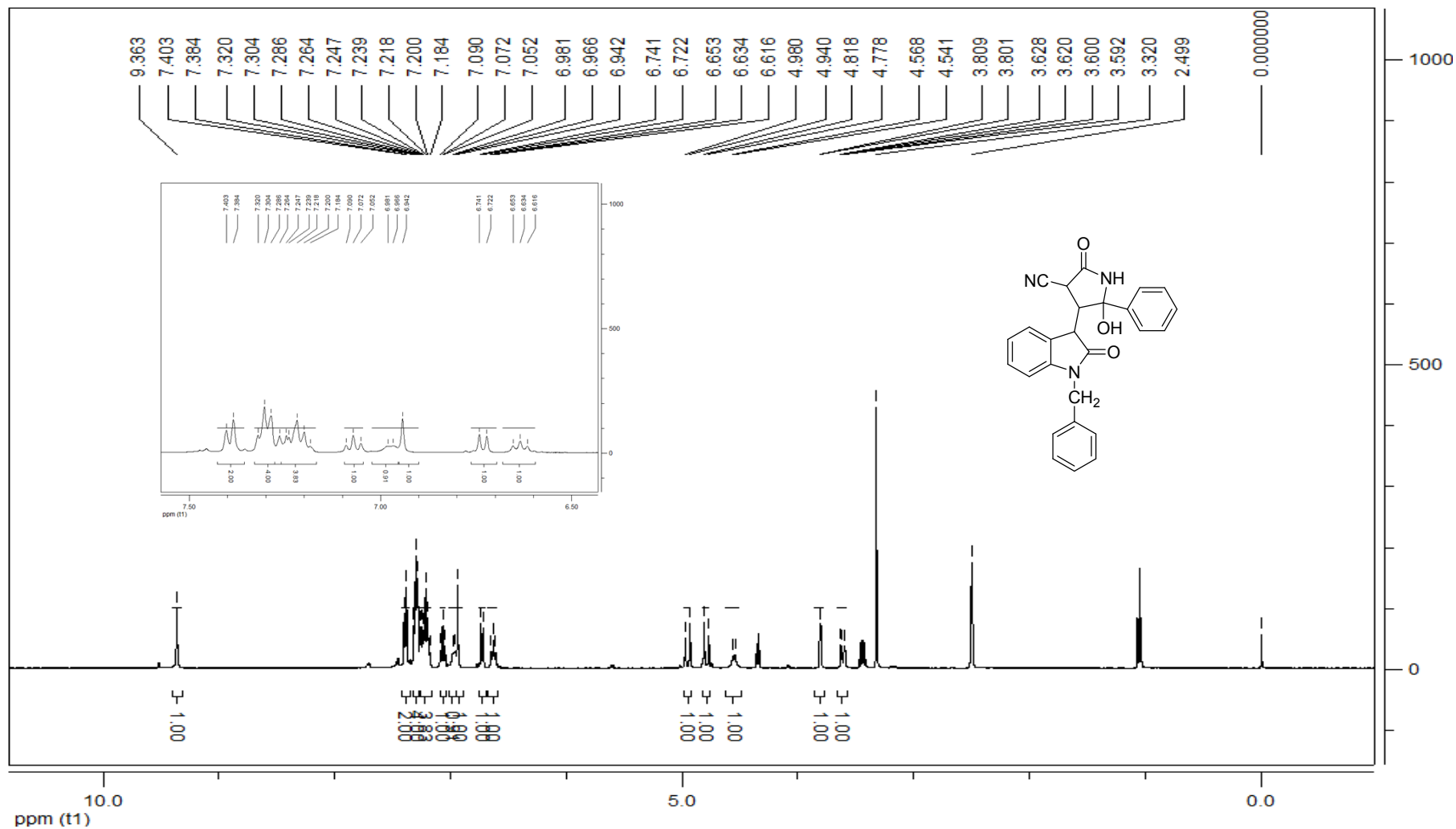


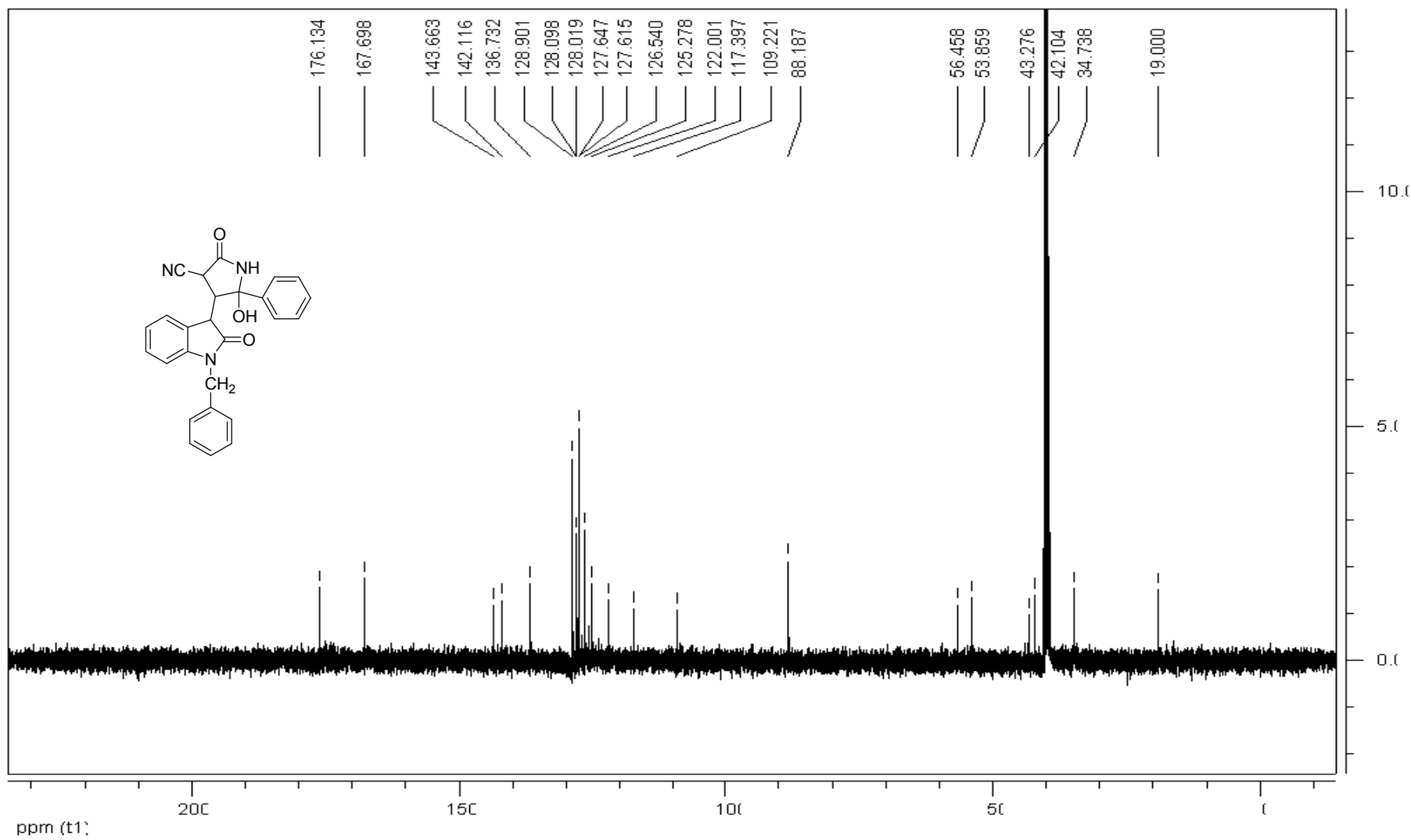
Ethyl 2-(1-benzyl-2-oxoindolin-3-yl)-3,3-dicyanopropanoate (2):



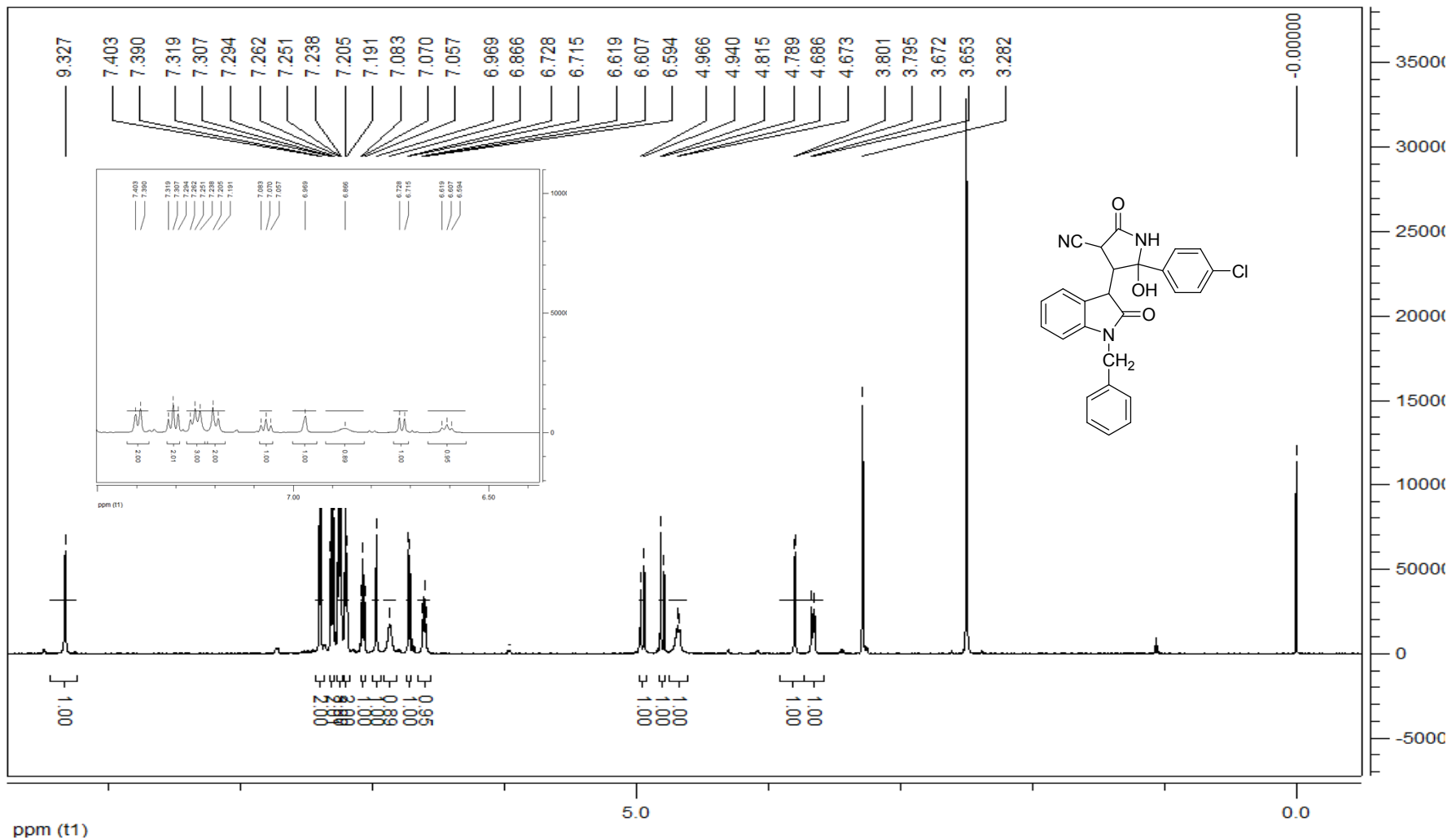


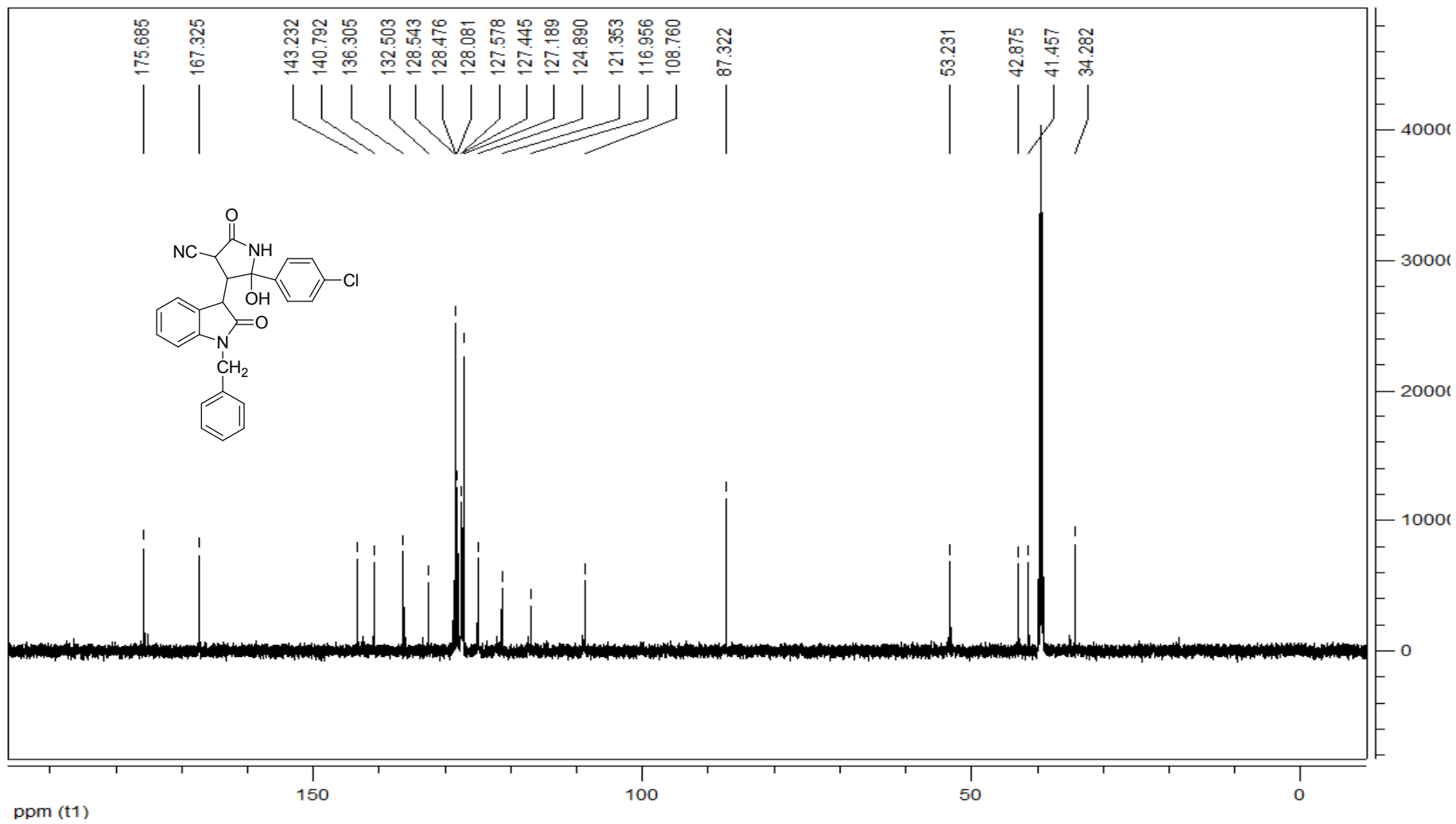
4-(1-benzyl-2-oxoindolin-3-yl)-5-hydroxy-2-oxo-5-phenylpyrrolidine-3-carbonitrile (3a):



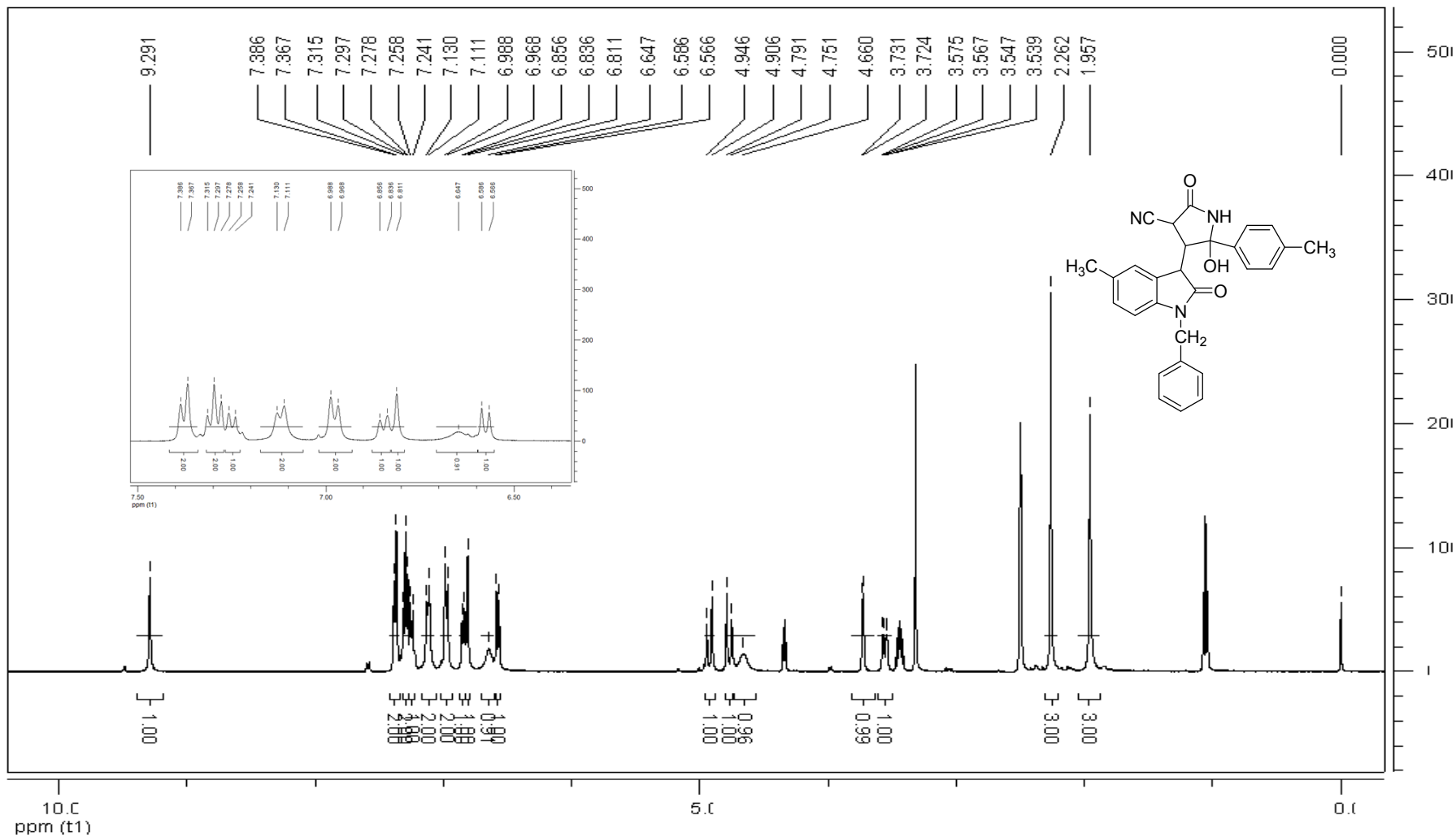


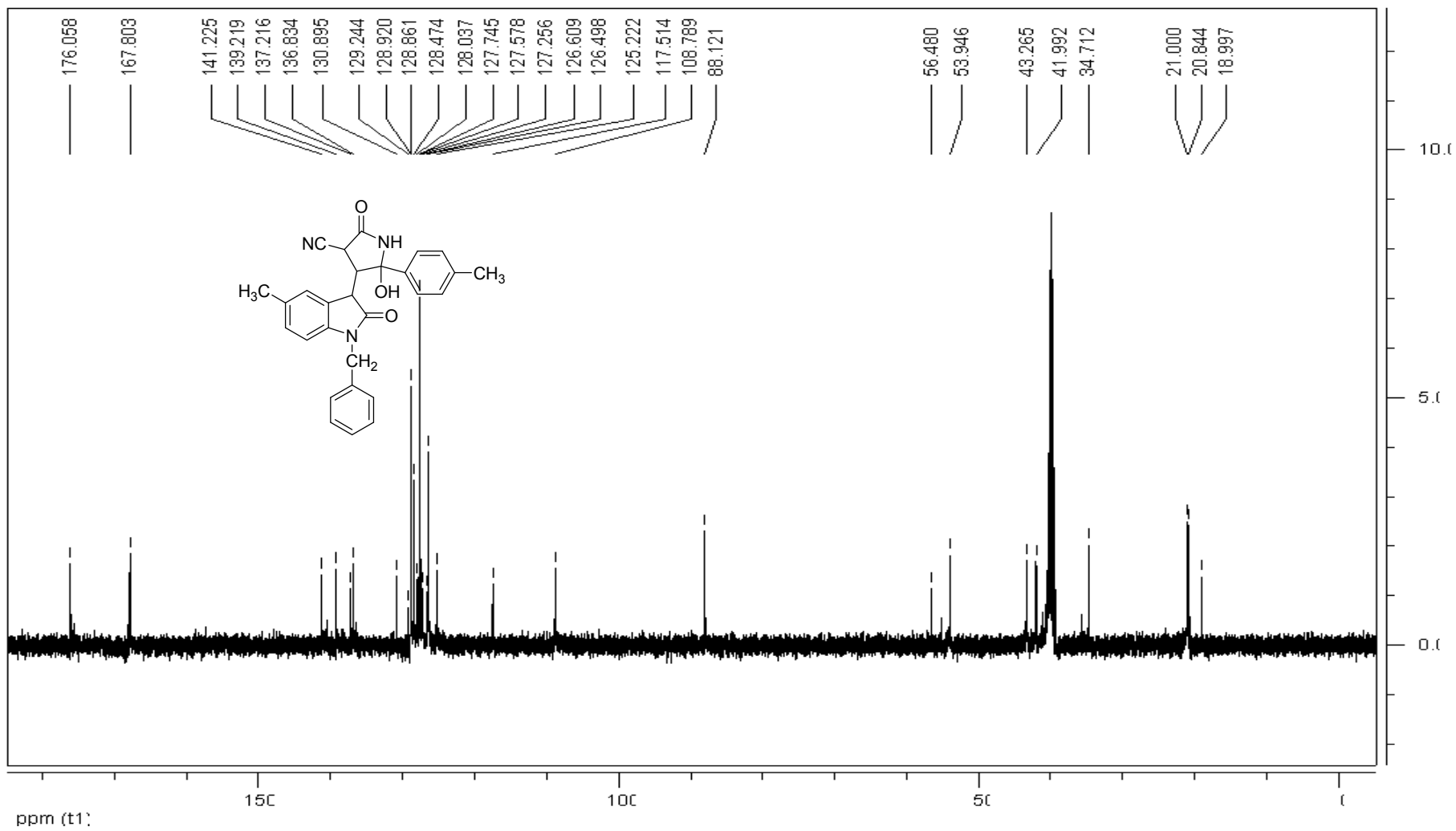
4-(1-benzyl-2-oxoindolin-3-yl)-5-(4-chlorophenyl)-5-hydroxy-2-oxopyrrolidine-3-carbonitrile (3b):



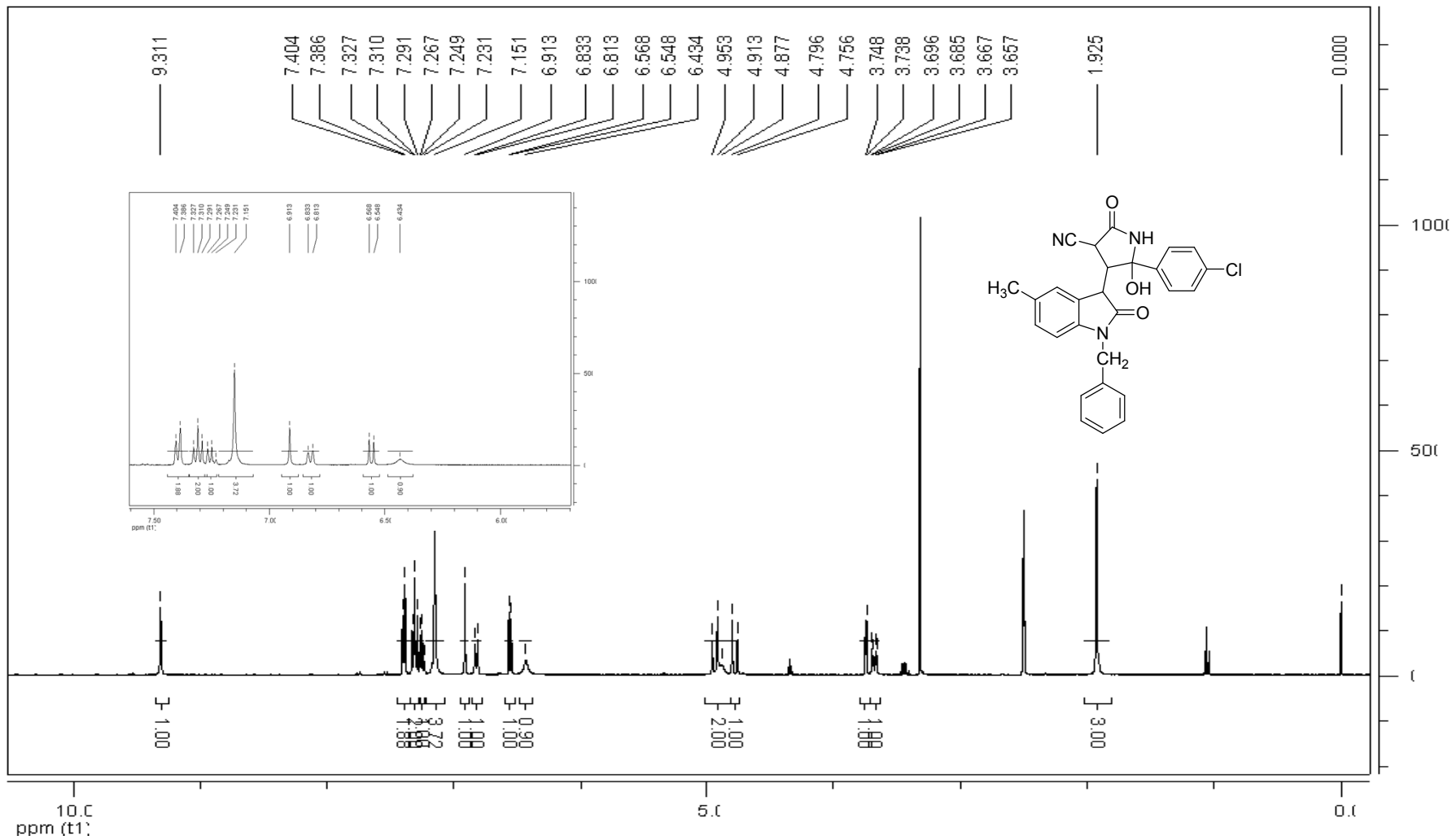


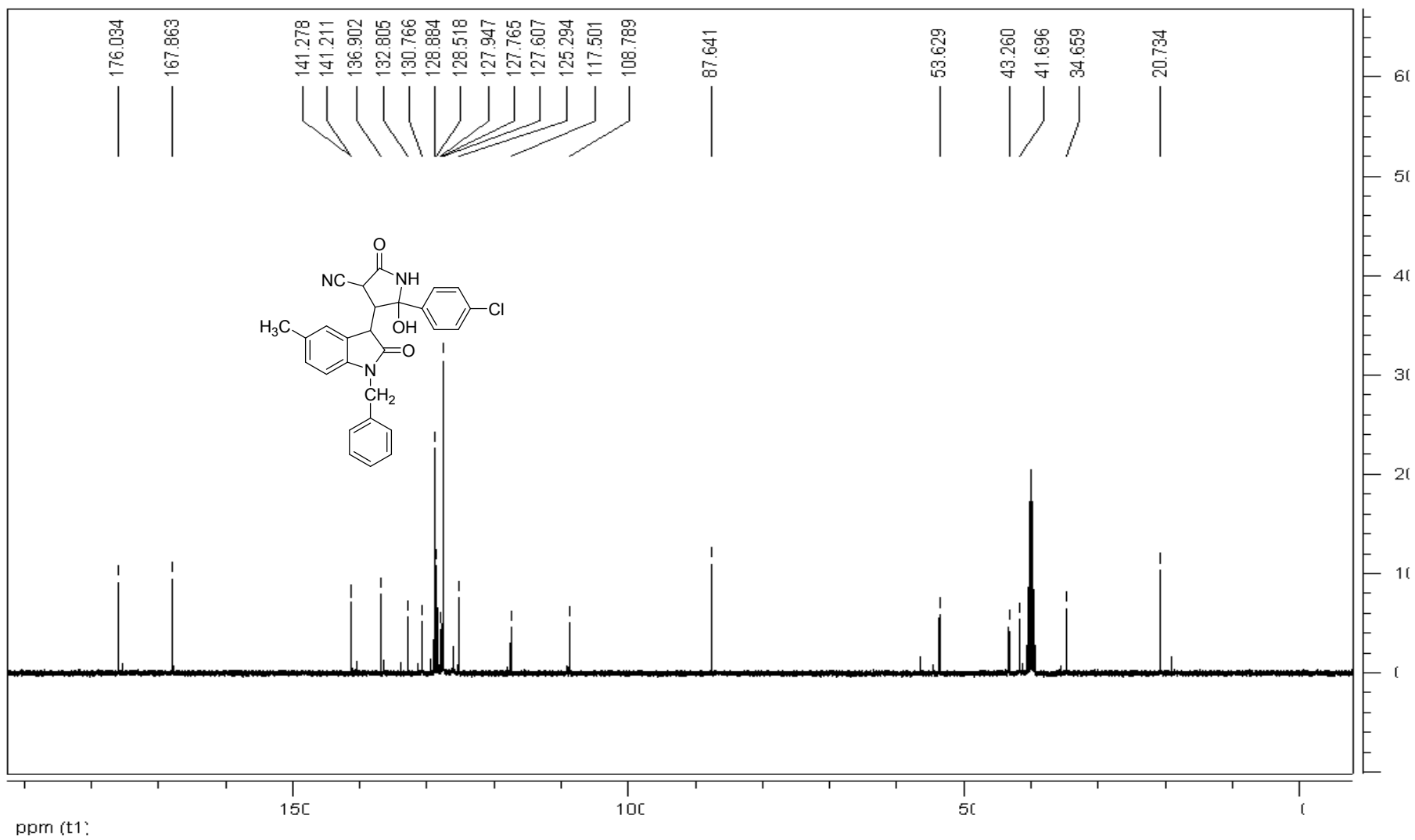
4-(1-benzyl-5-methyl-2-oxindolin-3-yl)-5-hydroxy-2-oxo-5-p-tolylpyrrolidine-3-carbonitrile (3c):



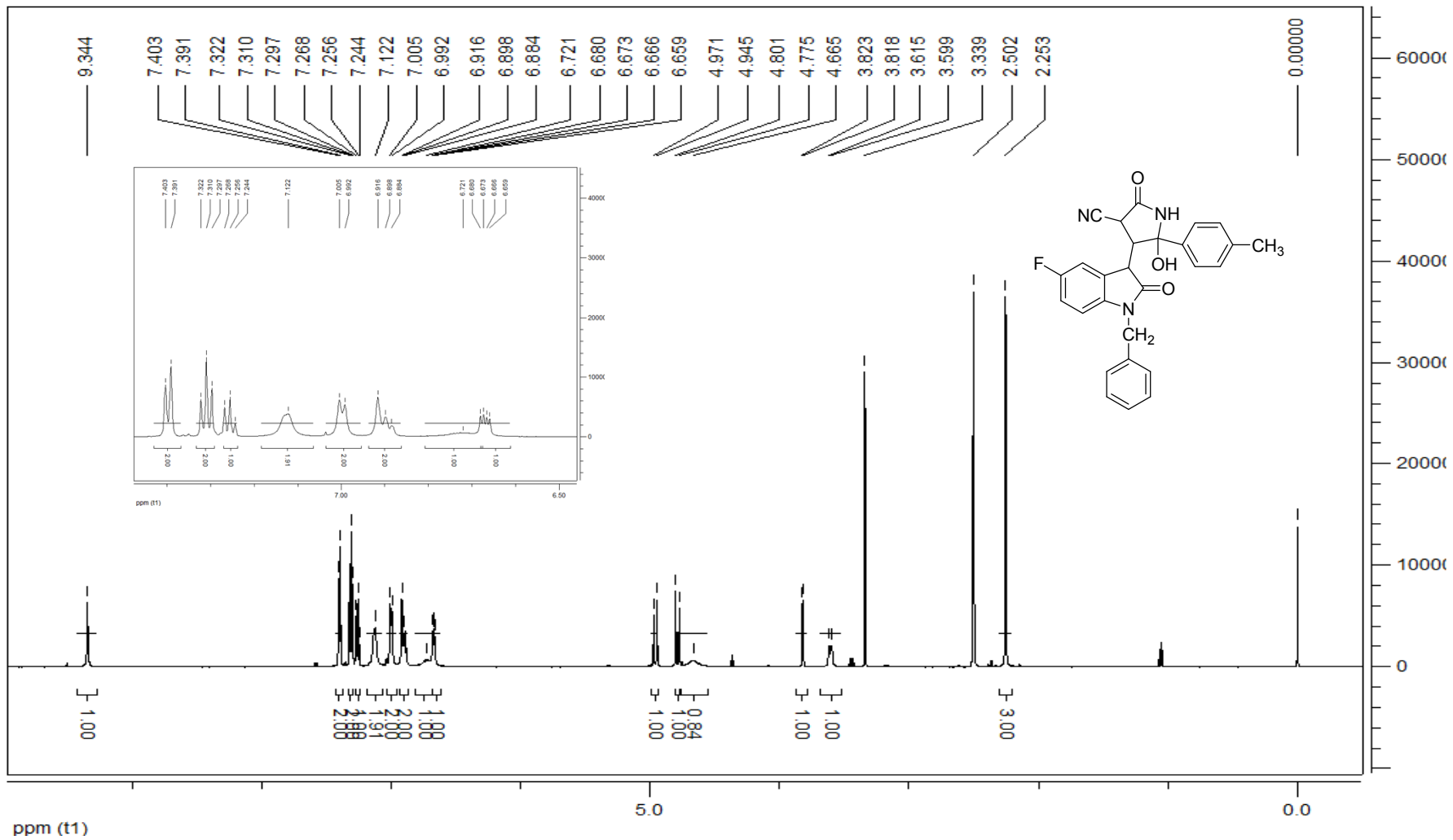


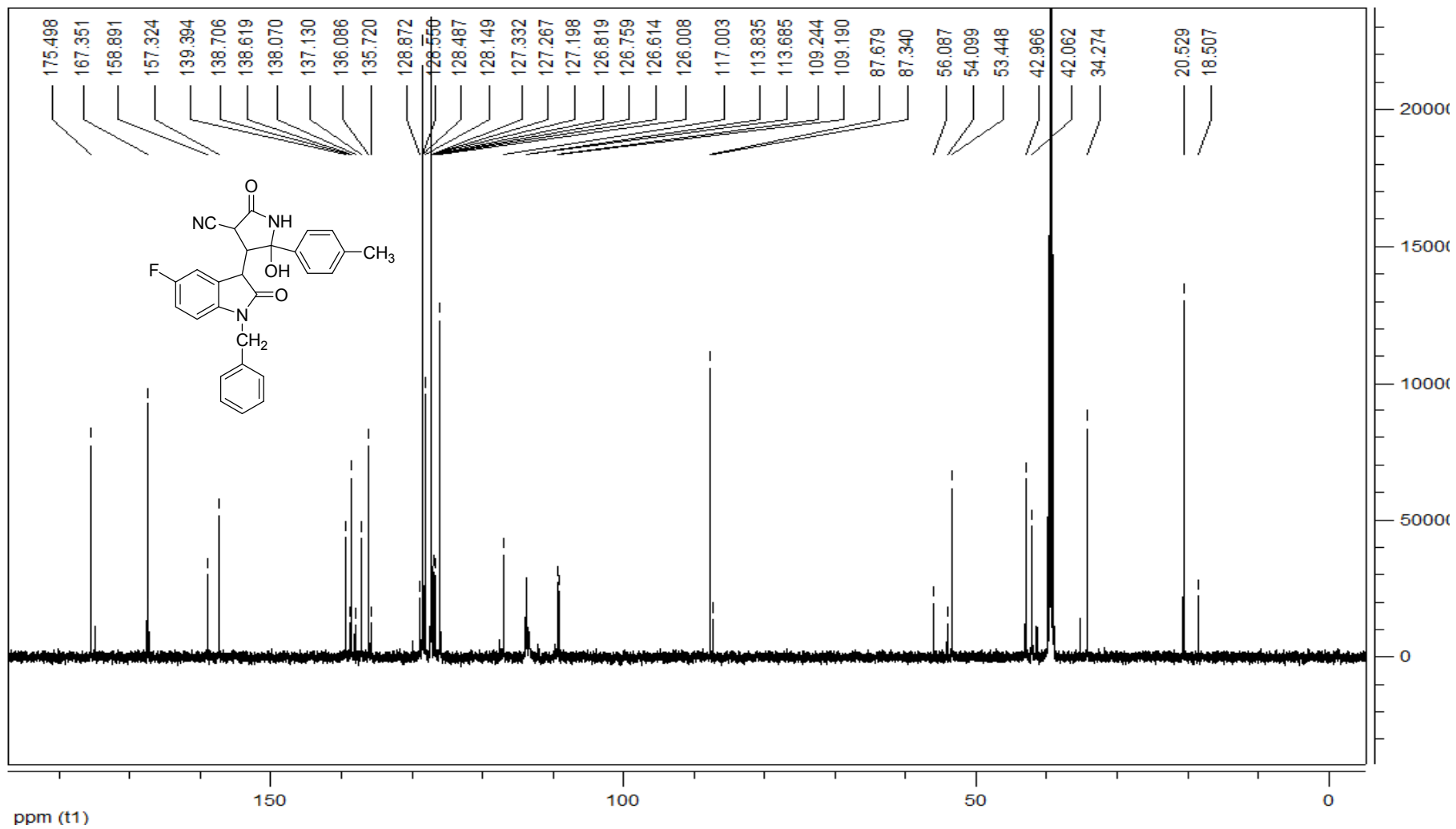
4-(1-benzyl-5-methyl-2-oxindolin-3-yl)-5-(4-chlorophenyl)-5-hydroxy-2-oxopyrrolidine-3-carbonitrile (3d):





4-(1-benzyl-5-fluoro-2-oxindolin-3-yl)-5-hydroxy-2-oxo-5-p-tolylpyrrolidine-3-carbonitrile (3e):





4-(1-butyl-5-chloro-2-oxindolin-3-yl)-5-hydroxy-5-(4-methoxyphenyl)-2-oxpyrrolidine-3-carbonitrile (3f):

