

**Diastereoselective synthesis of spiro[indene-2,2'-pyrazolo[1,2-a]pyrazoles] and
spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazoles] via 1,3-dipolar cycloaddition**

Yu-Ling Lu, Jing Sun*, Yan-Hong Jiang, Chao-Guo Yan*

Supporting Information

| | |
|--|-------------|
| Figures s1-s4 | 2-3 |
| ¹H, ¹³C NMR and HRMS spectra of new compounds | 4-44 |

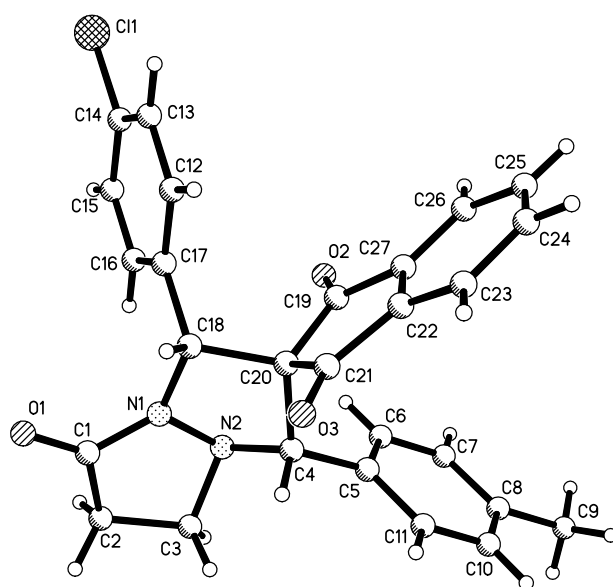


Fig s1. Molecular structure of compound 1e

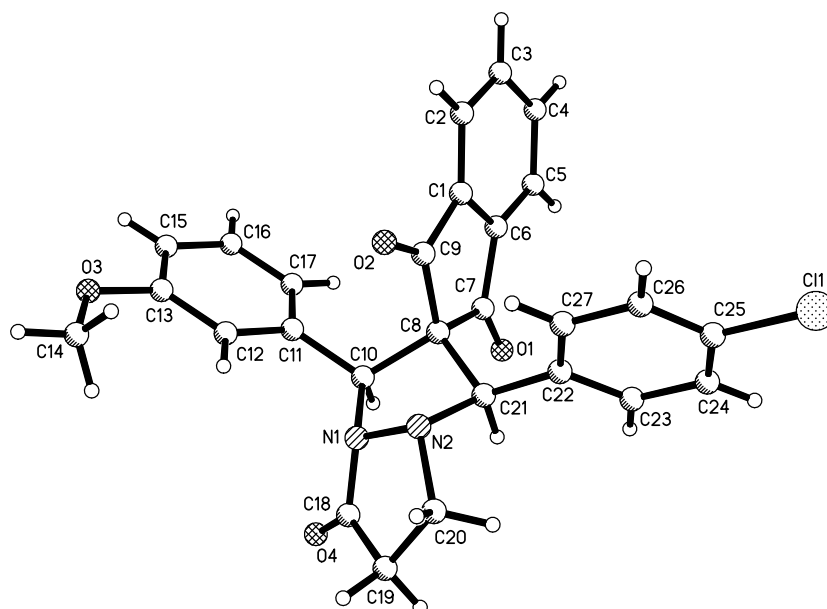


Fig. s2 Molecular structure of compound 1k

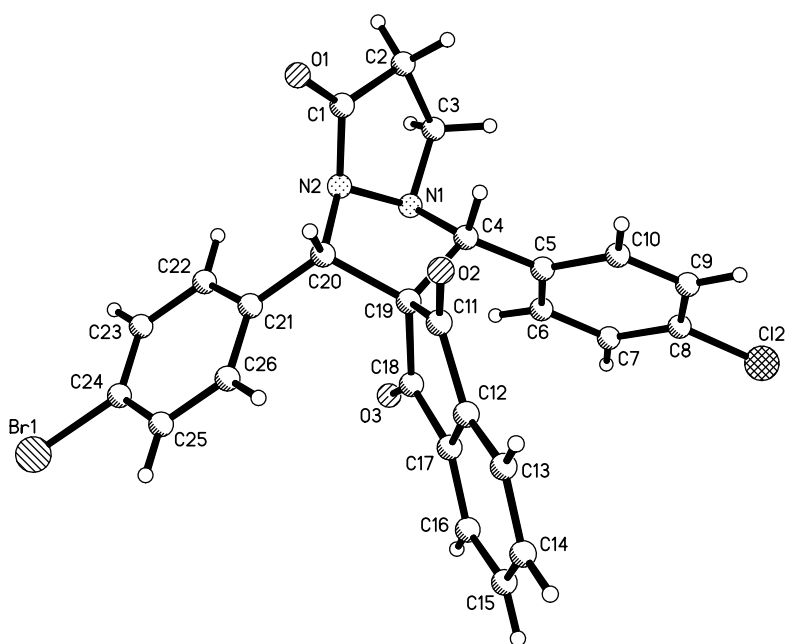


Fig. s3 Molecular structure of compound **1m**

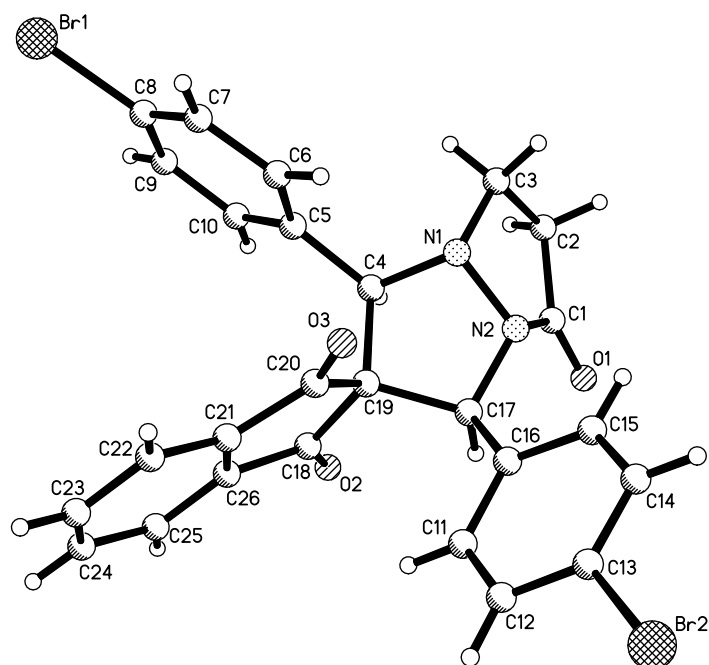
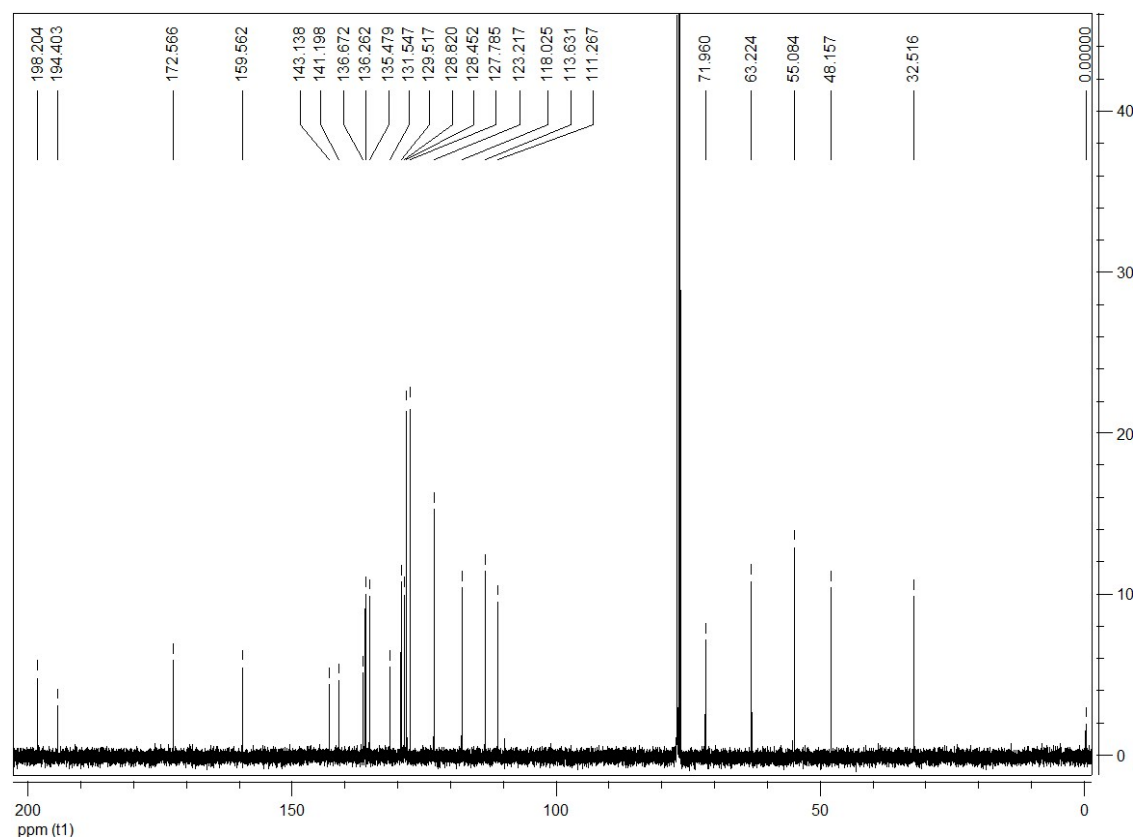
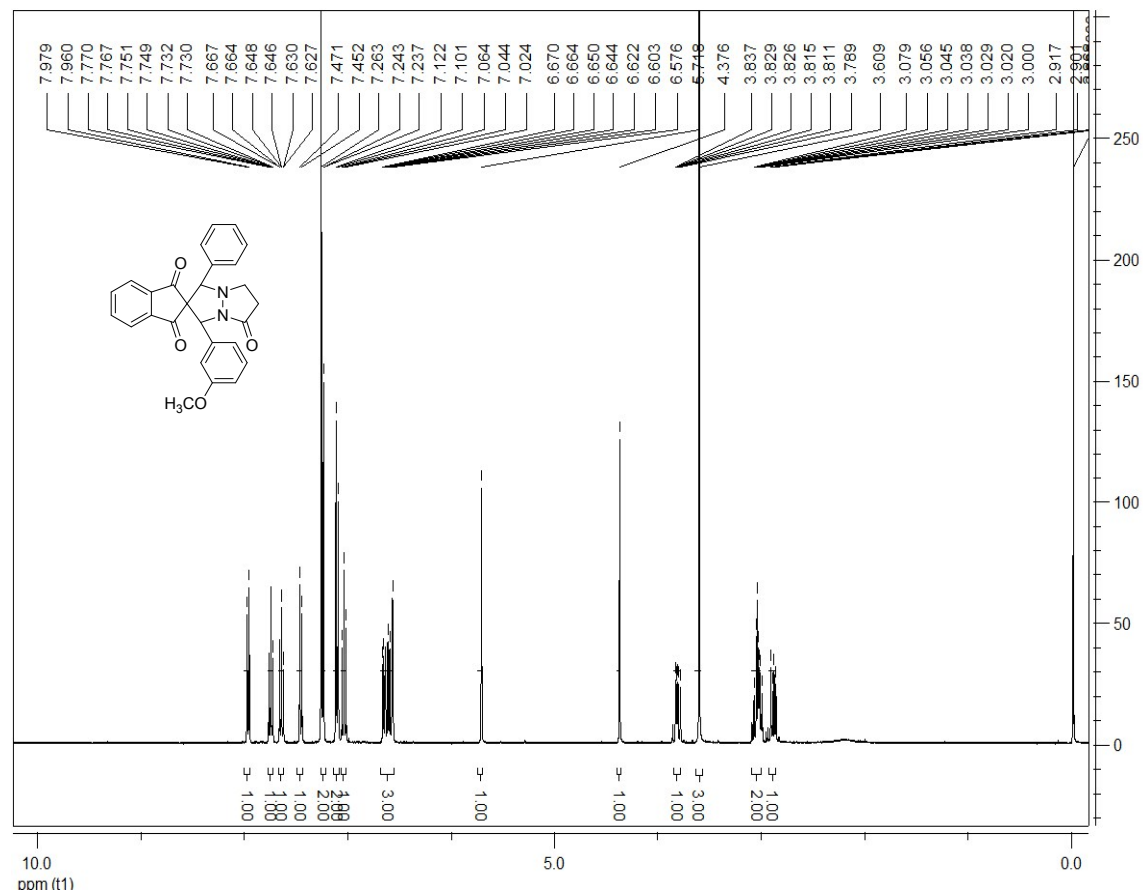
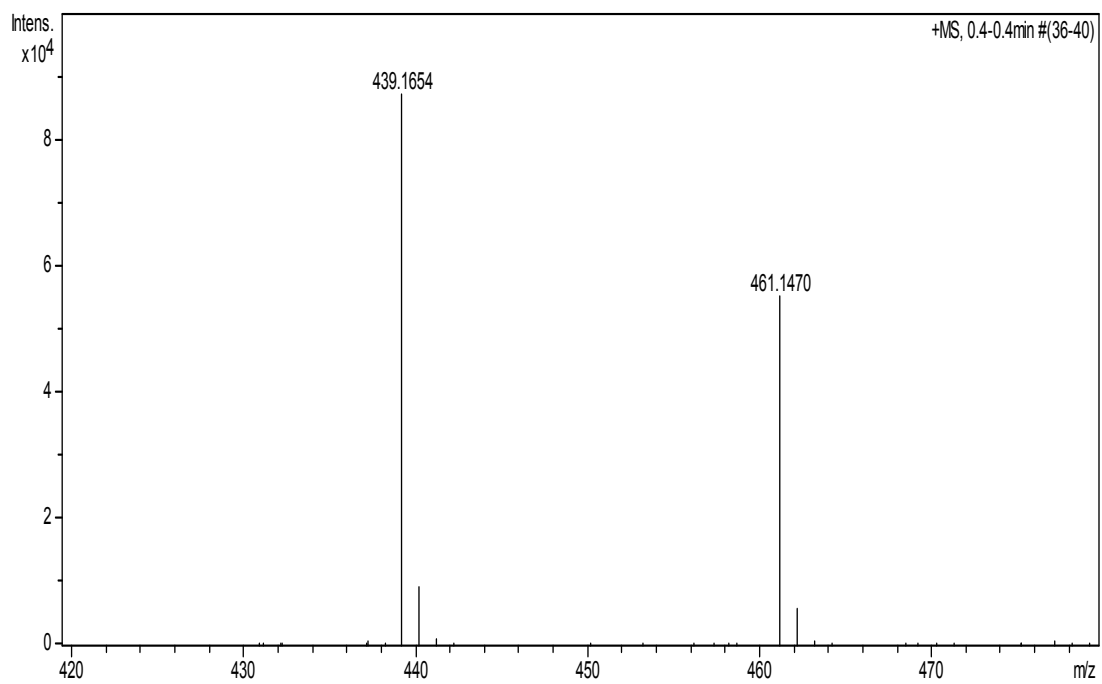


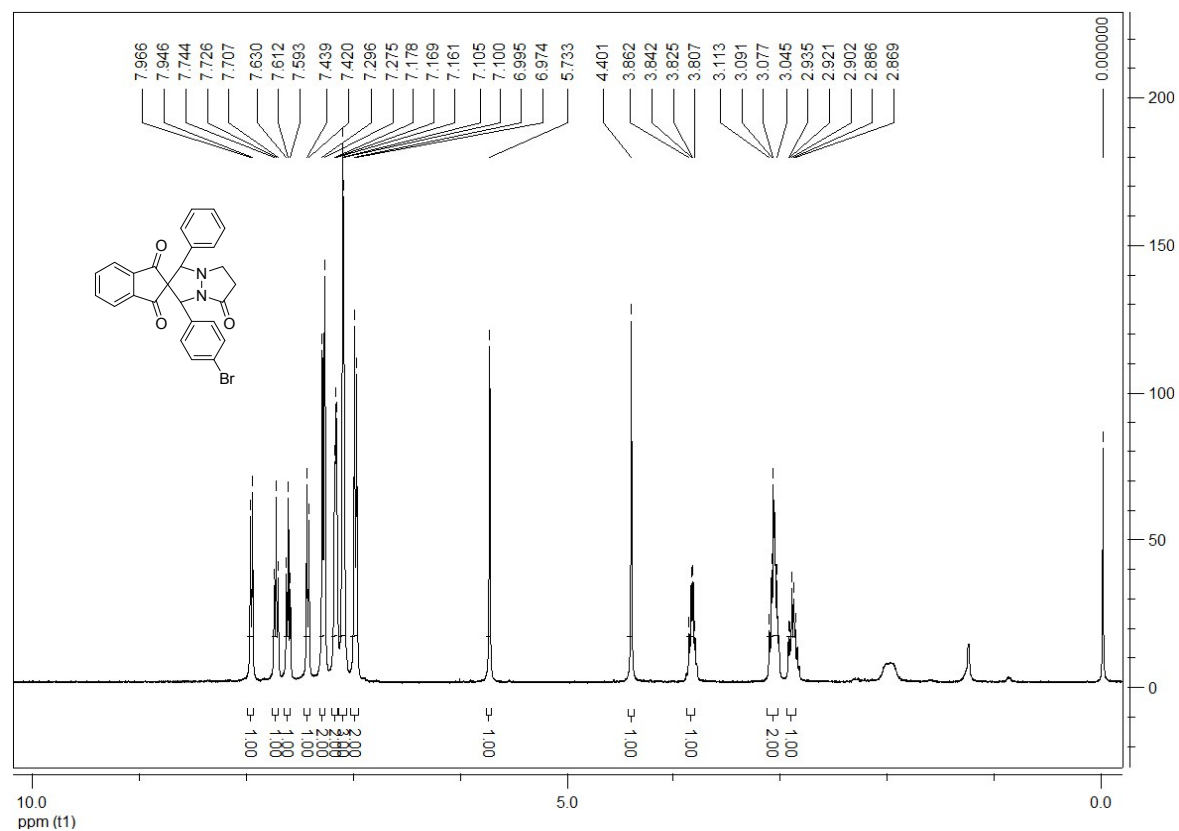
Fig. s4 Molecular structure of compound **1o**

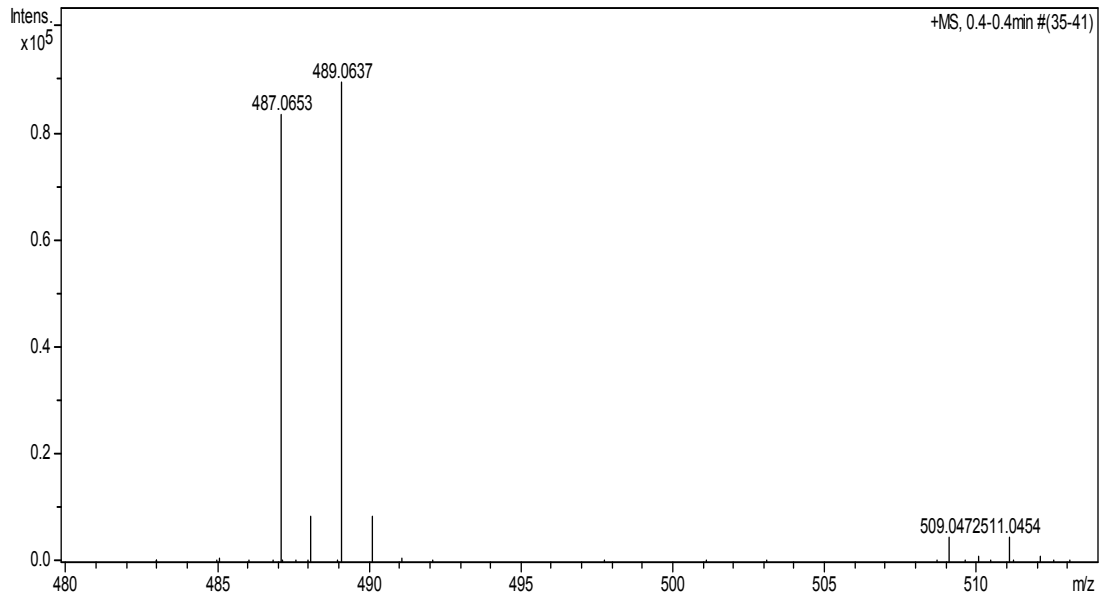
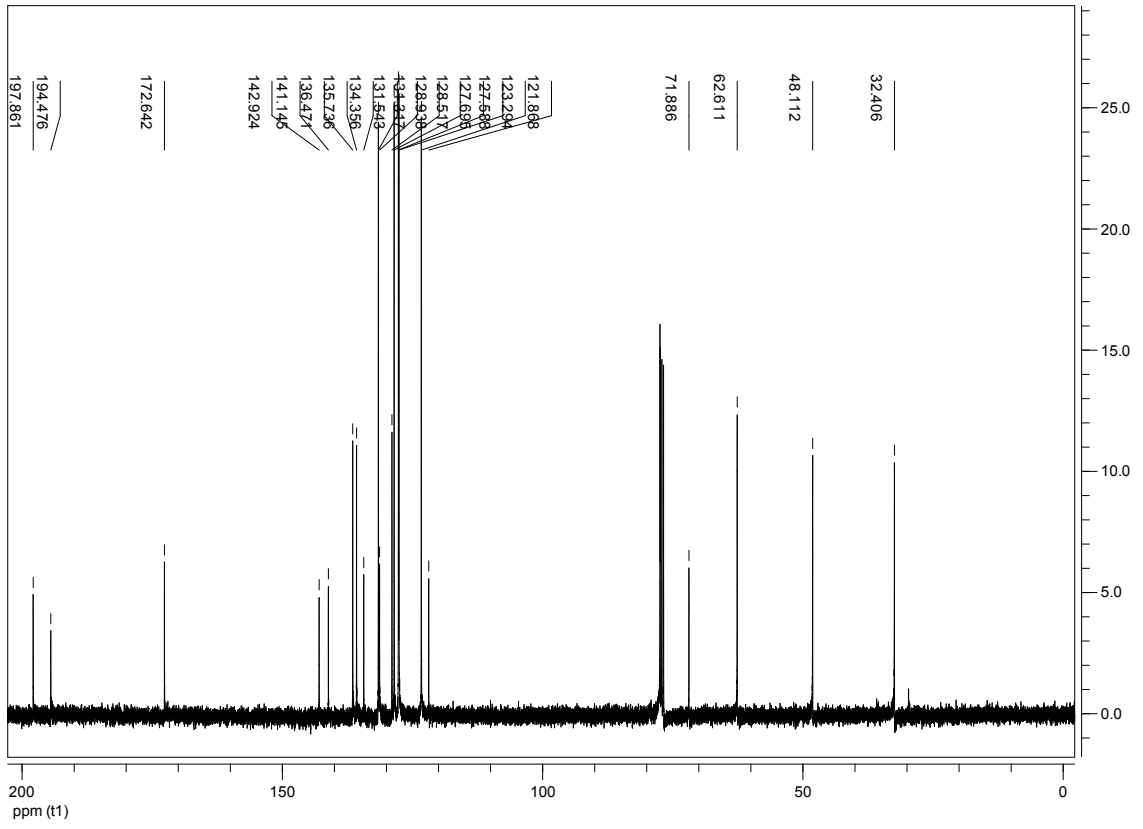
3'-(3-Methoxyphenyl)-1'-phenyl-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1a):



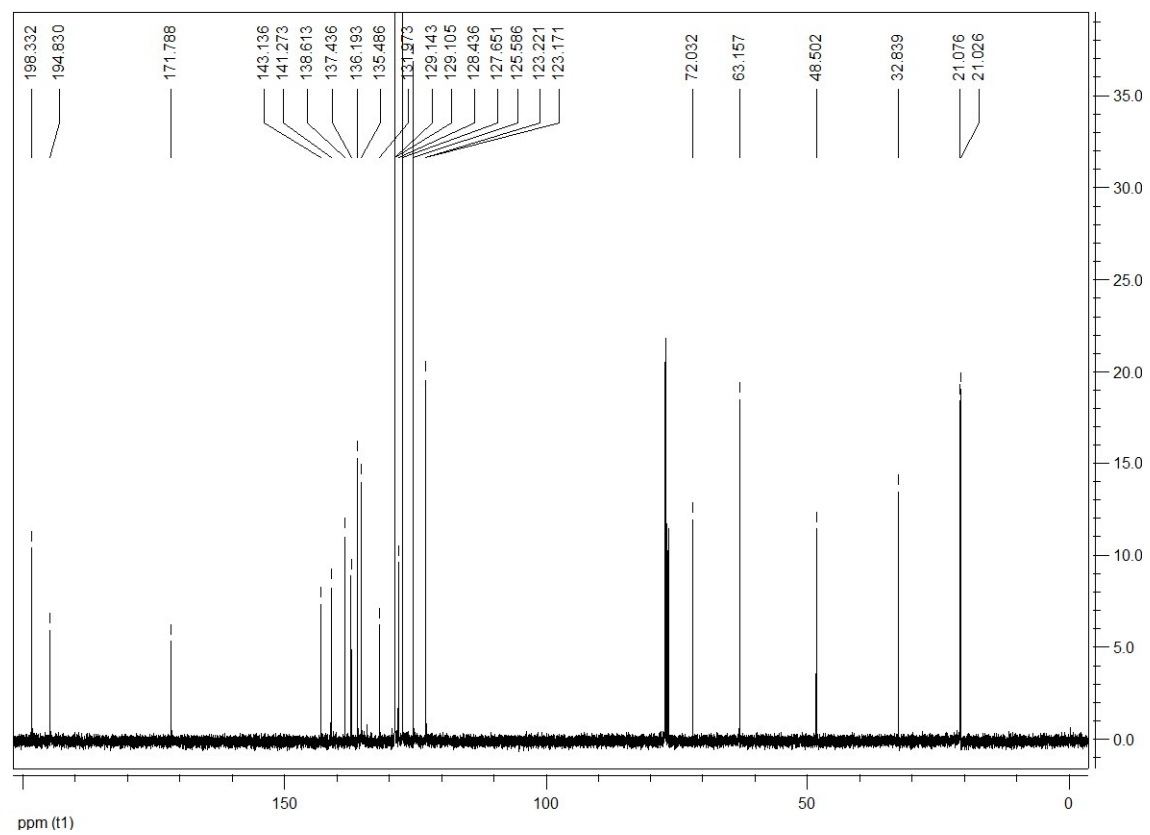
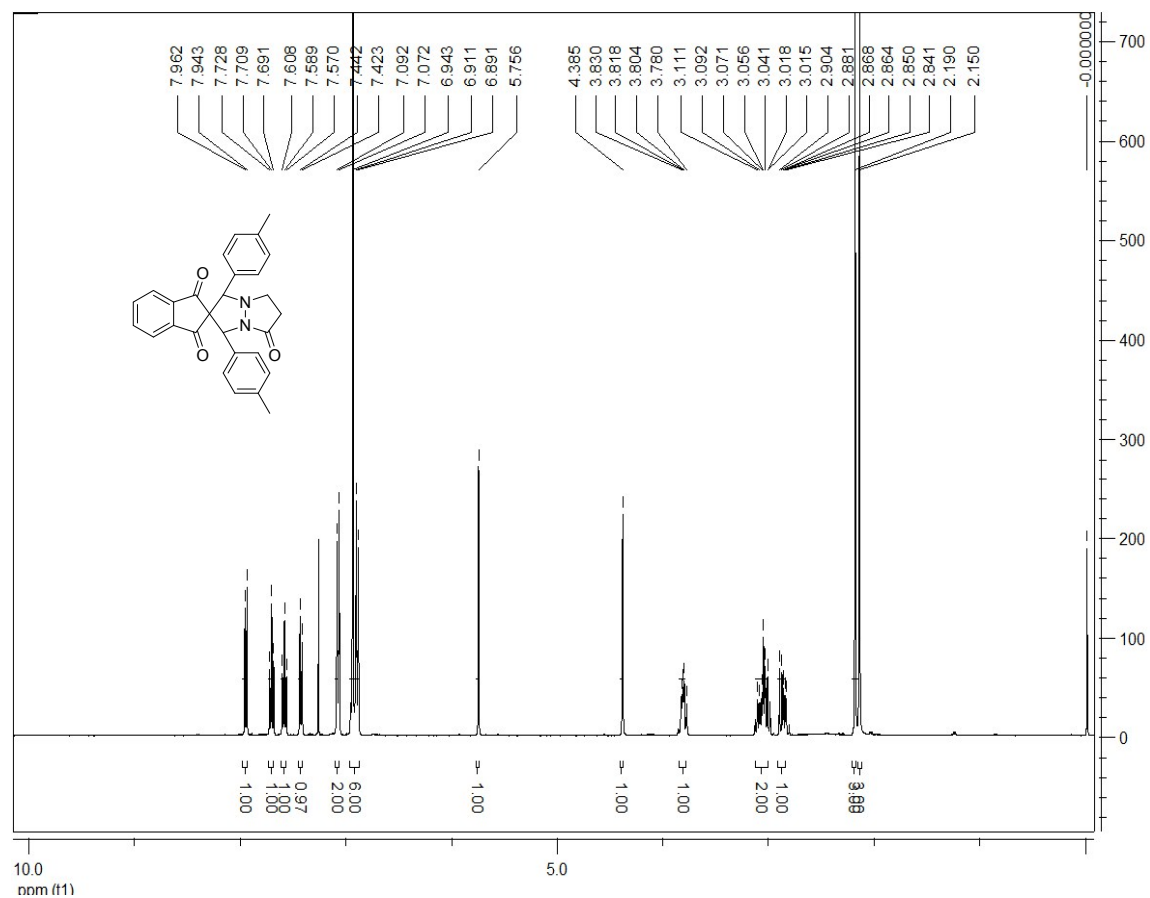


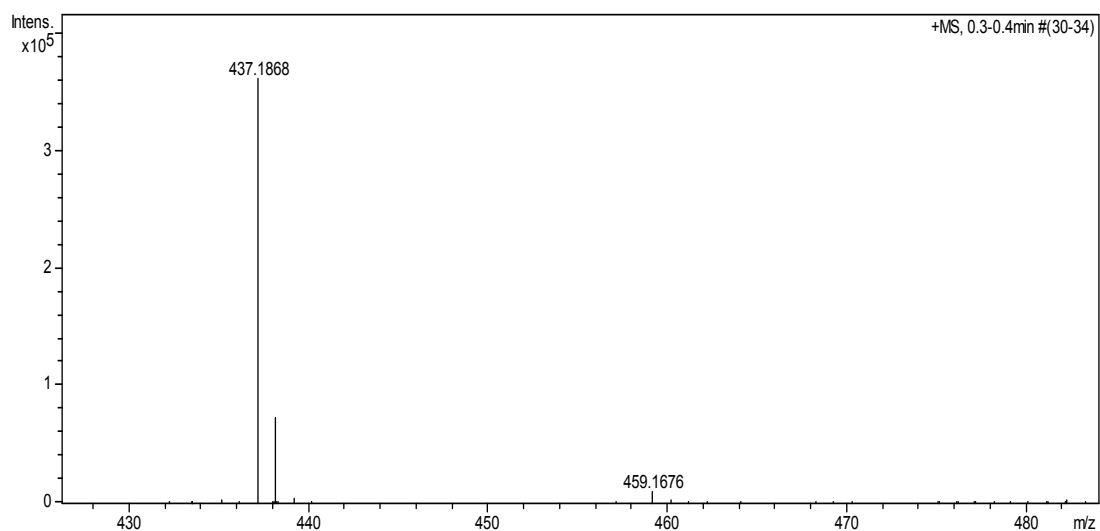
3'-(4-Bromophenyl)-1'-phenyl-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1b):



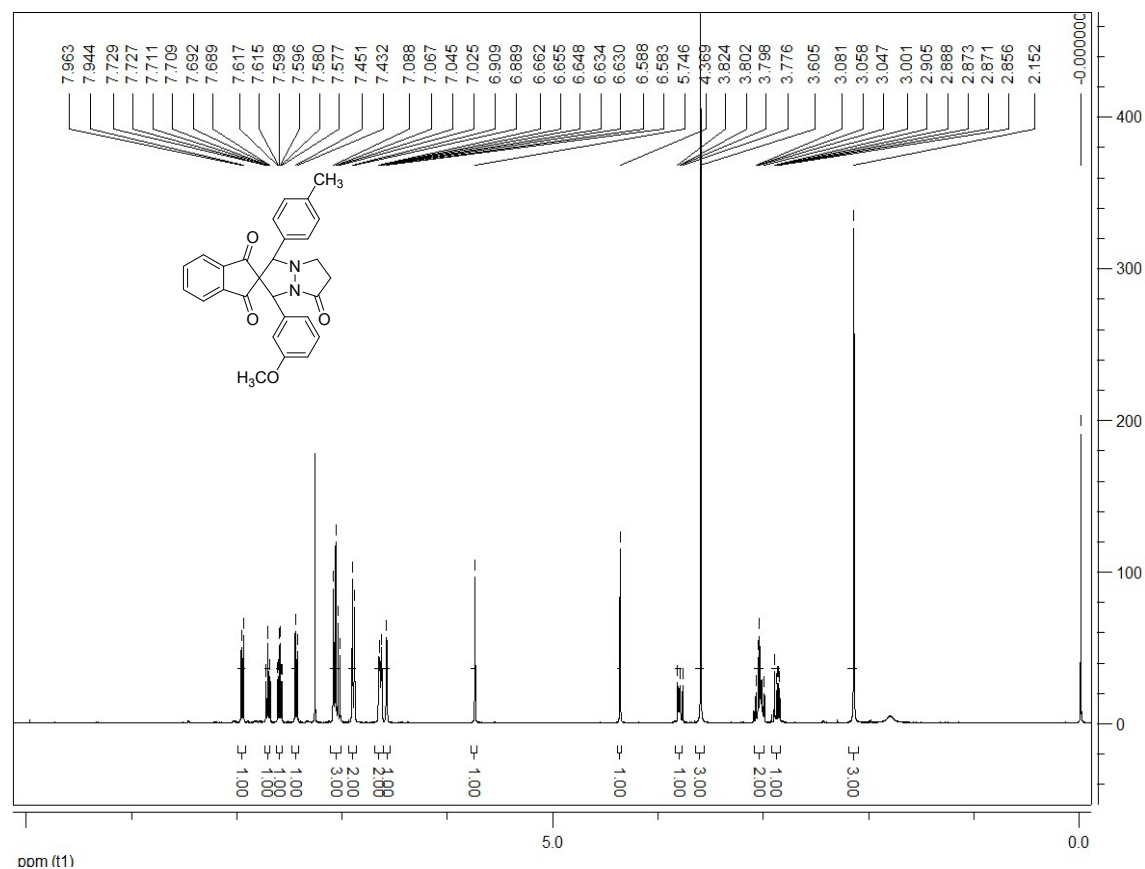


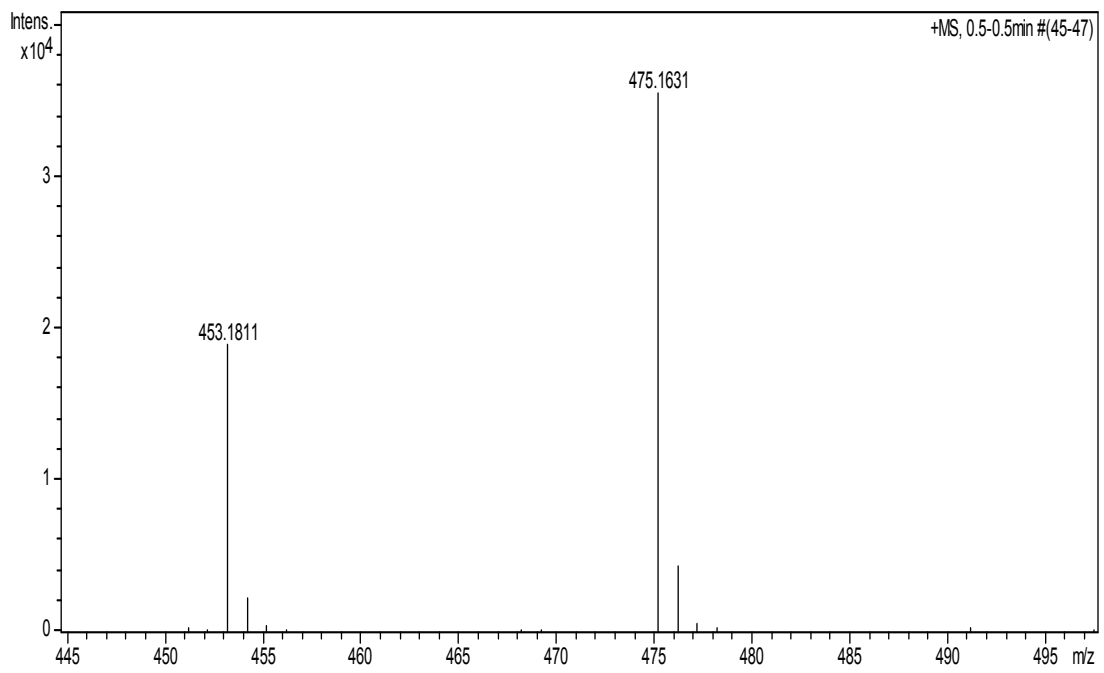
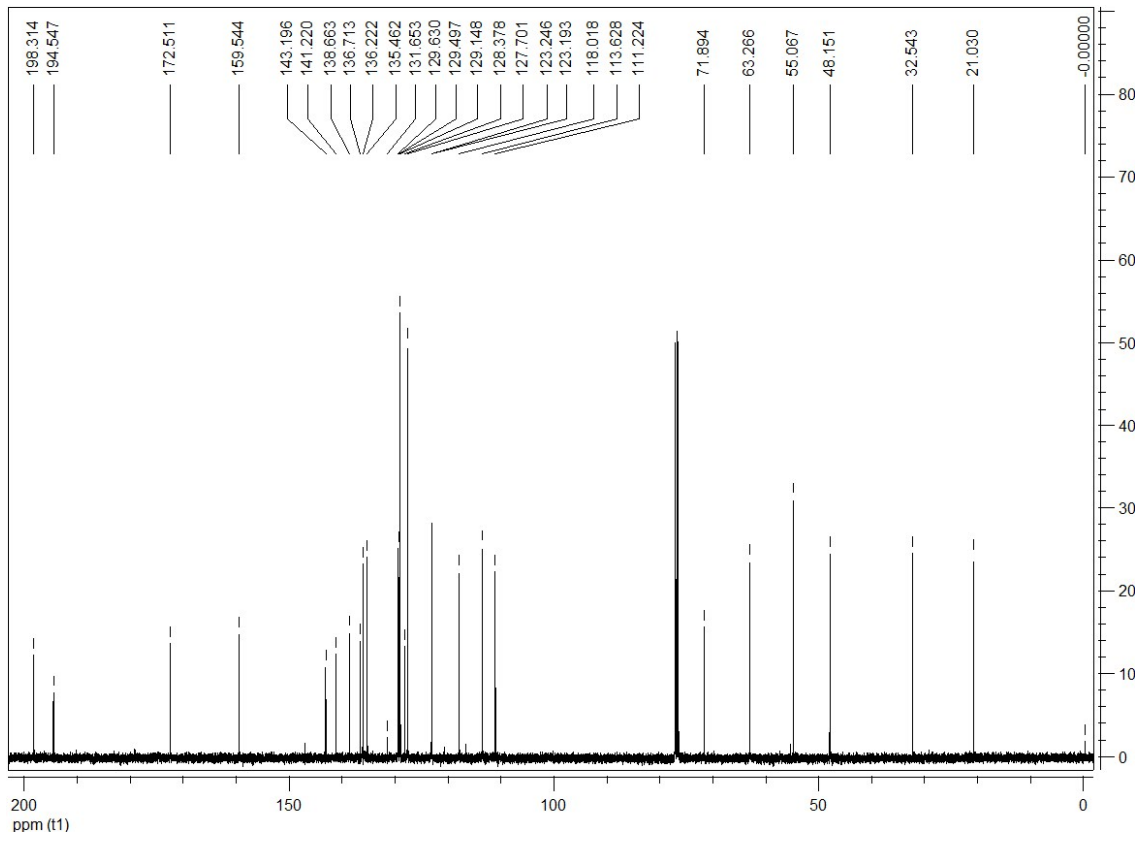
1',3'-Di-p-tolyl-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1c):



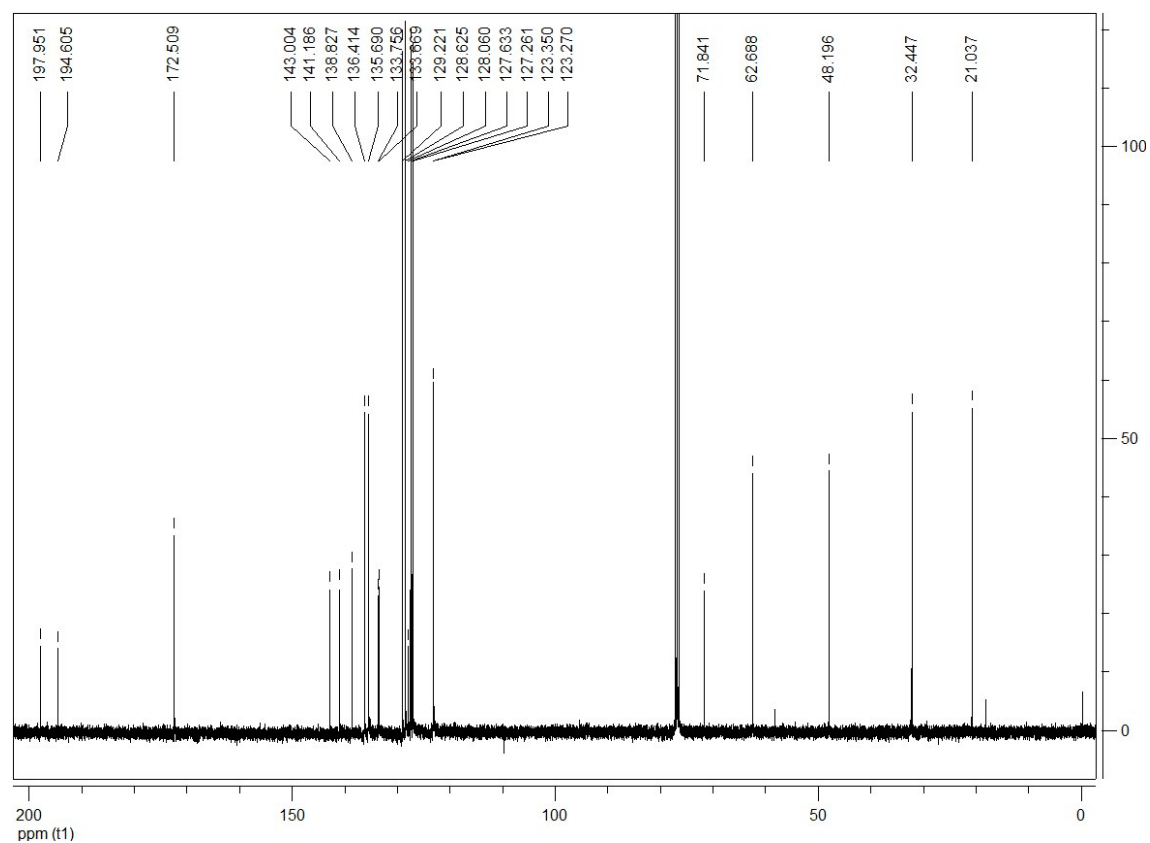
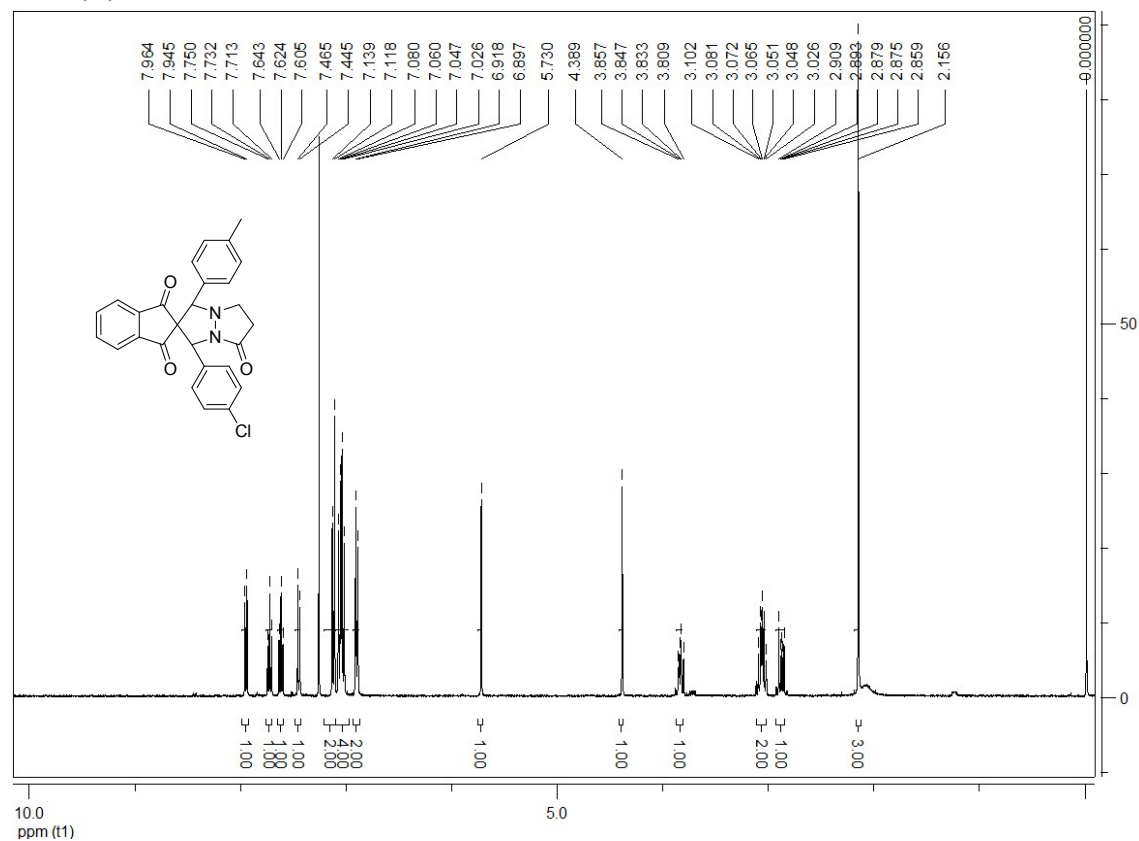


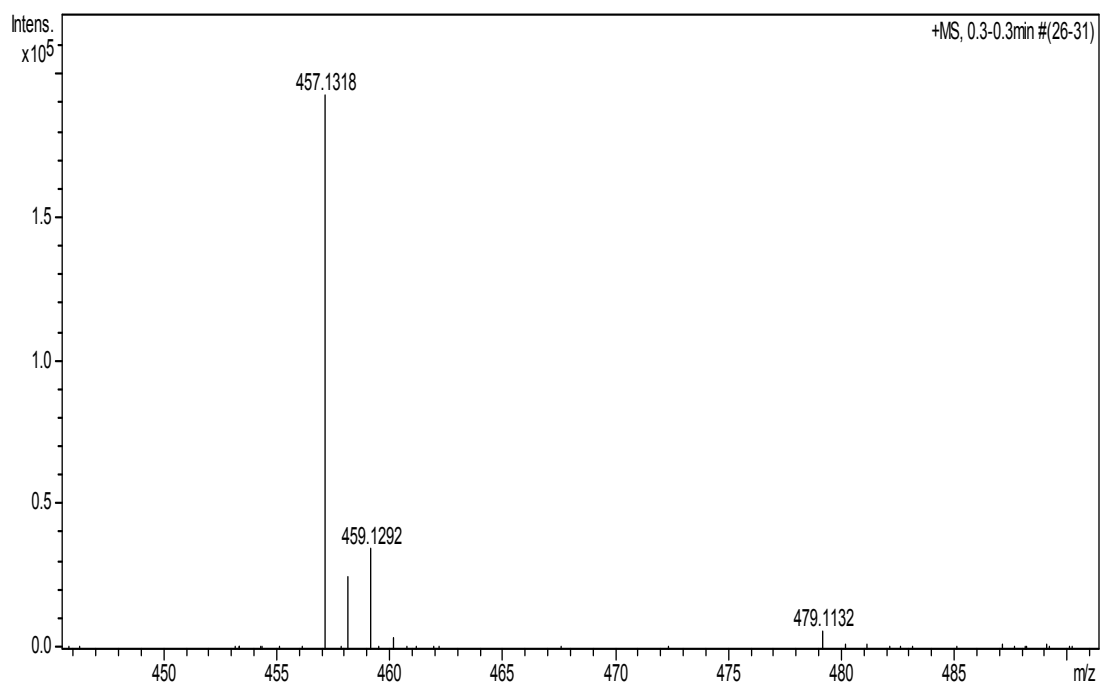
3'-(3-Methoxyphenyl)-1'-(p-tolyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1d):



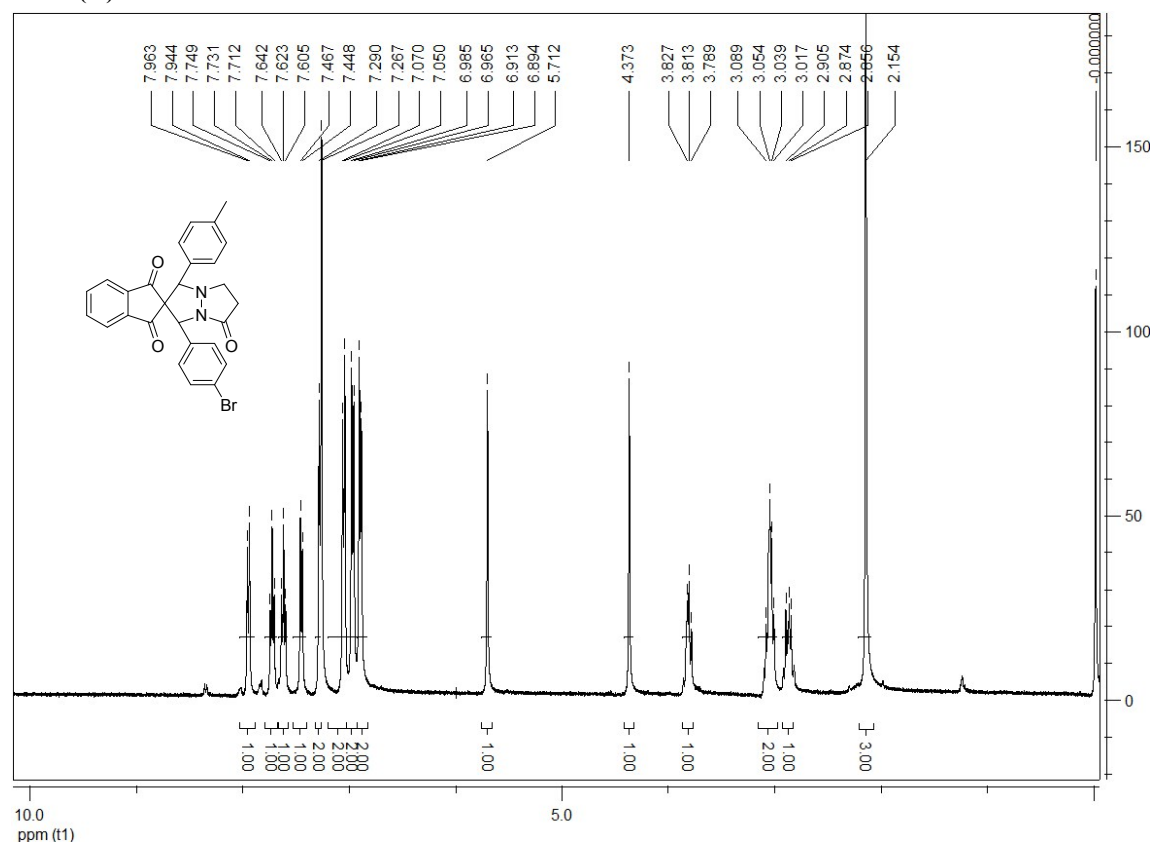


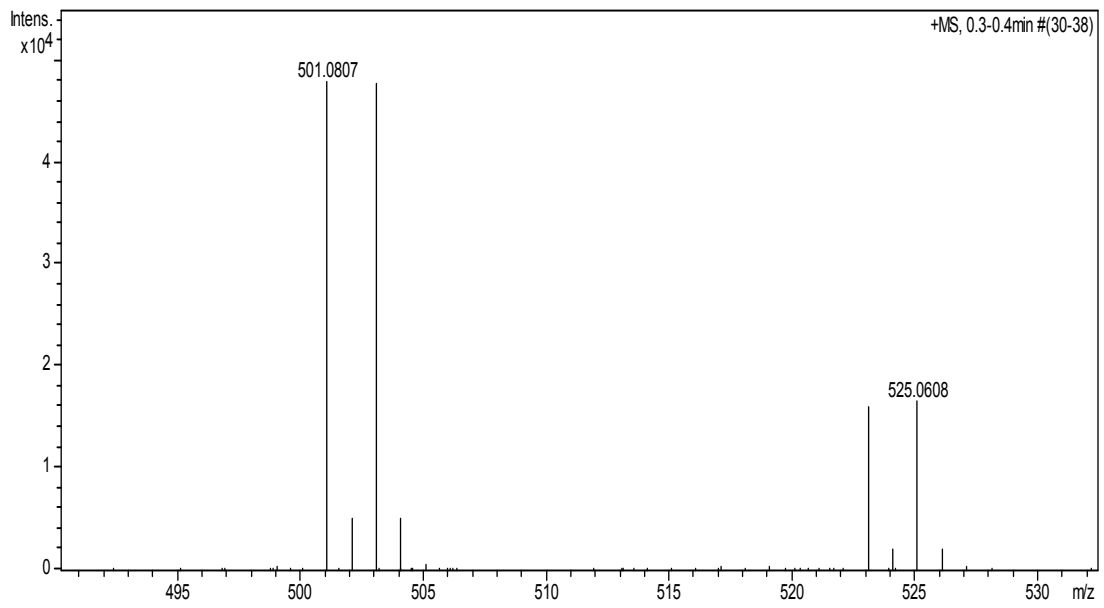
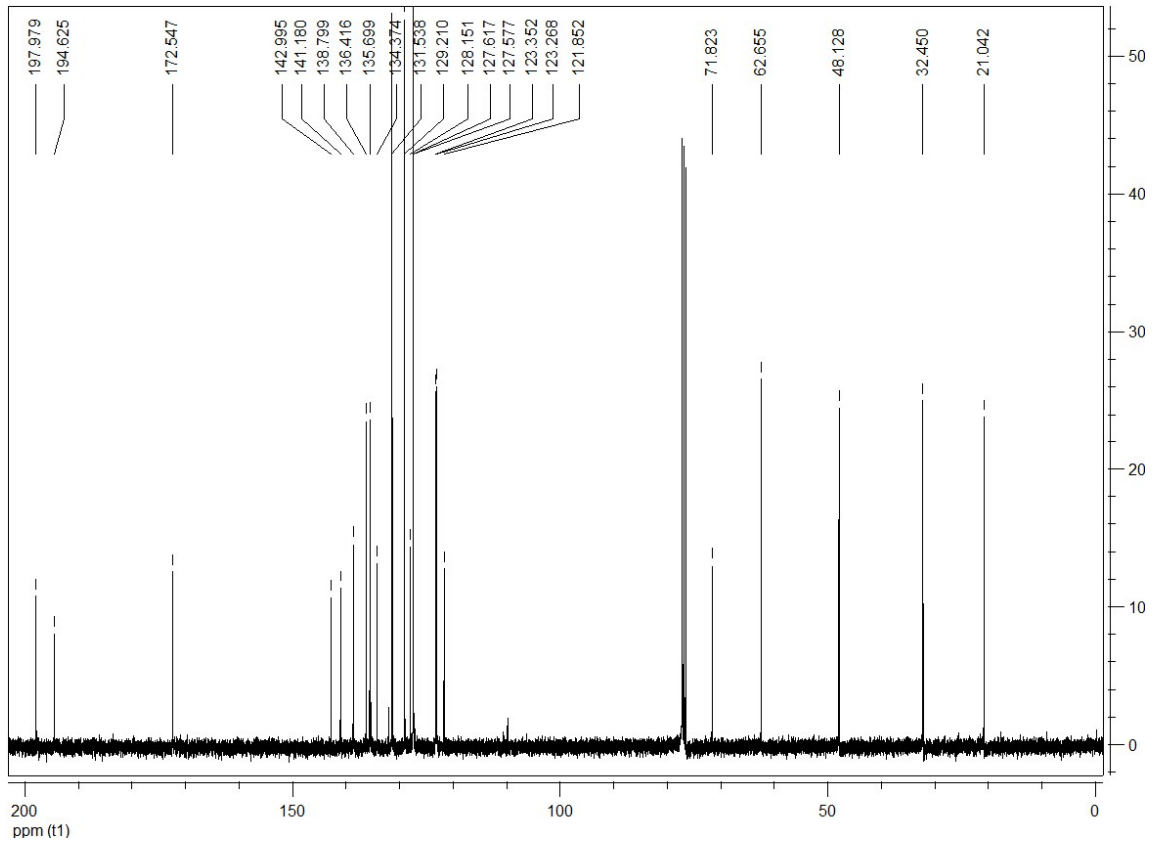
3'-(4-Chlorophenyl)-1'-(p-tolyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1e):



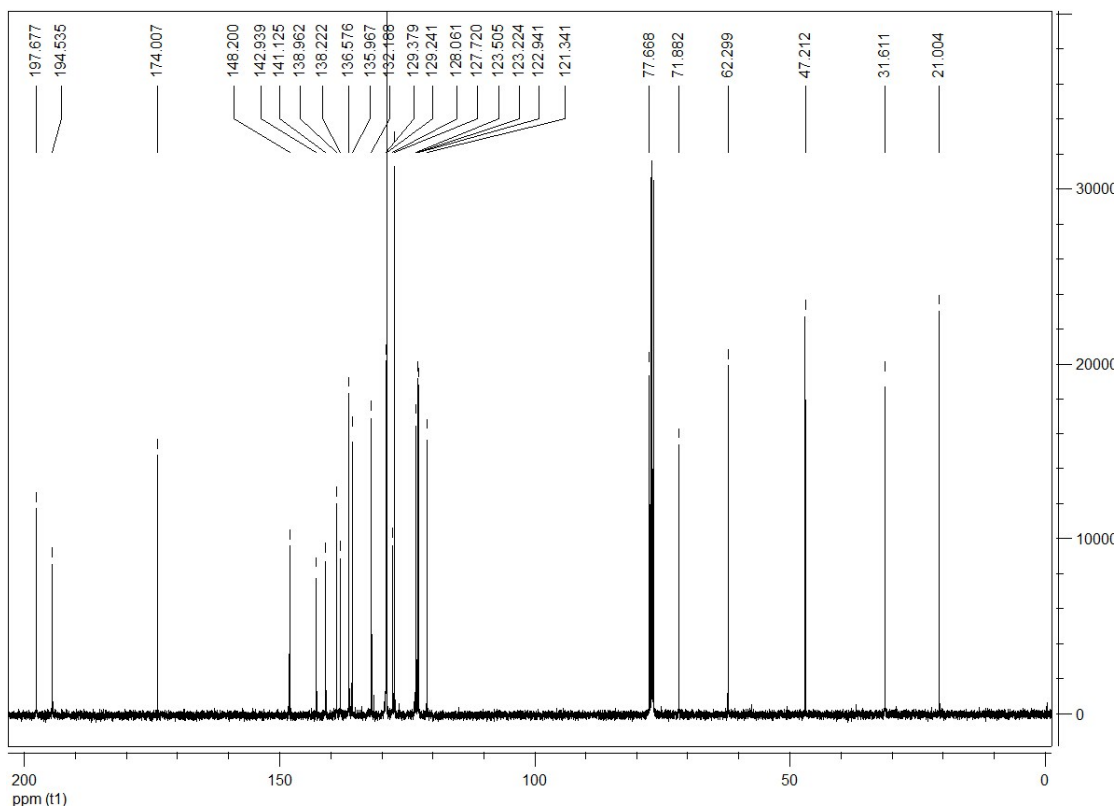
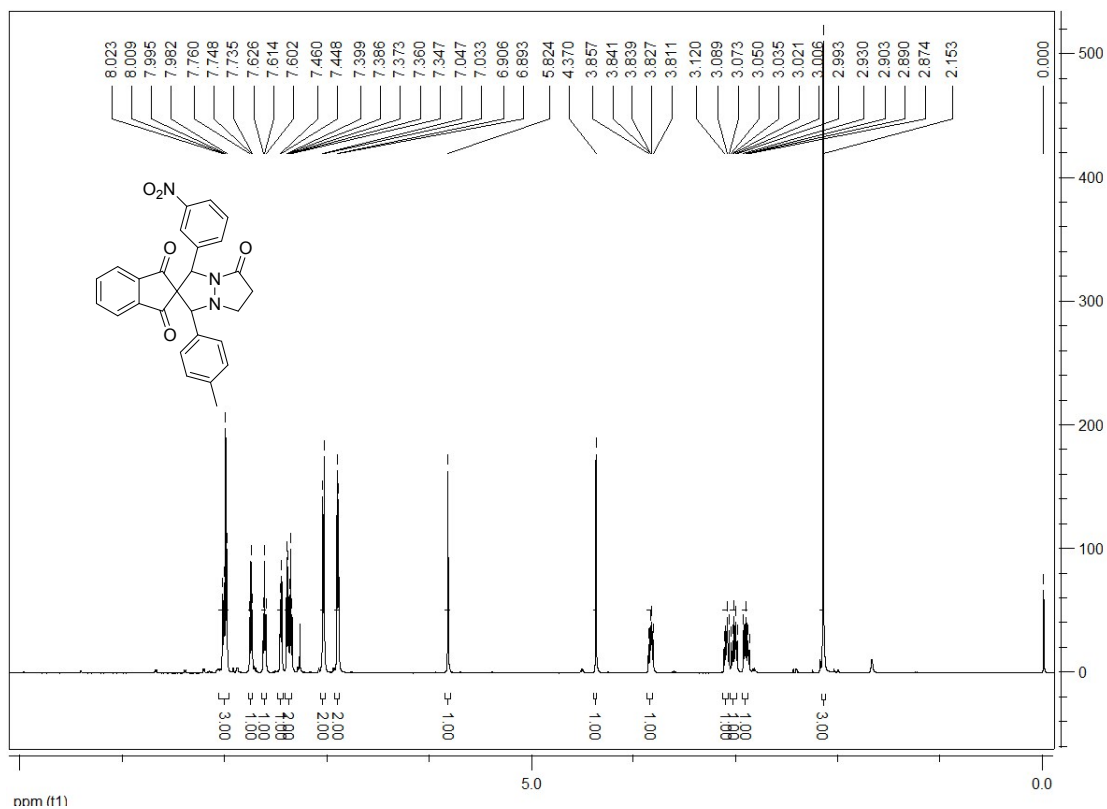


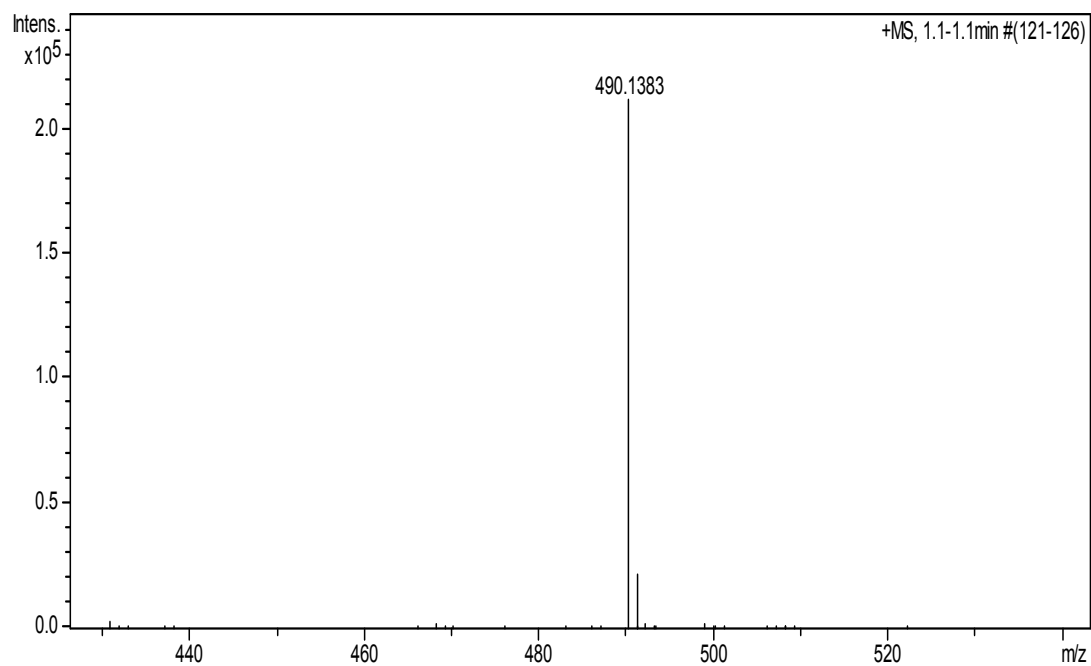
3'-(4-Bromophenyl)-1'-(p-tolyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1f):



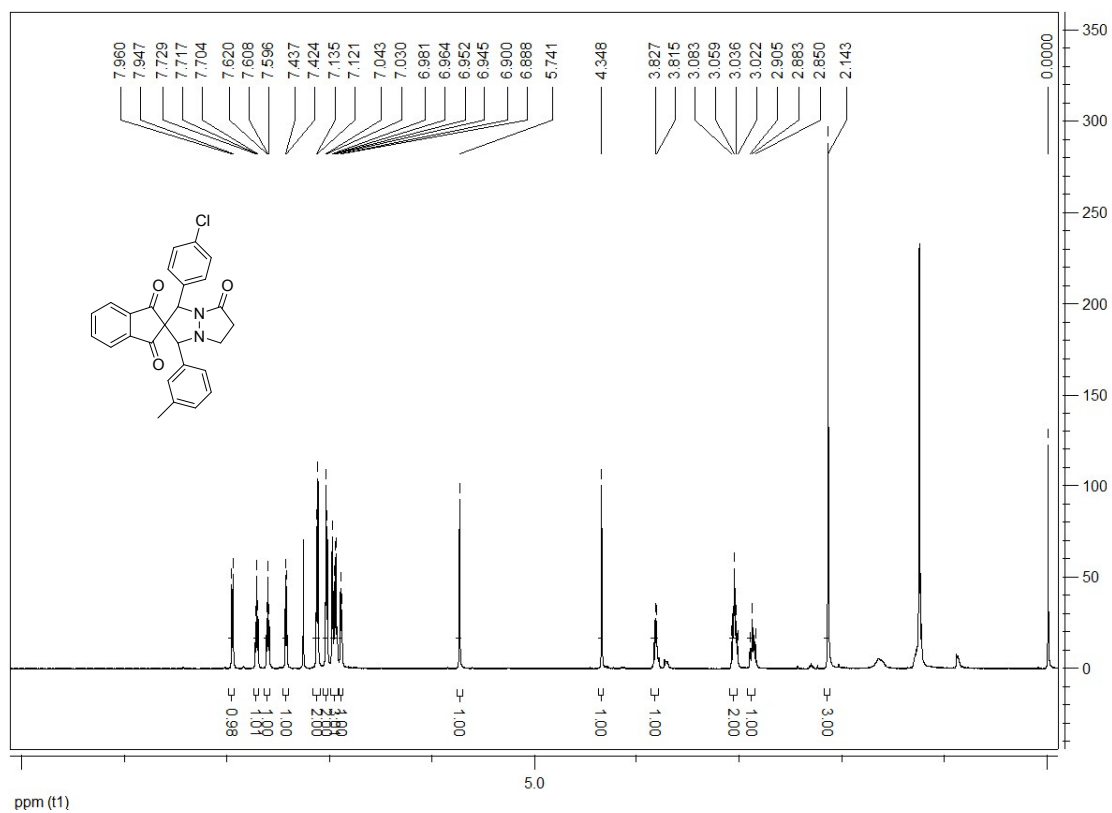


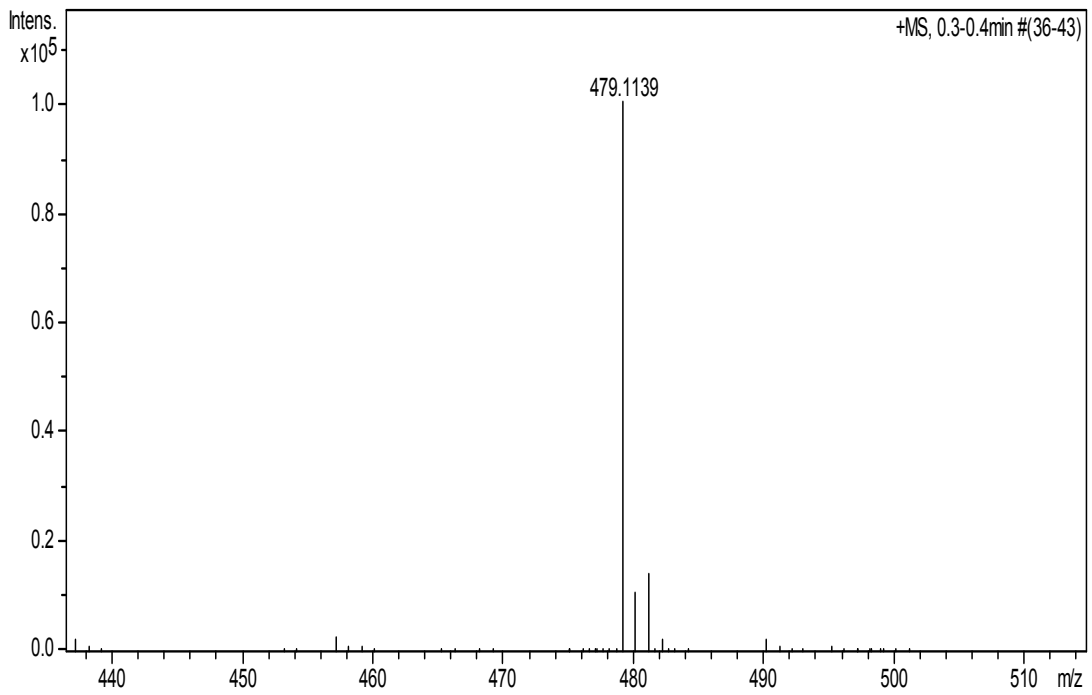
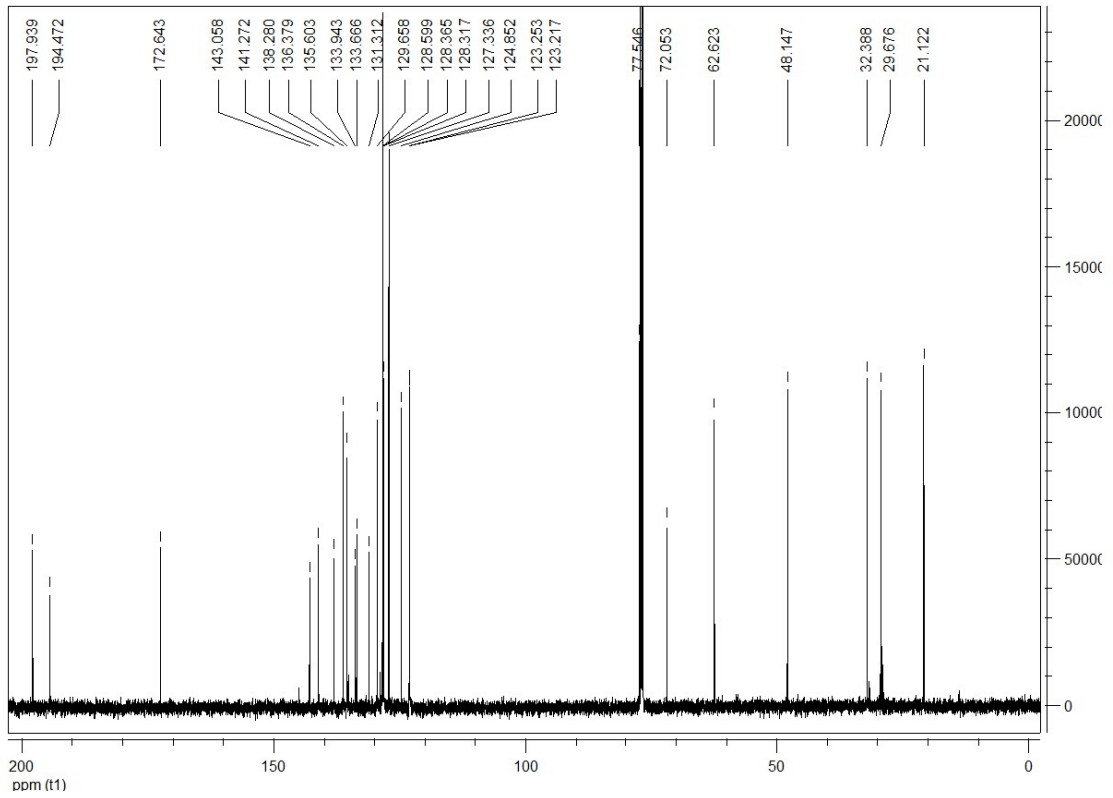
3'-(3-nitrophenyl)-1'-(p-tolyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1g):



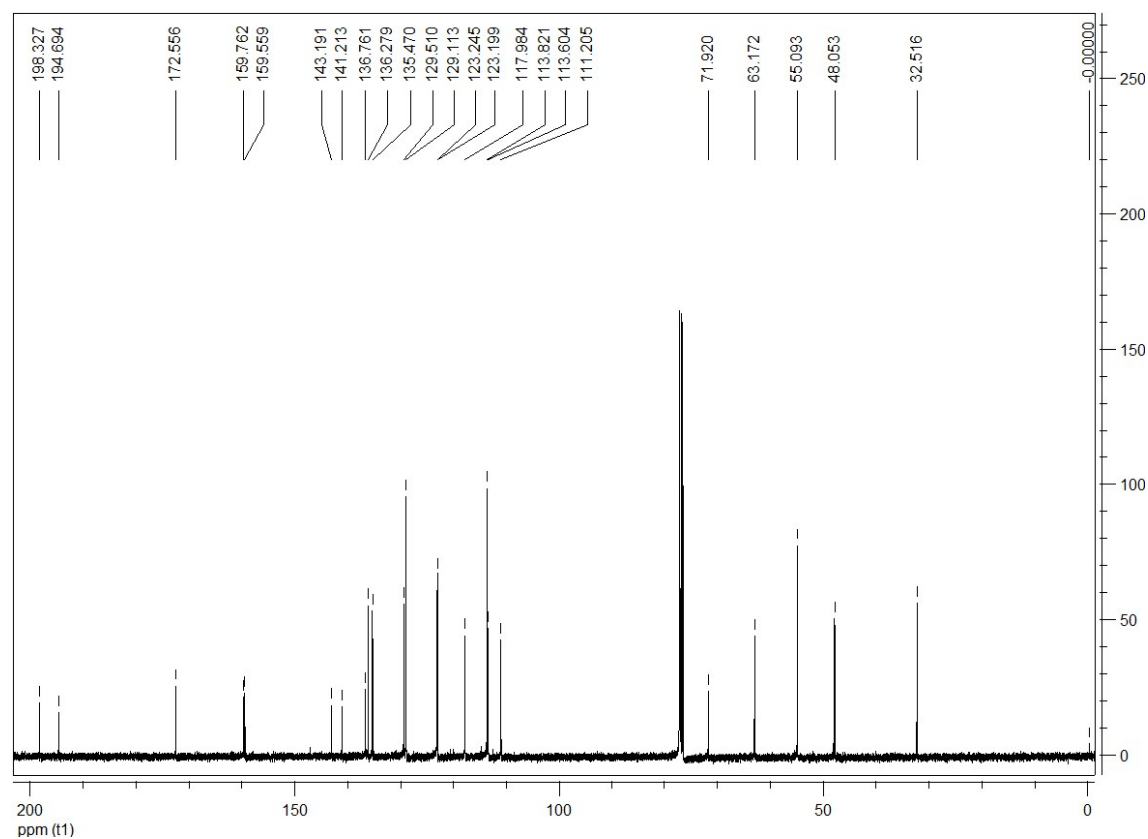
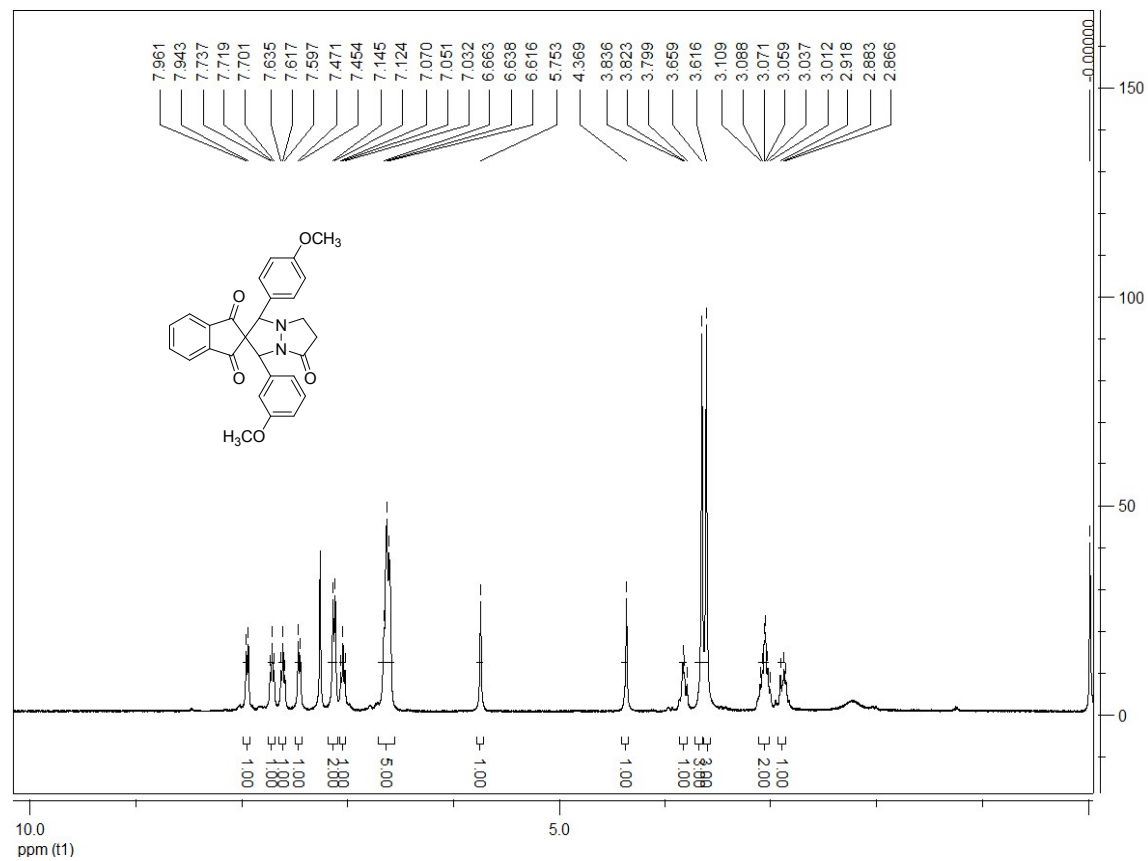


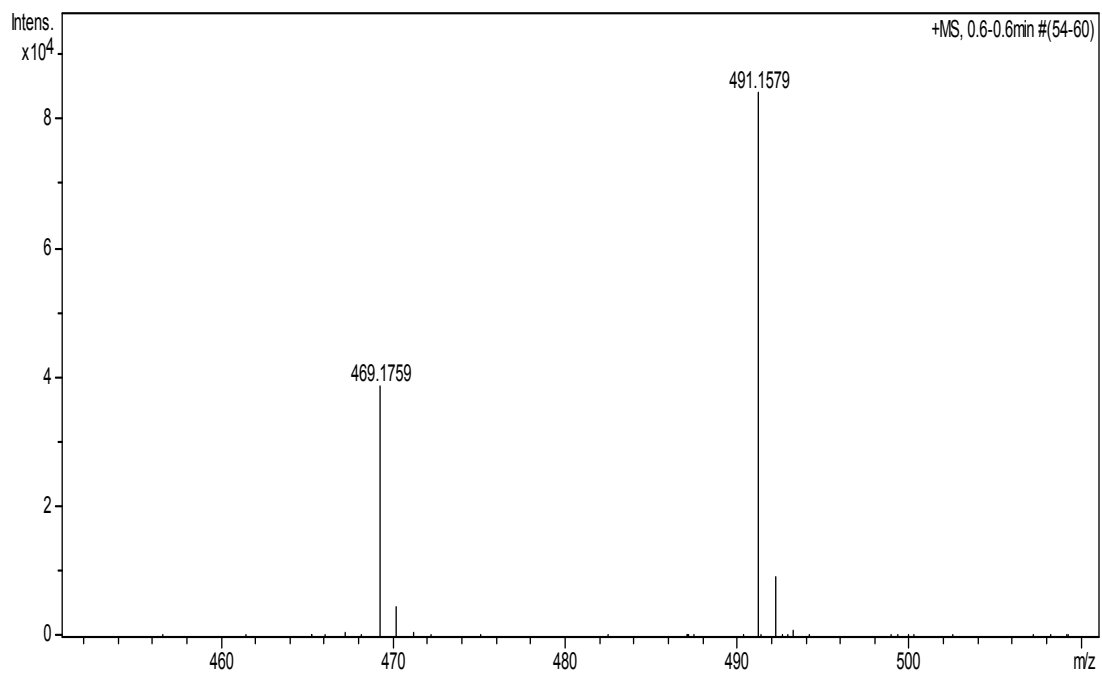
3'-(4-chlorophenyl)-1'-(m-tolyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1h):



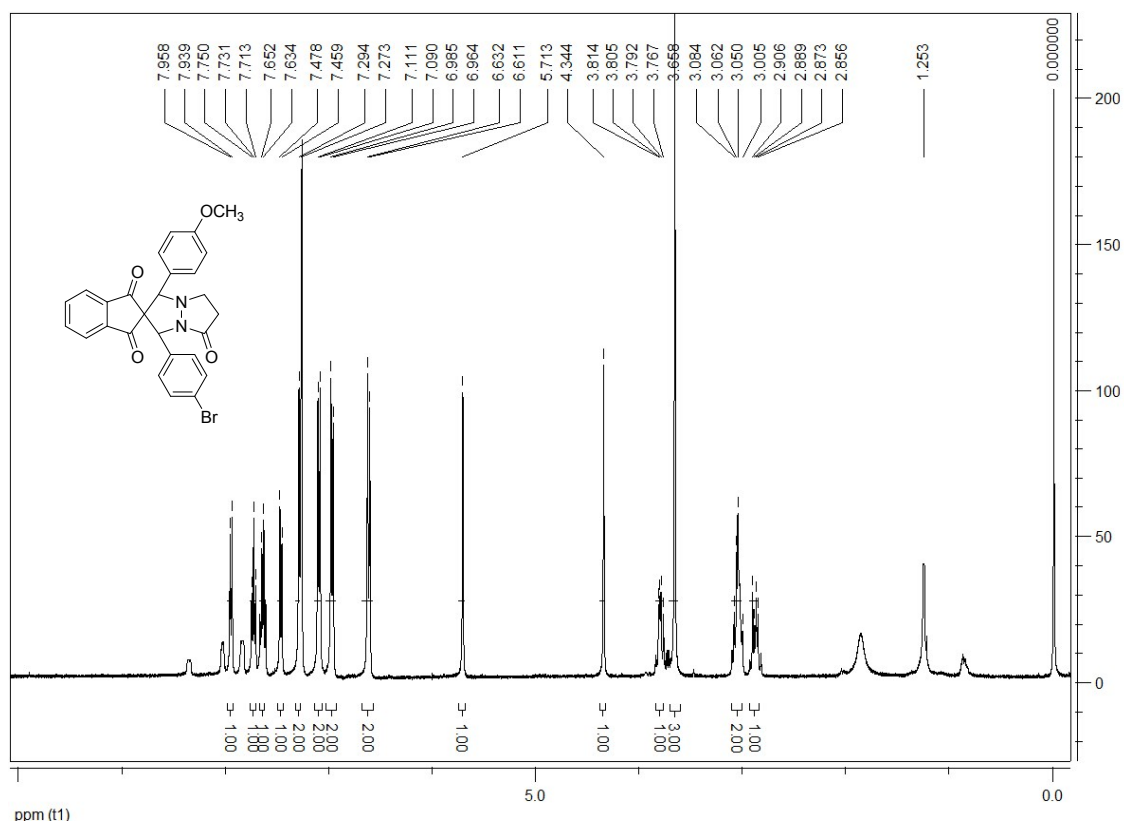


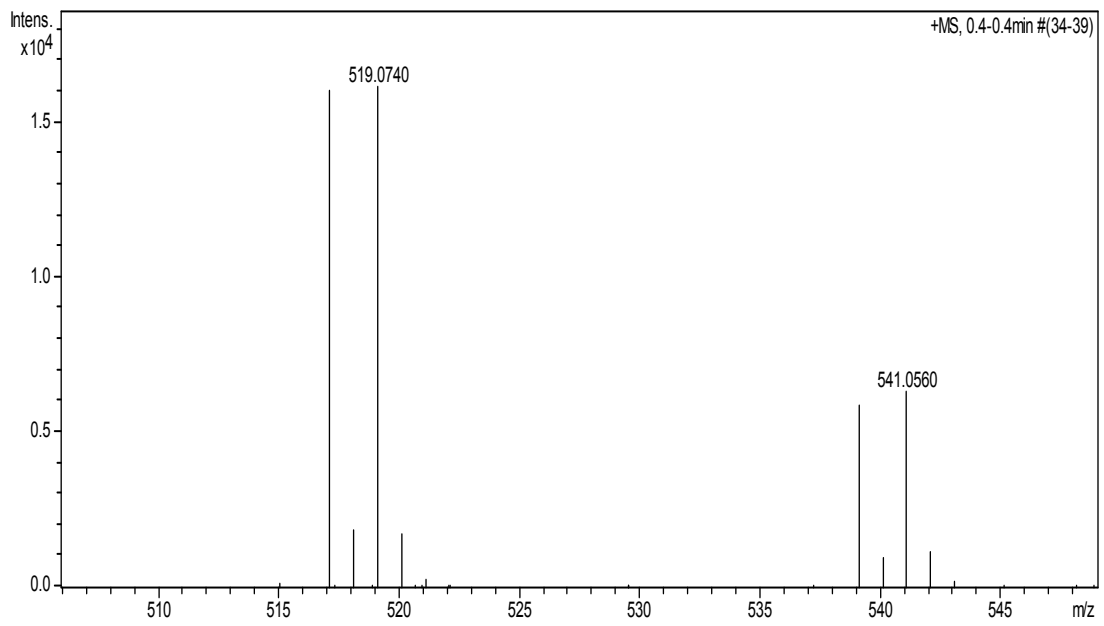
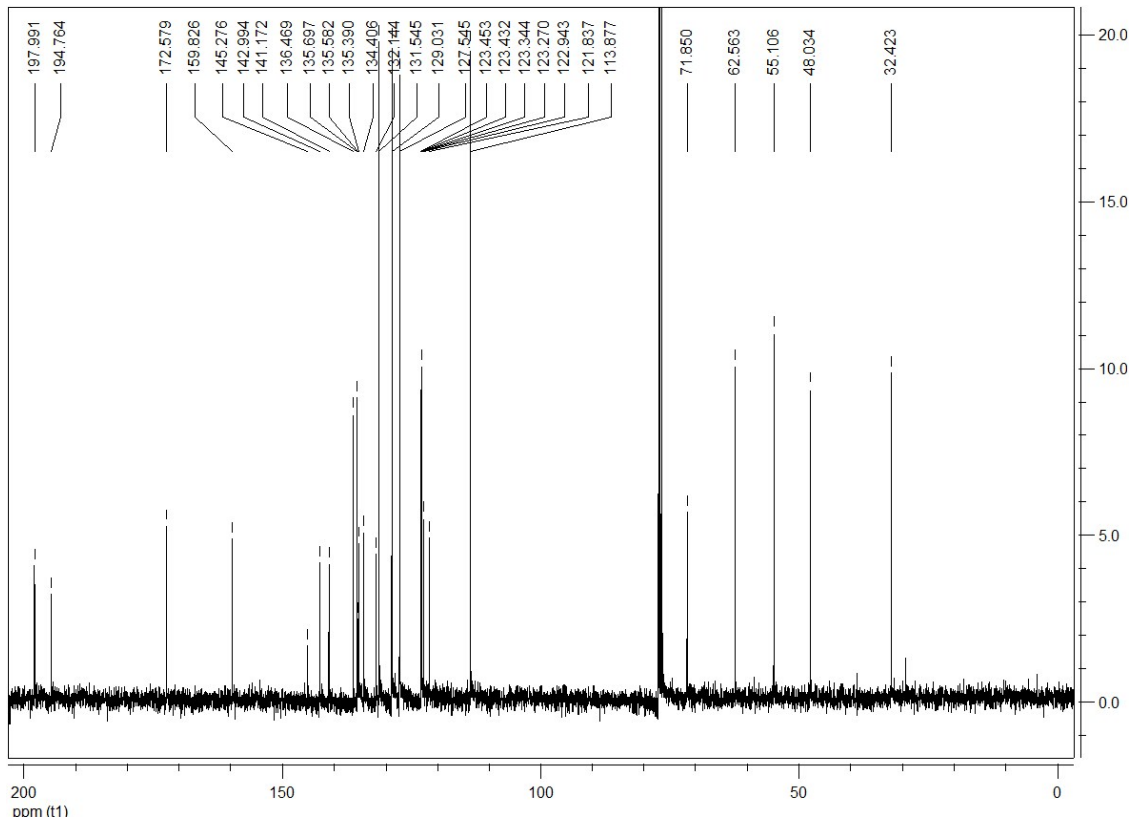
3'-(3-Methoxyphenyl)-1'-(4-methoxyphenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1i):



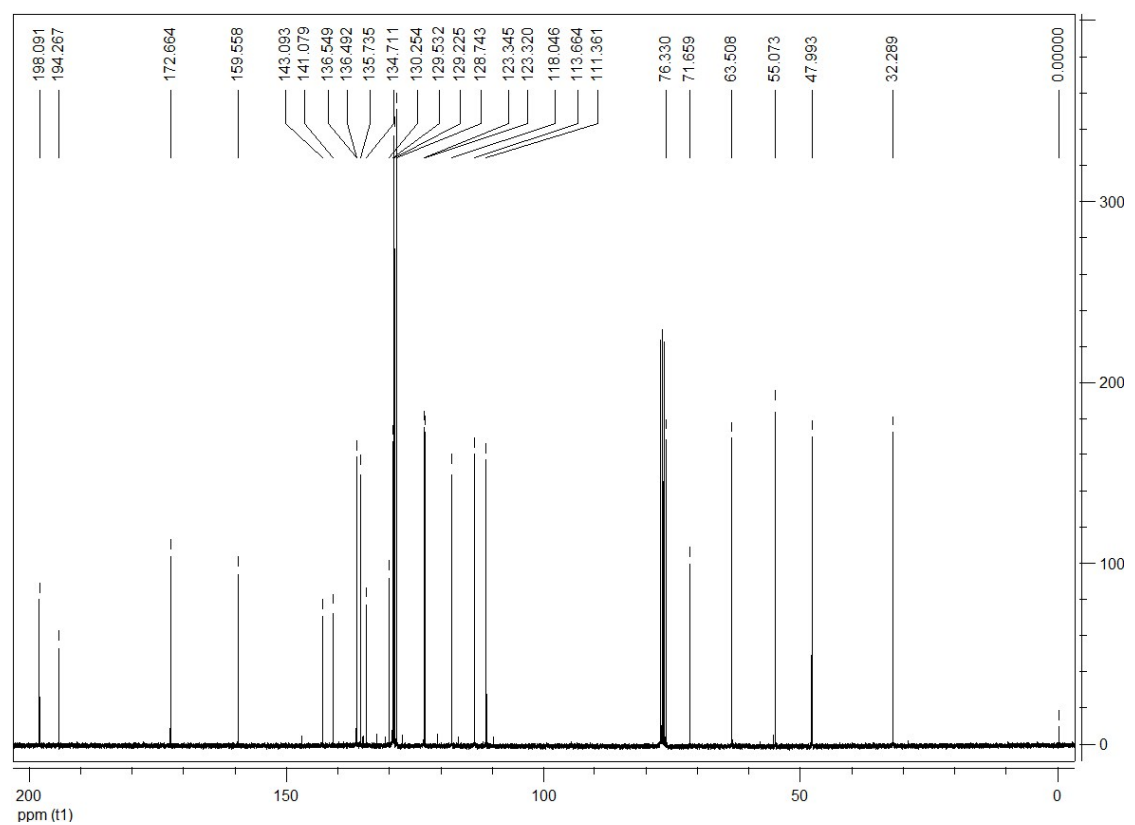
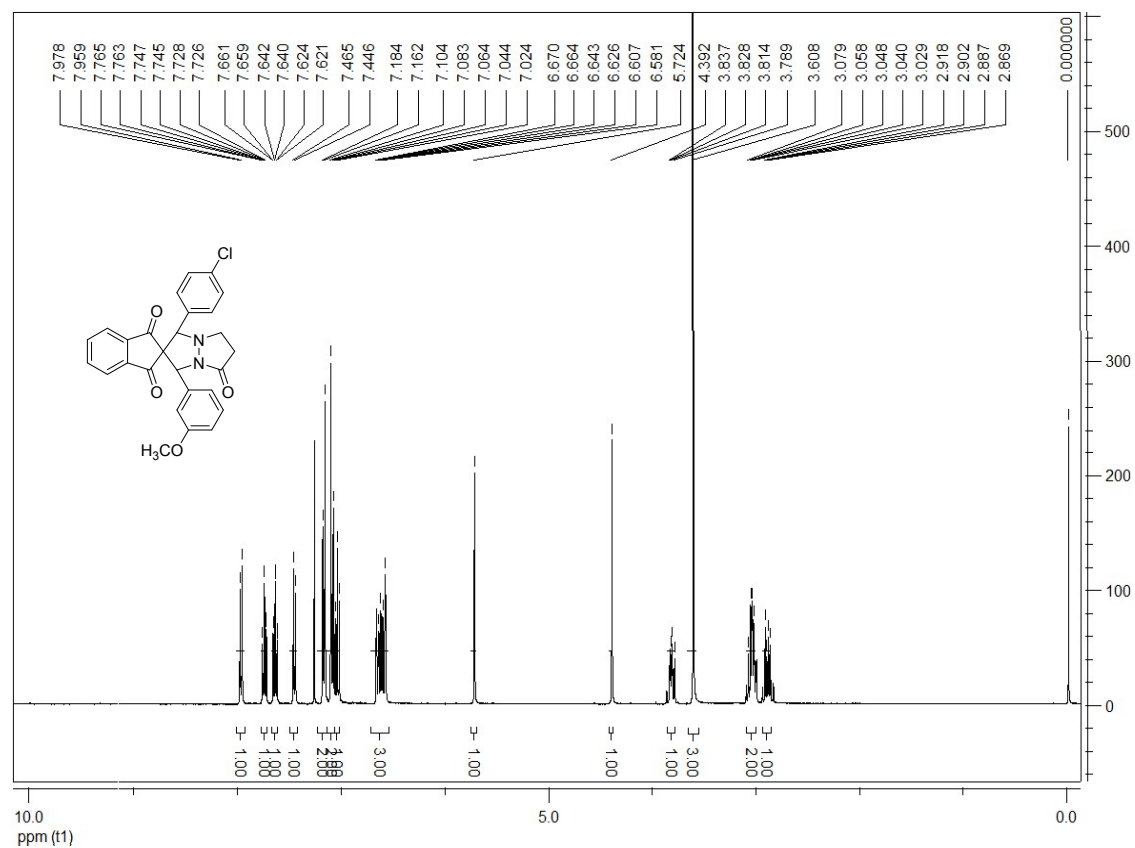


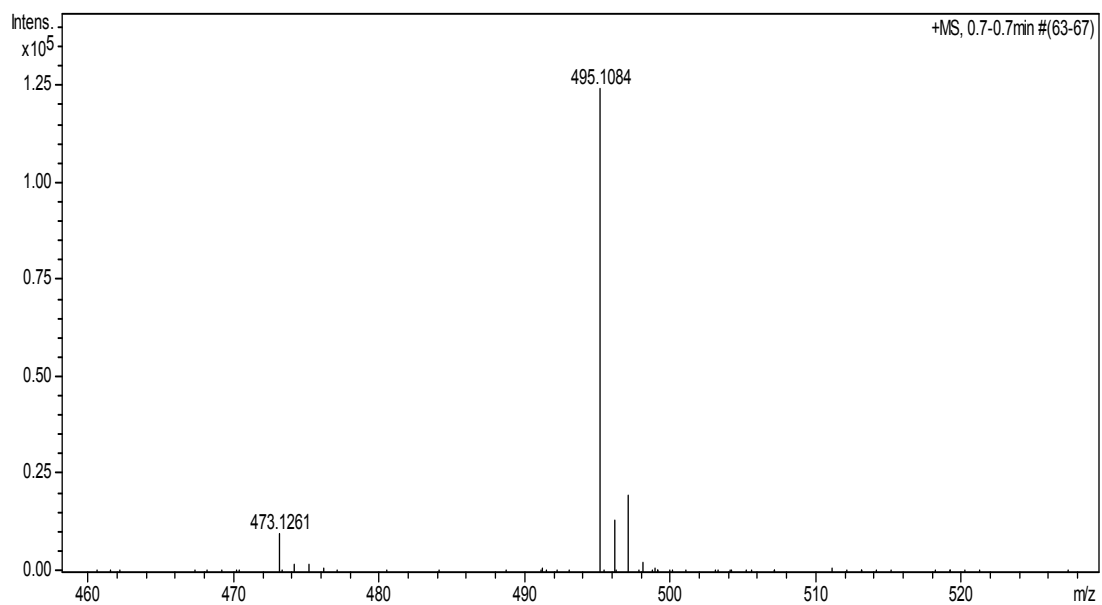
3'-(4-Bromophenyl)-1'-(4-methoxyphenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1j):



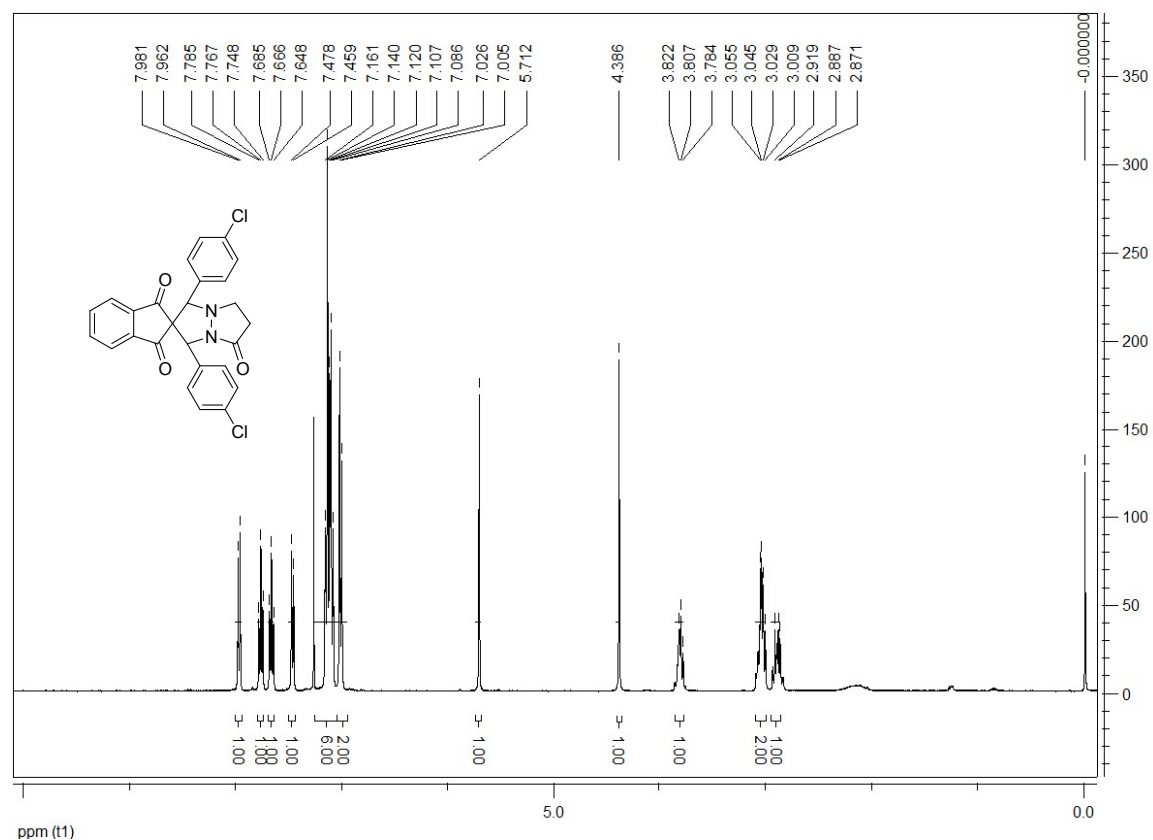


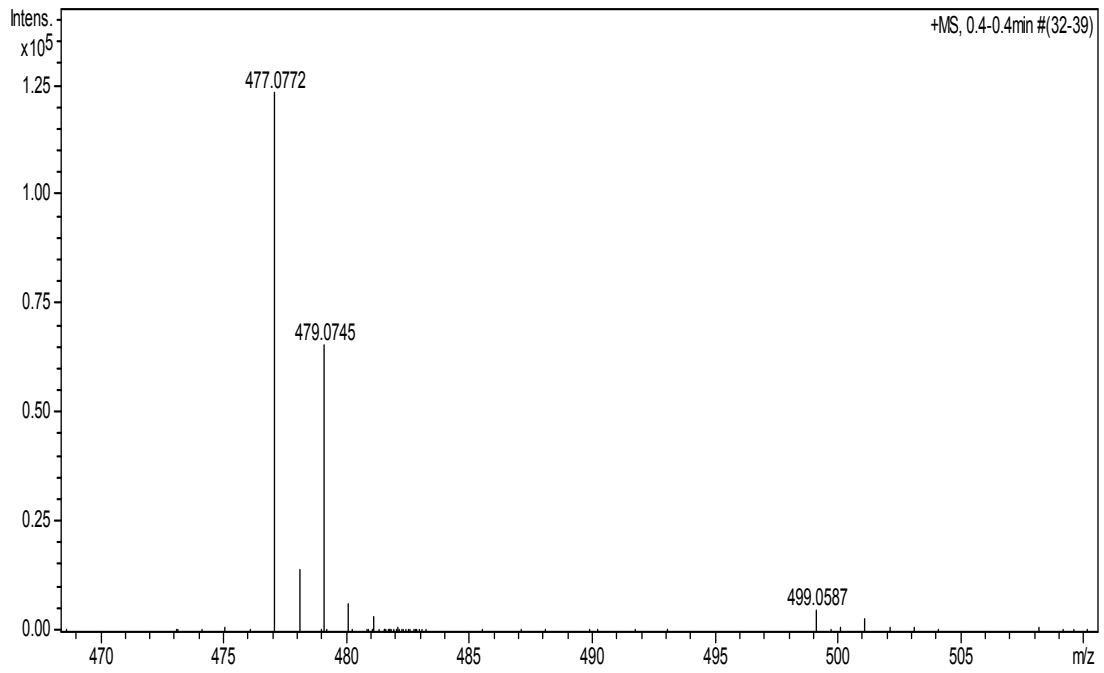
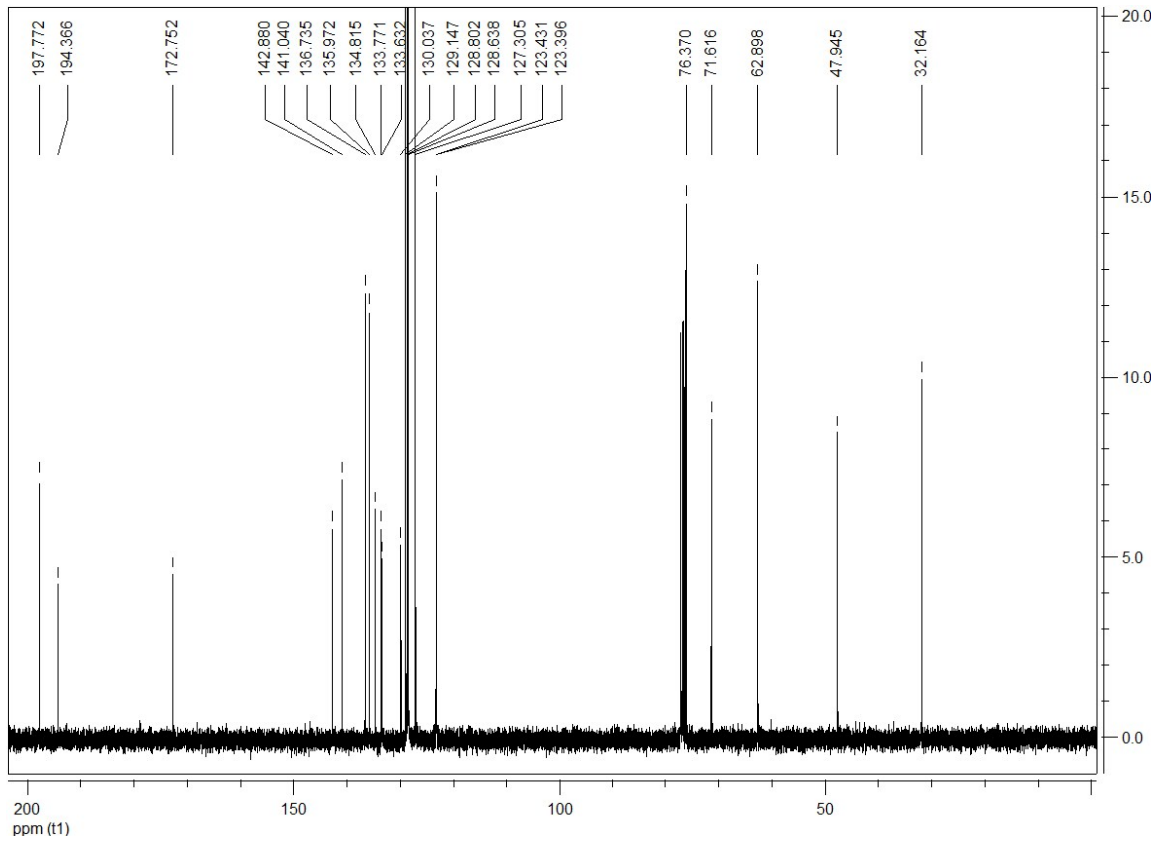
[1'-(4-Chlorophenyl)-3'-(3-methoxyphenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1k):



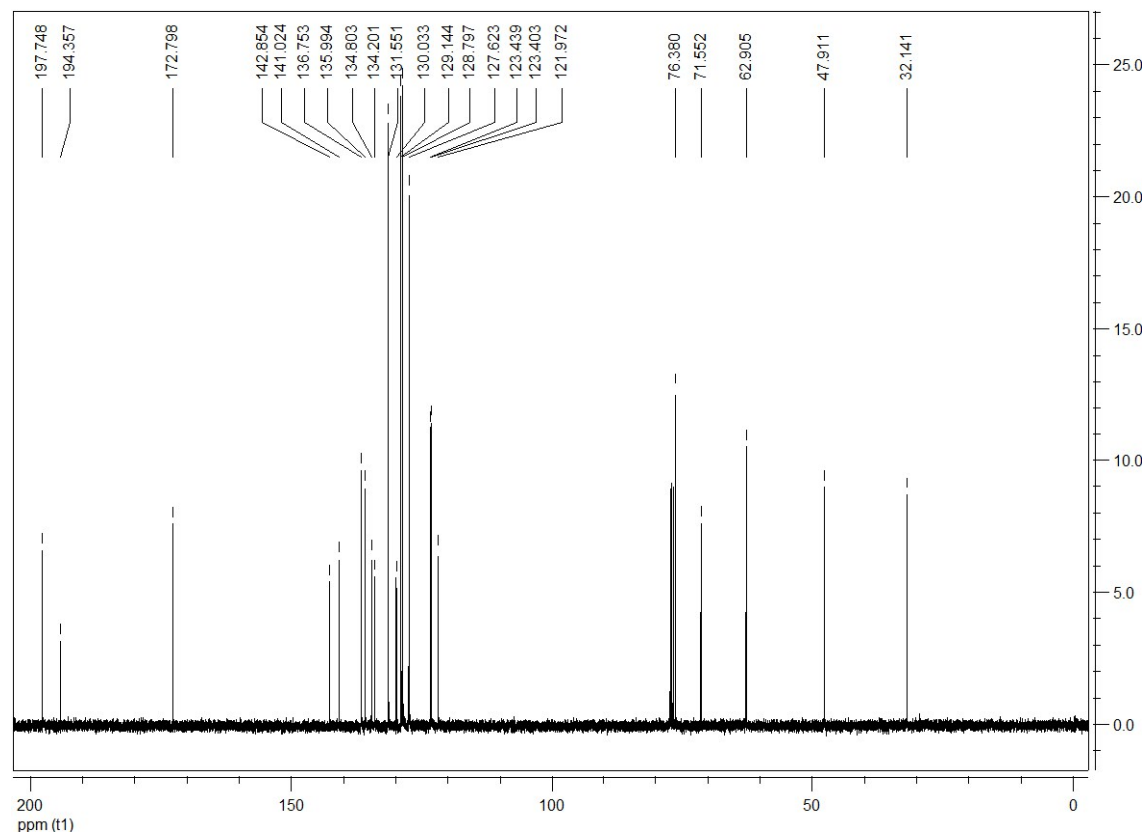
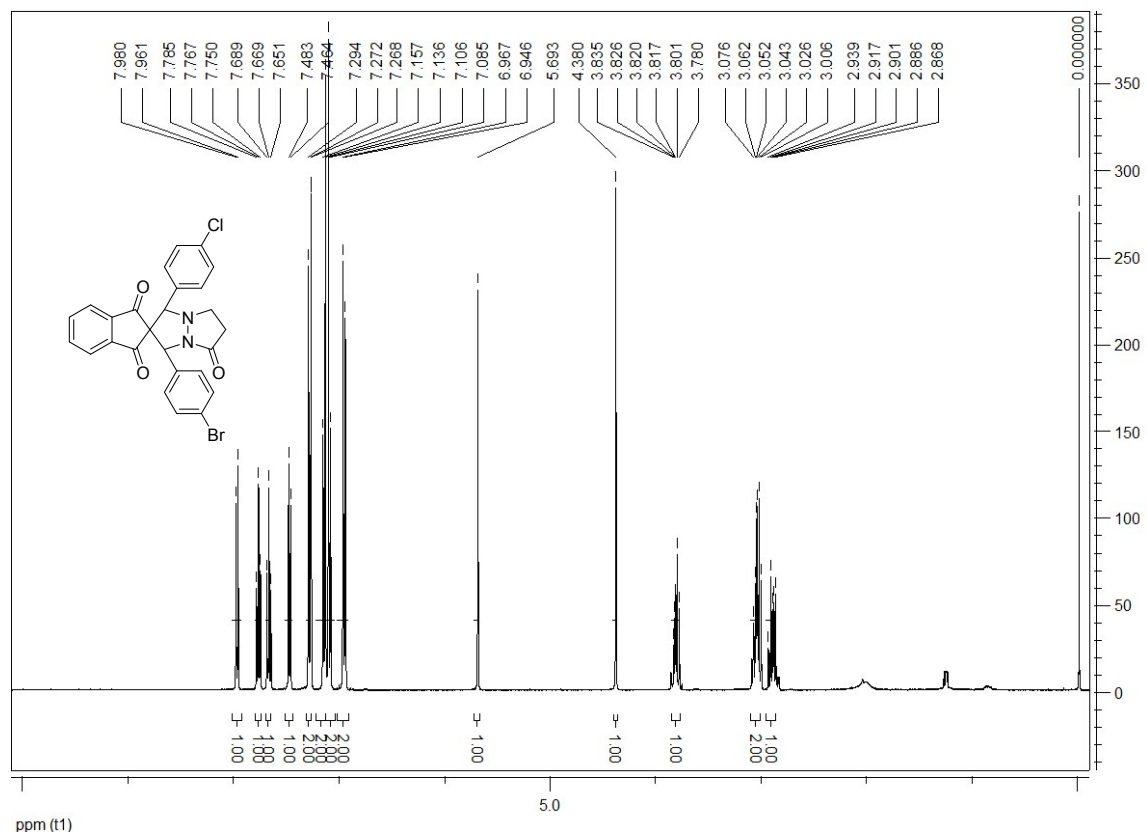


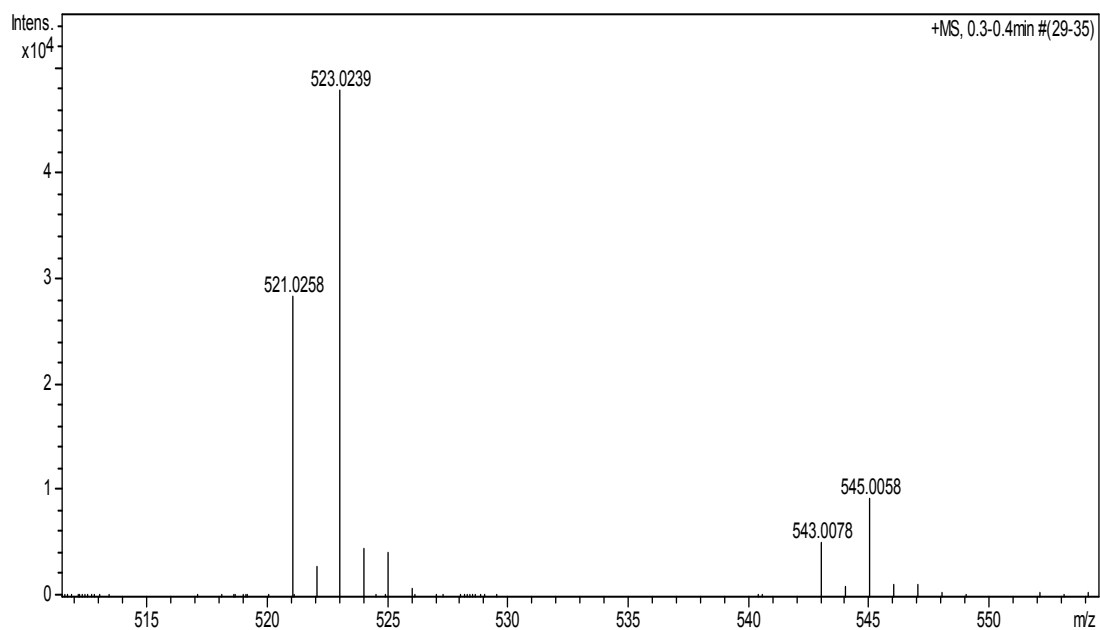
1',3'-Bis(4-chlorophenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (11):



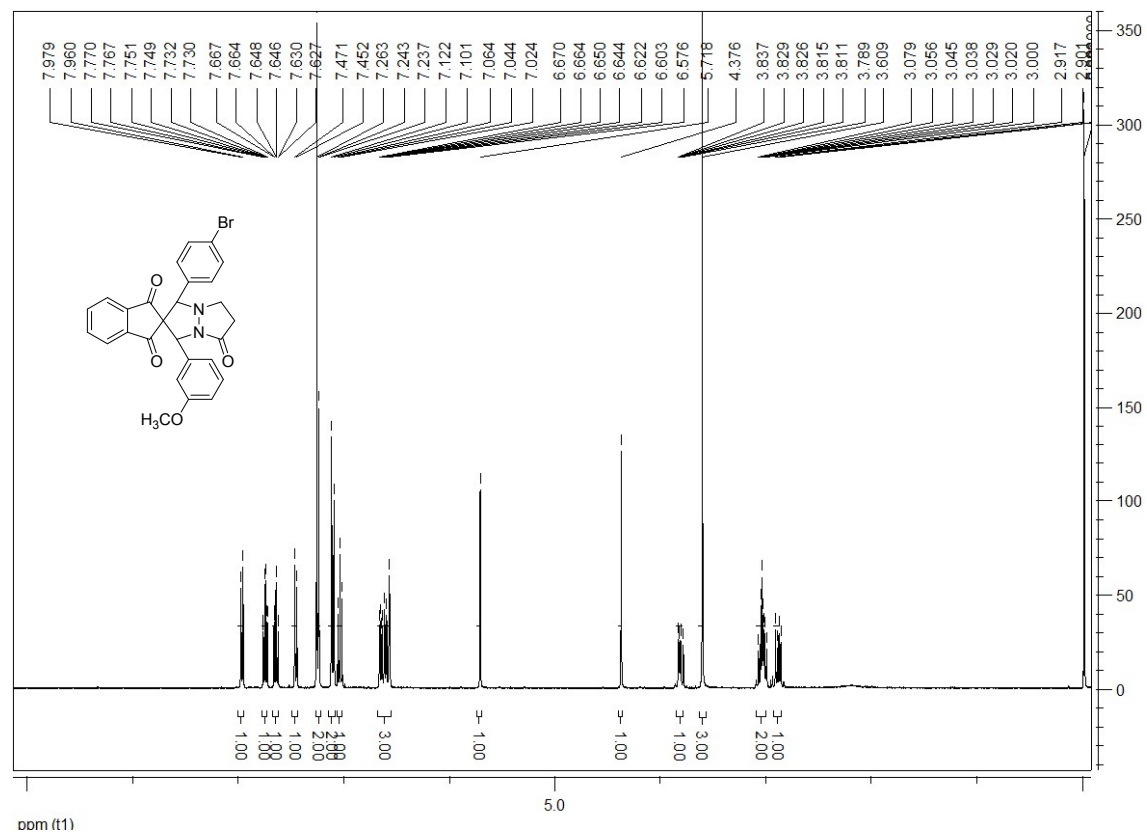


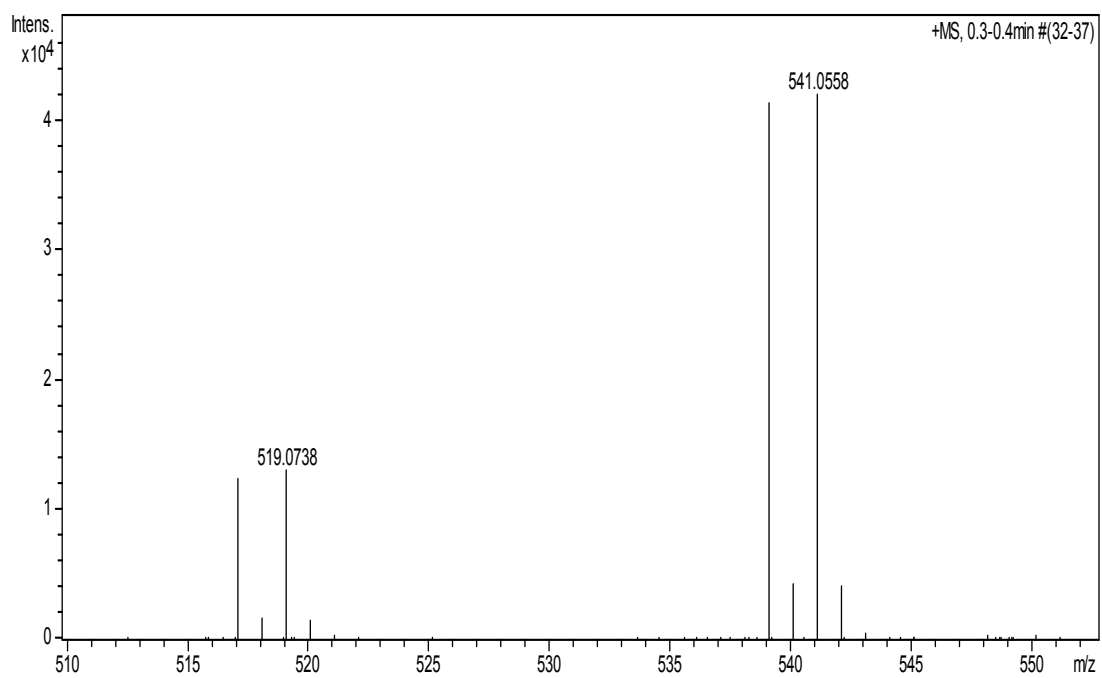
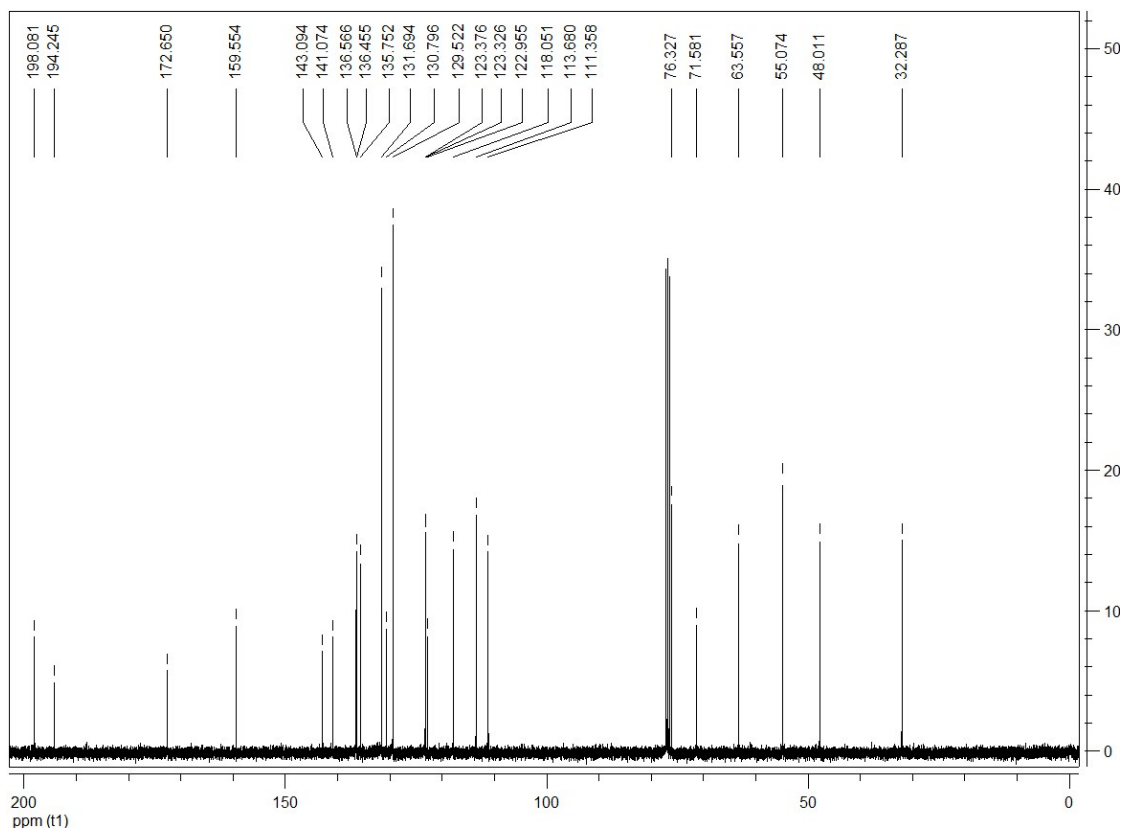
3'-(4-Bromophenyl)-1'-(4-chlorophenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1m):



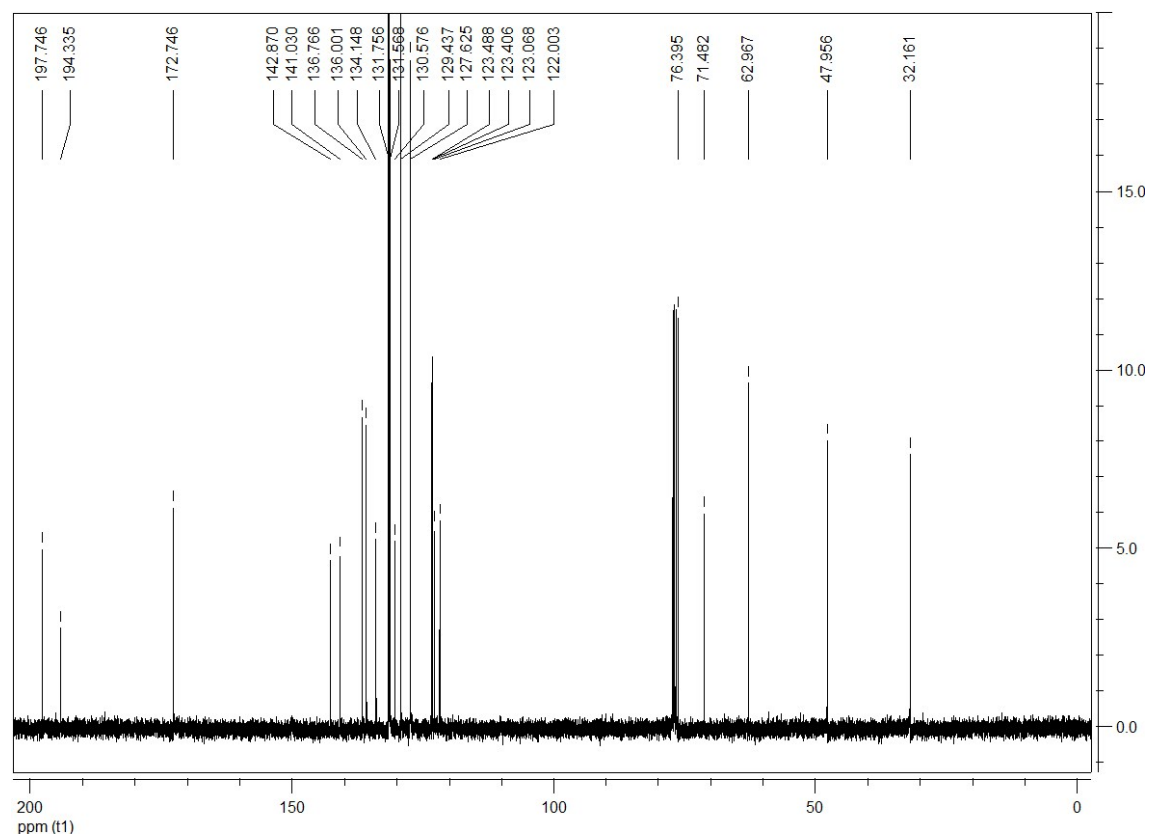
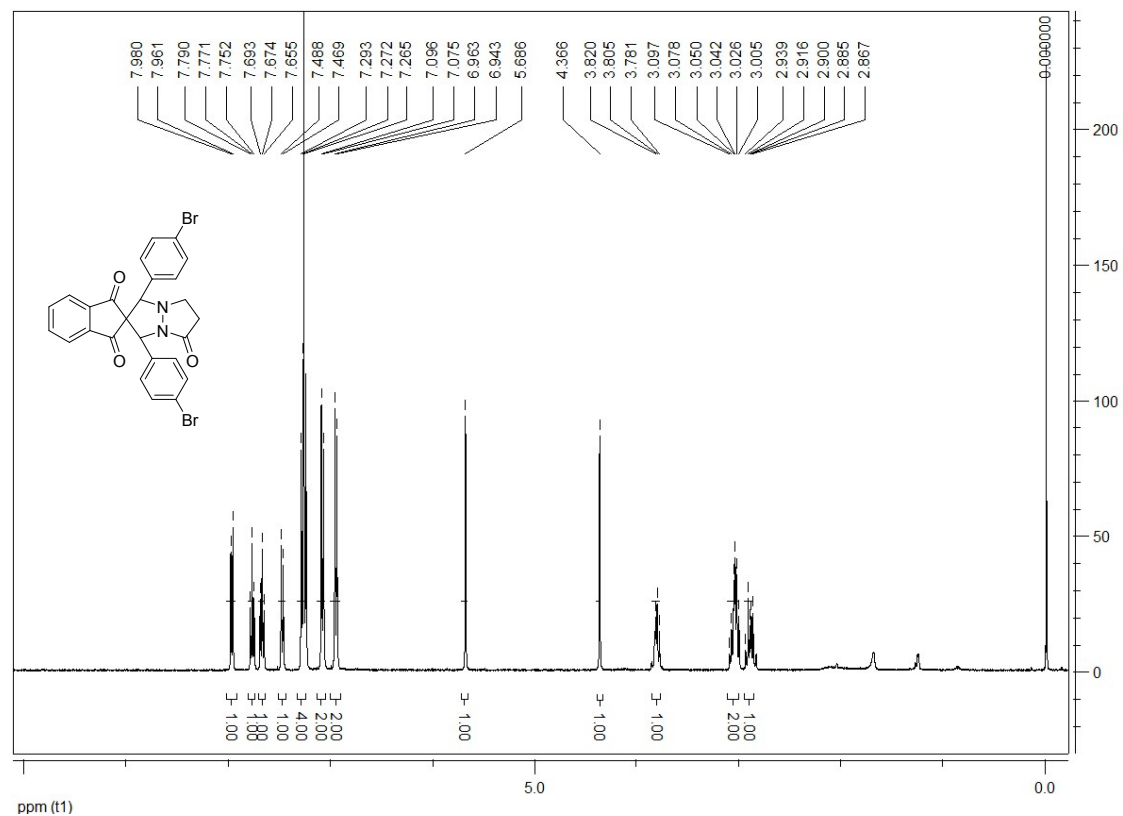


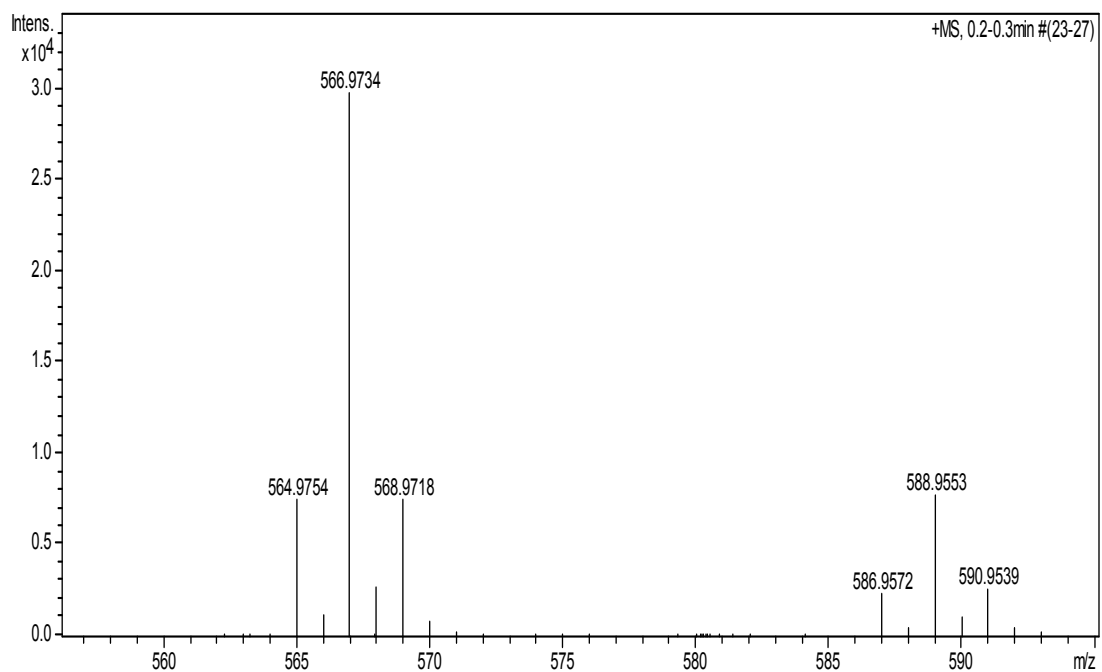
1'-(4-bromophenyl)-3'-(3-methoxyphenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1n):



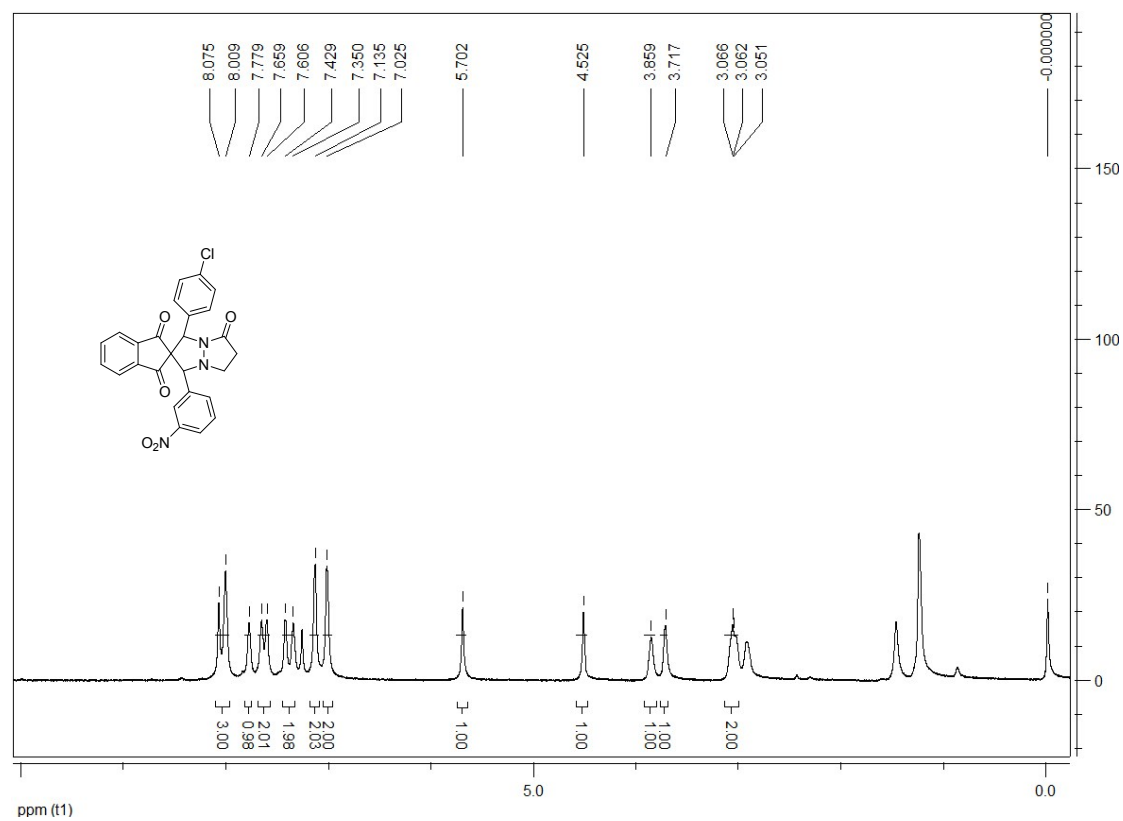


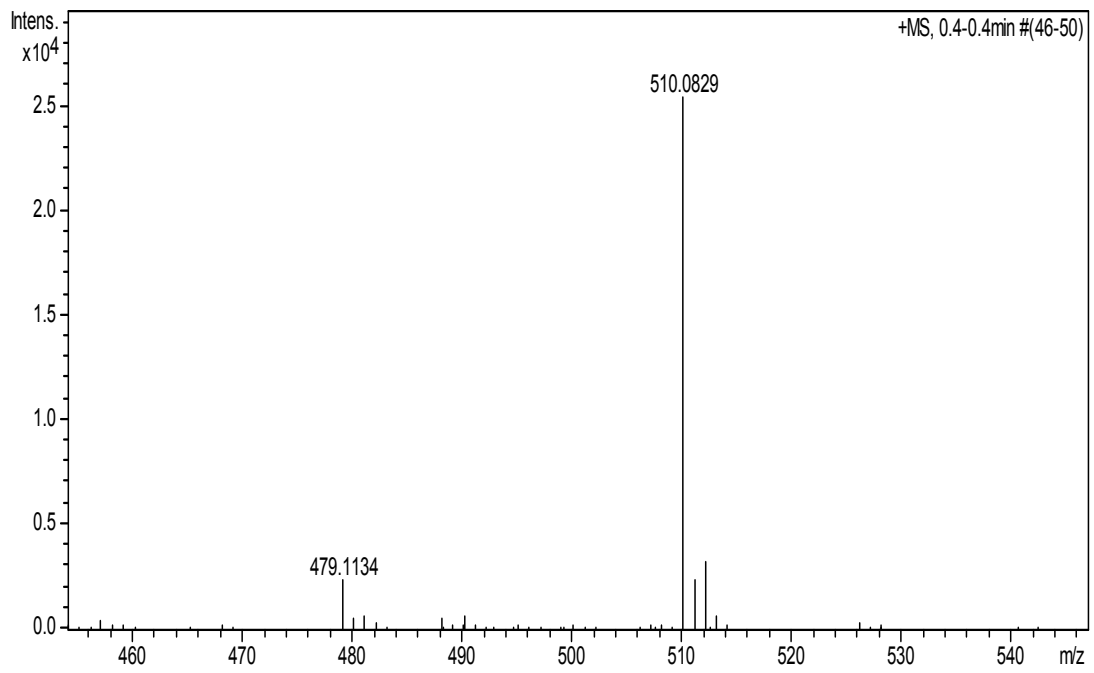
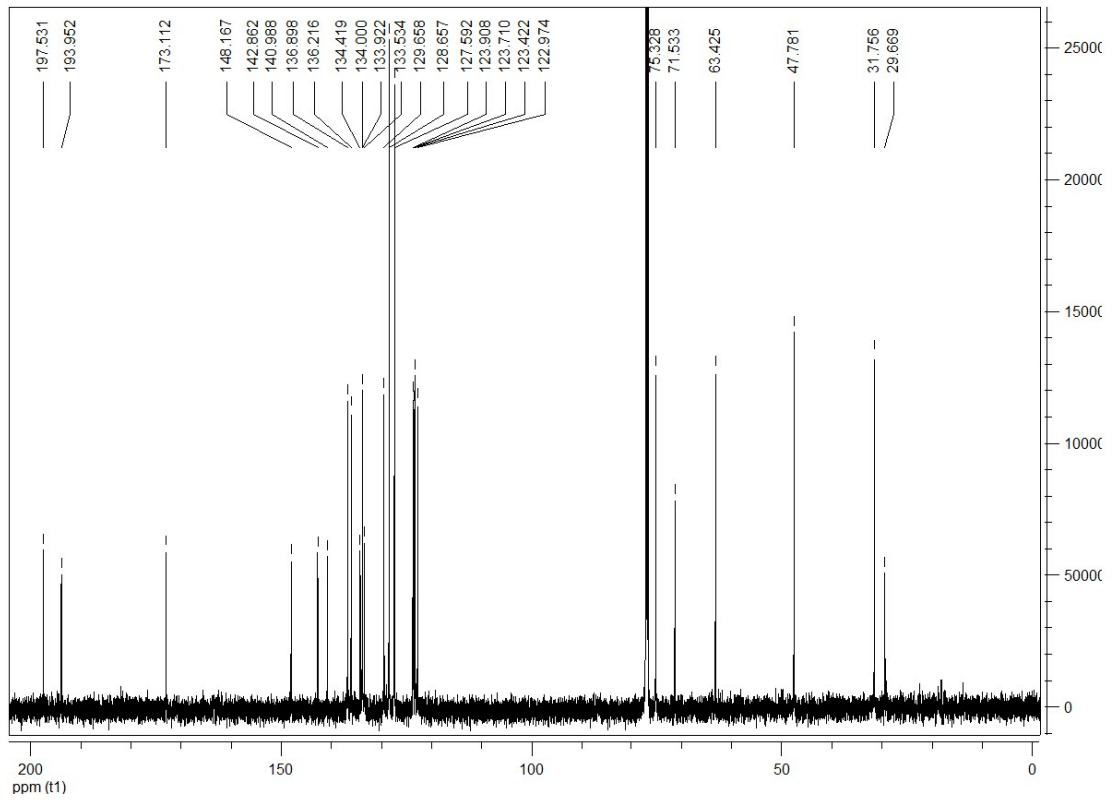
1',3'-bis(4-bromophenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione
(1o):



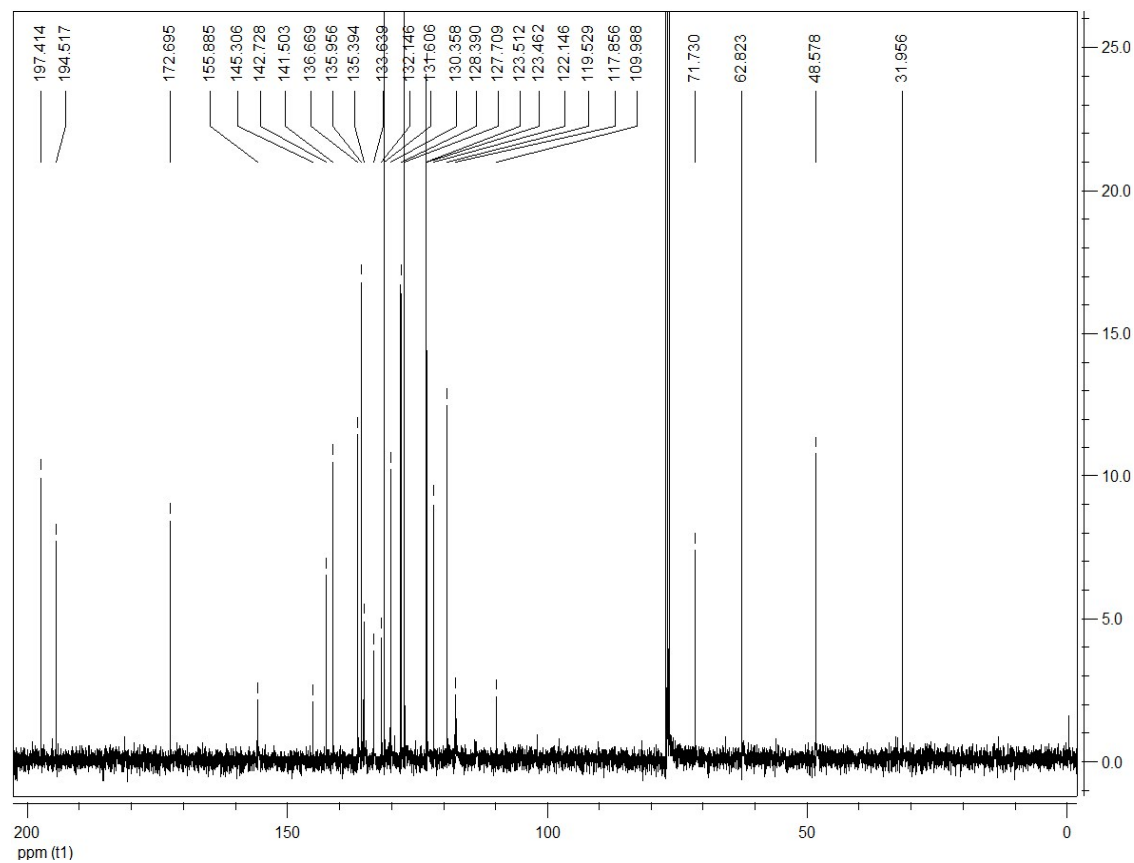
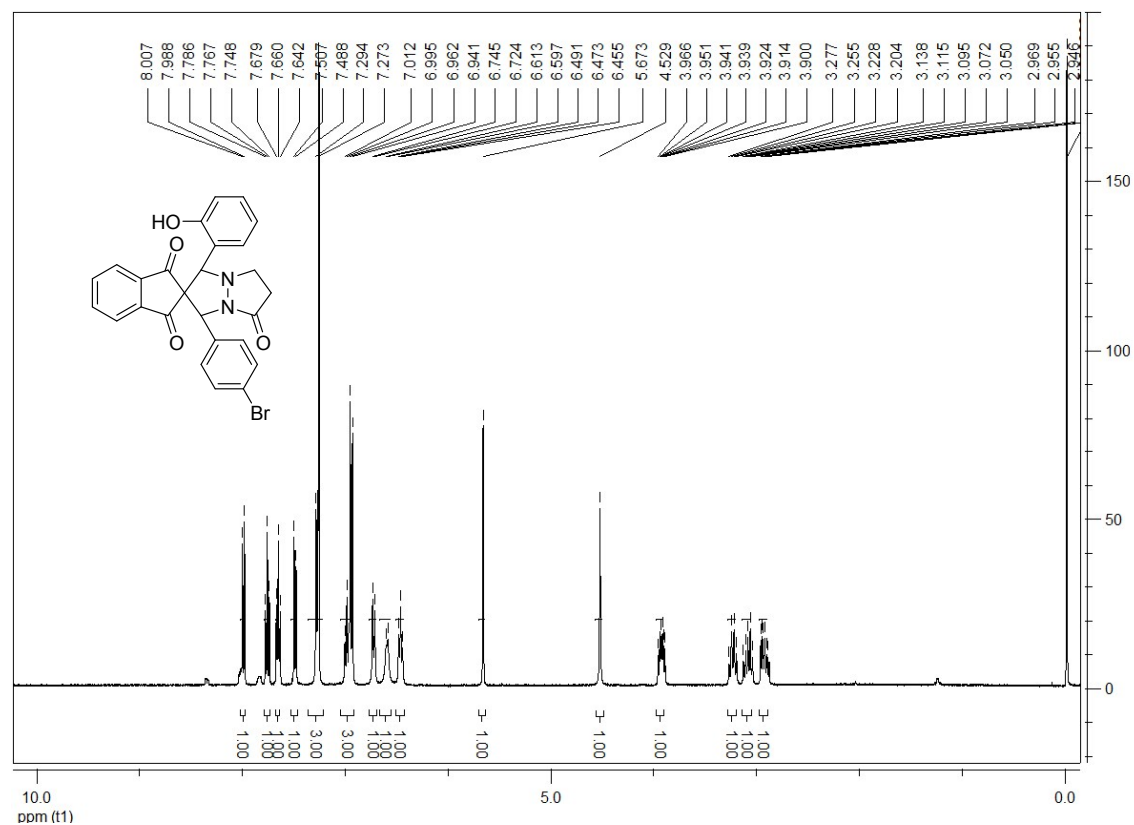


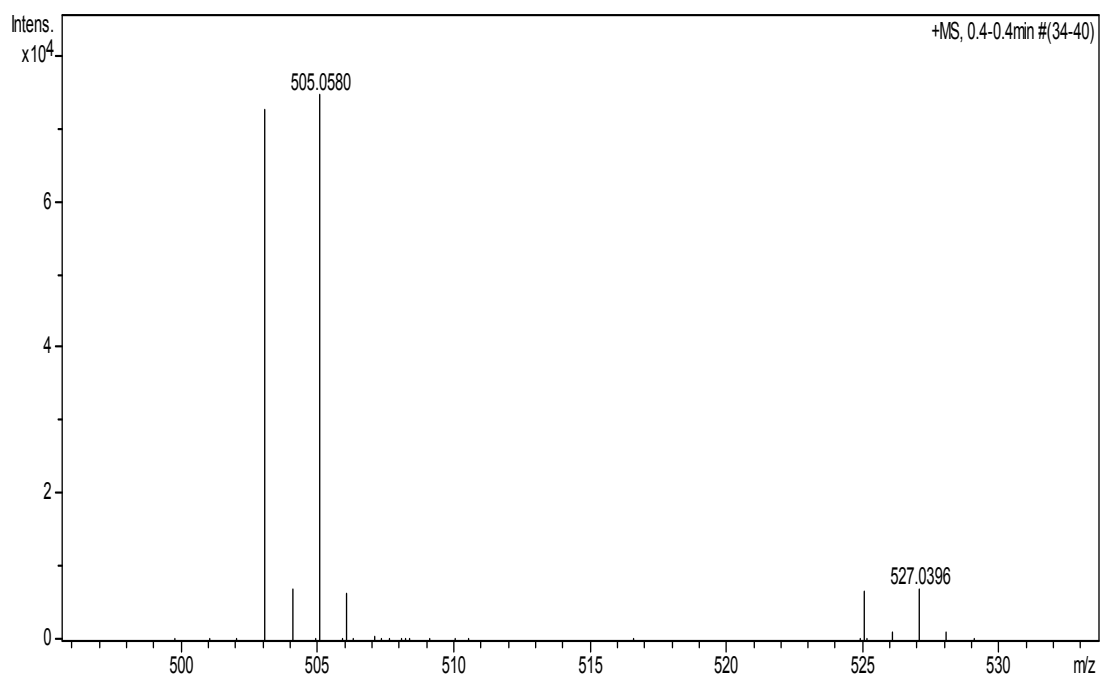
3'-(4-chlorophenyl)-1'-(3-nitrophenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1p):



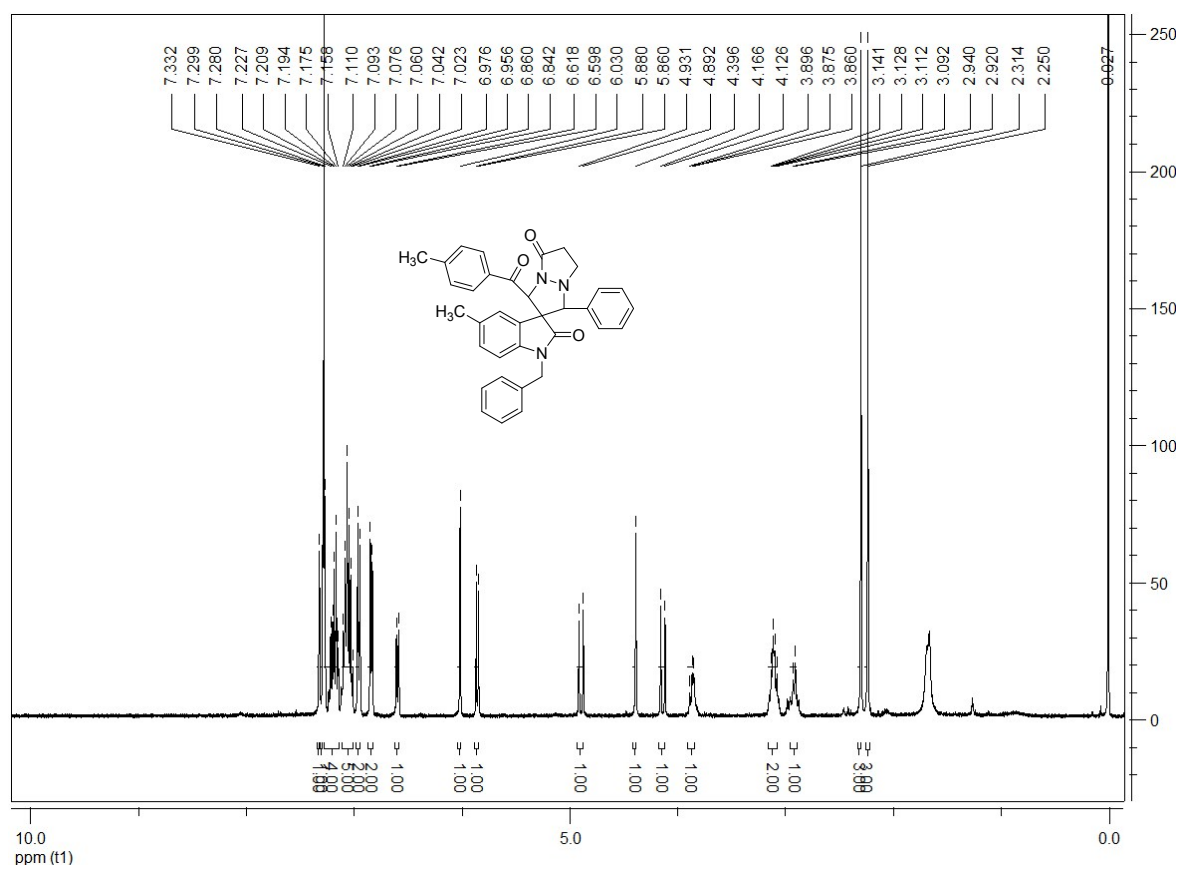


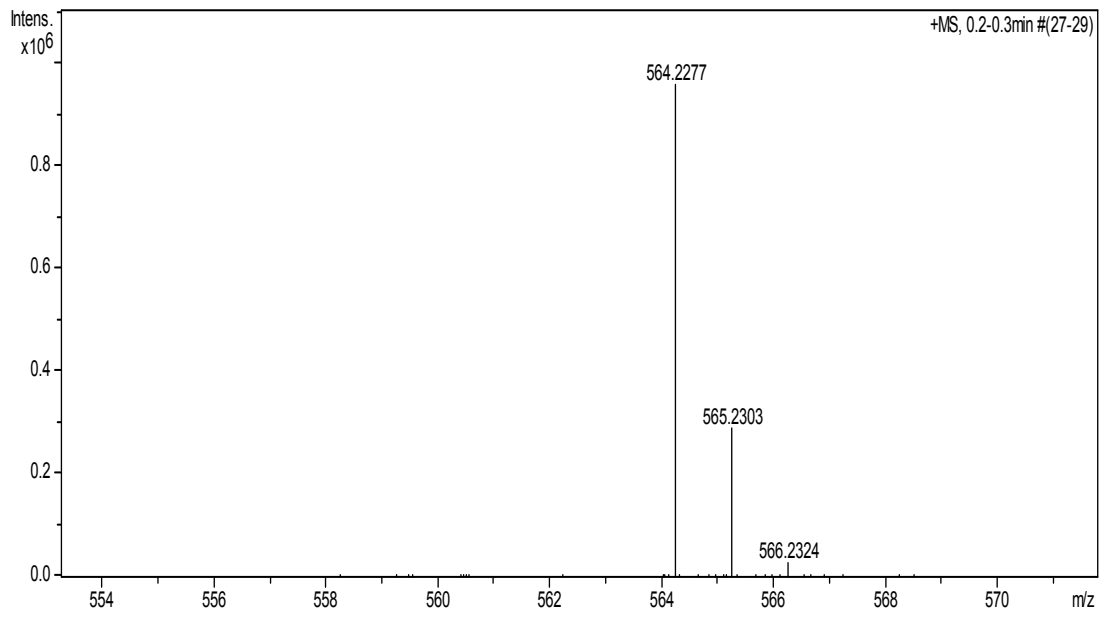
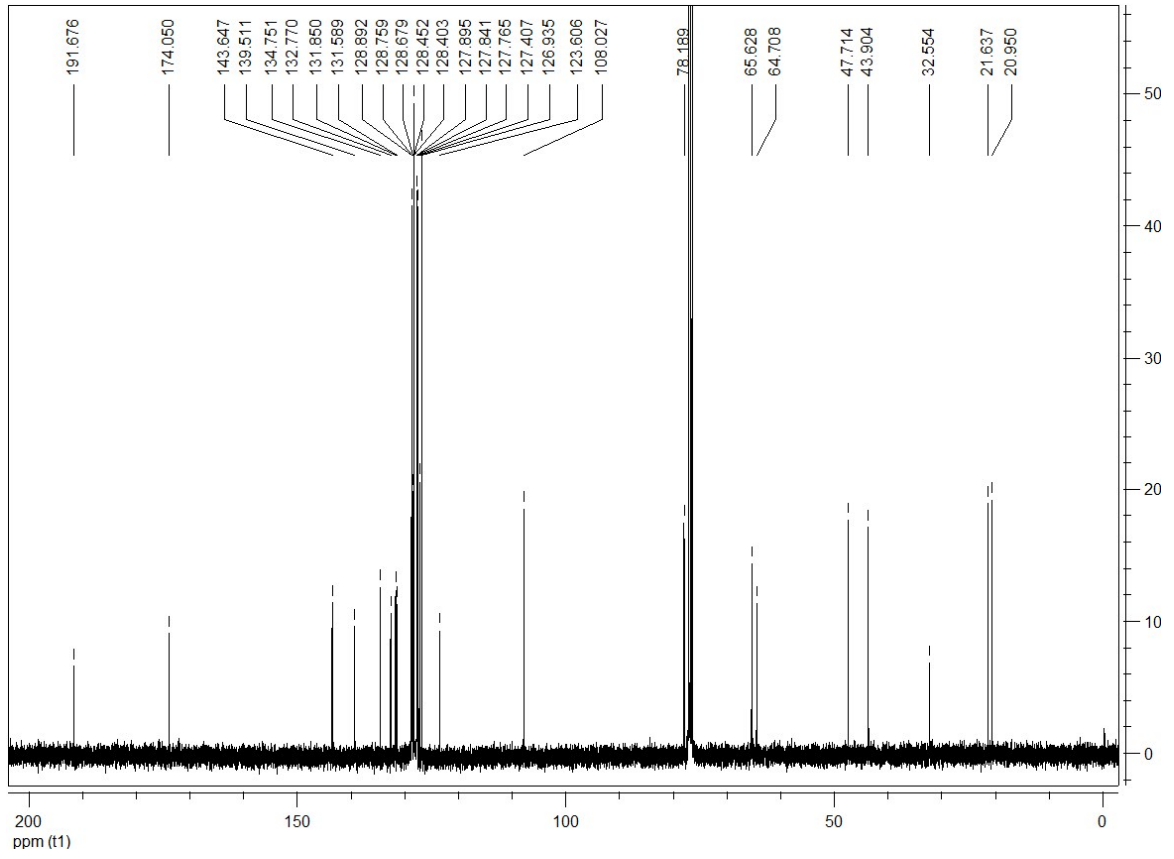
3'-(4-Bromophenyl)-1'-(2-hydroxyphenyl)-6',7'-dihydro-1'H-spiro[indene-2,2'-pyrazolo[1,2-a]pyrazole]-1,3,5'(3'H)-trione (1q):



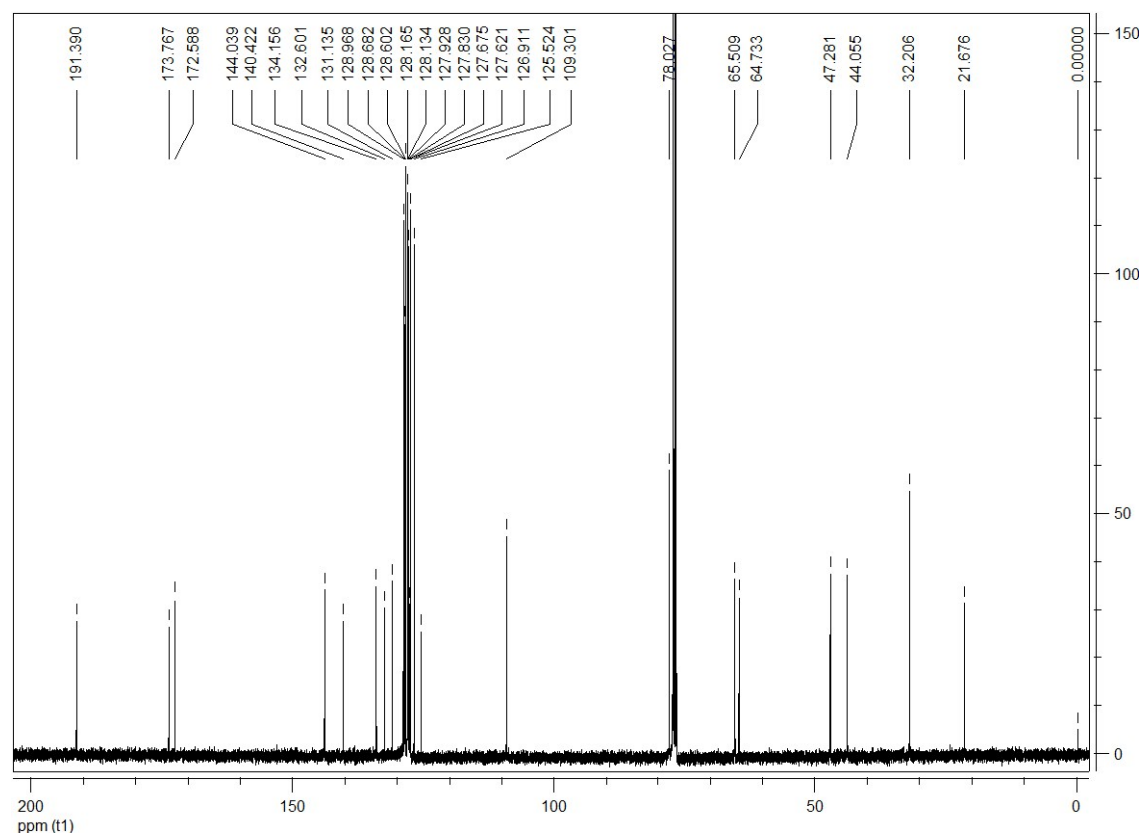
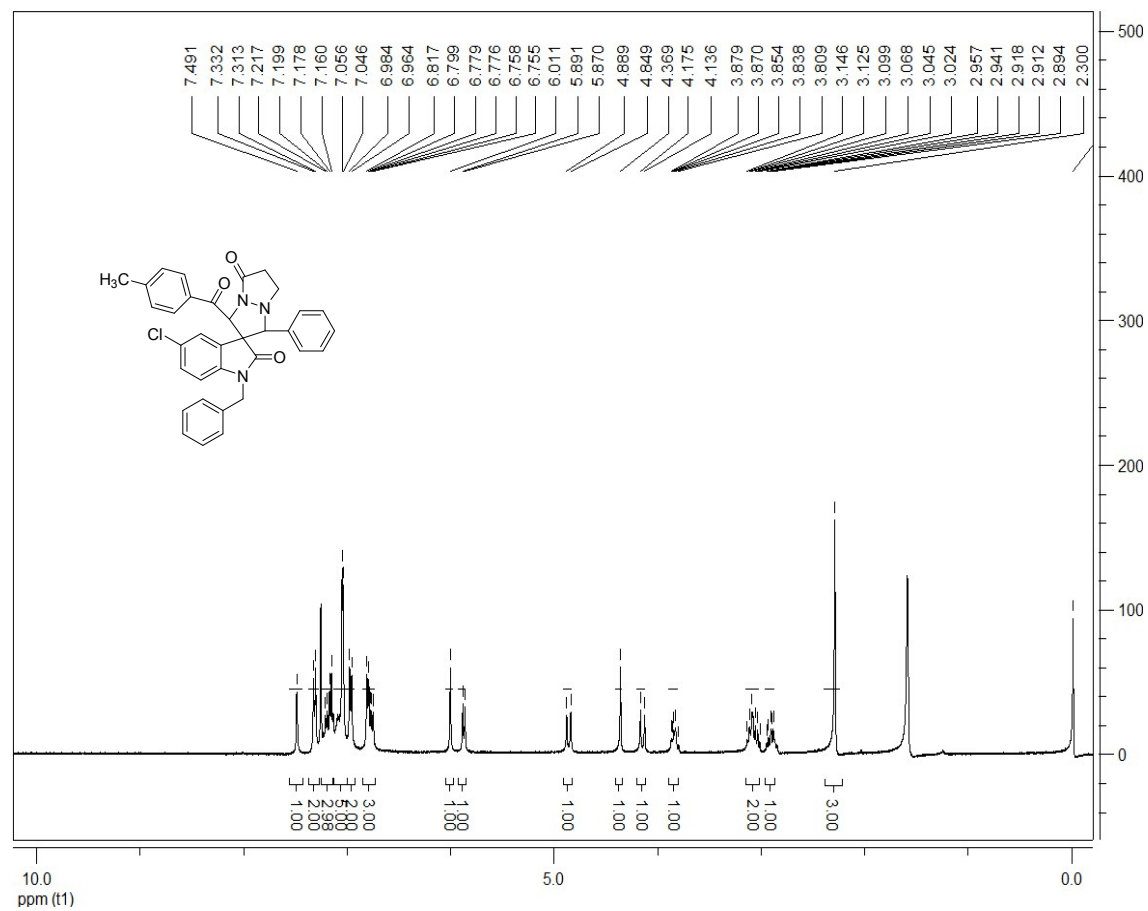


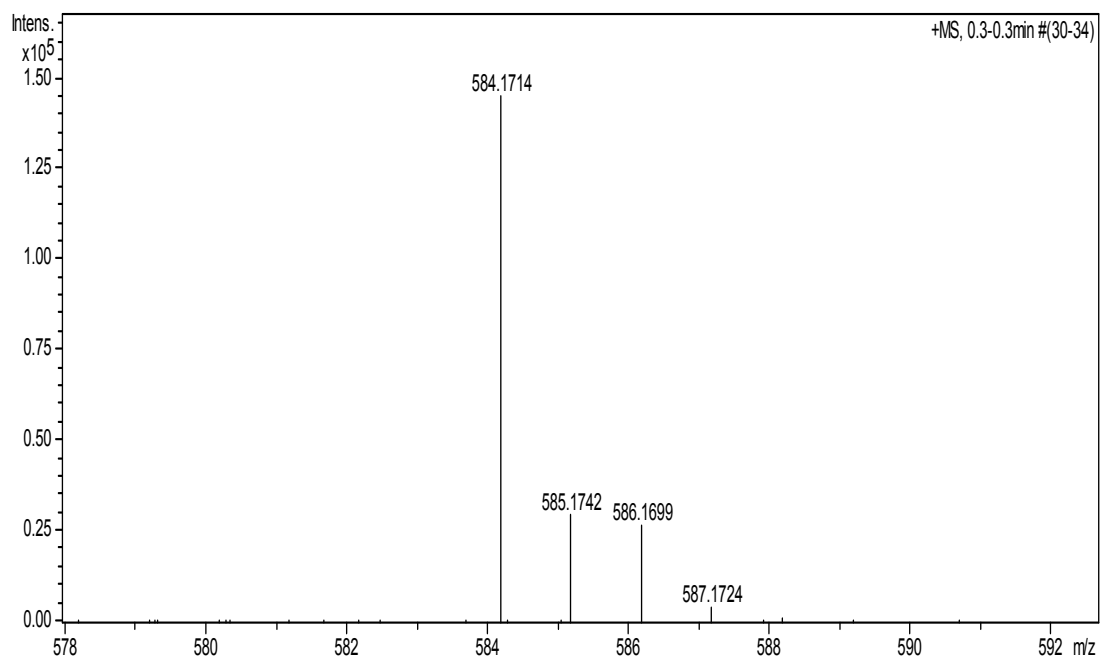
1-Benzyl-5-methyl-3'-(4-methylbenzoyl)-1'-phenyl-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2a):



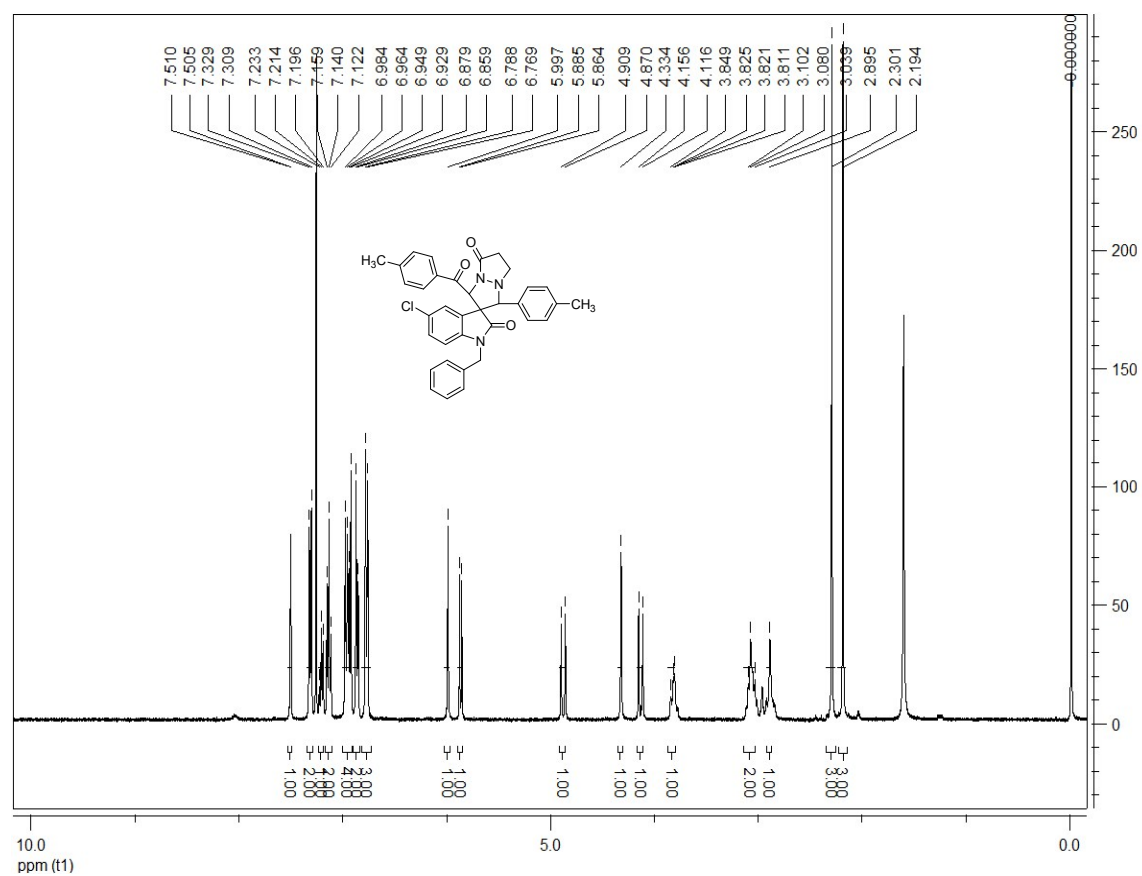


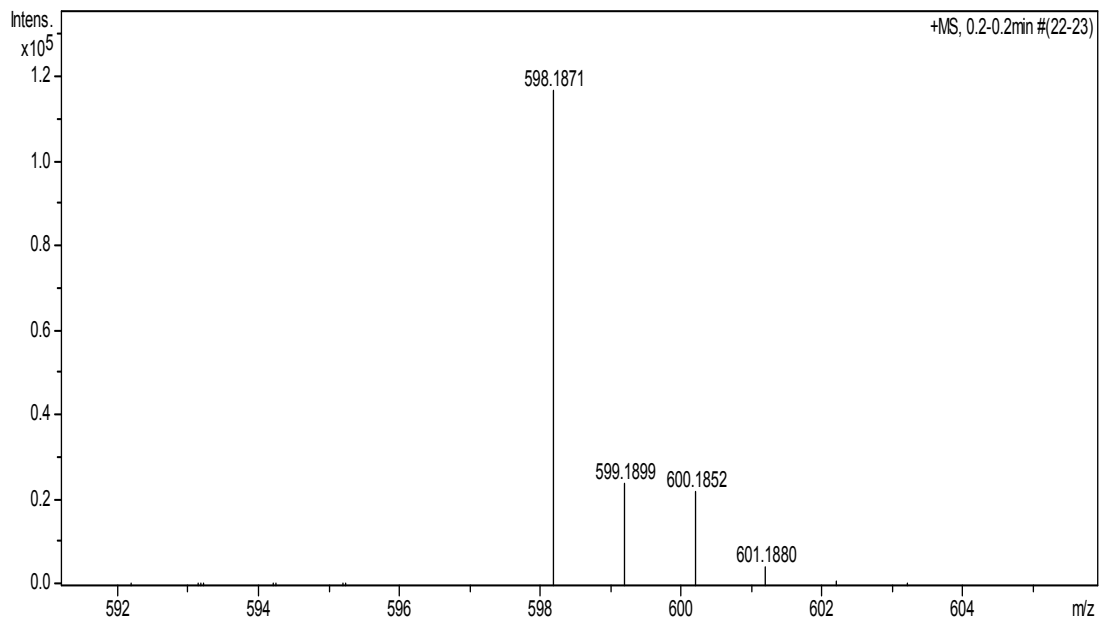
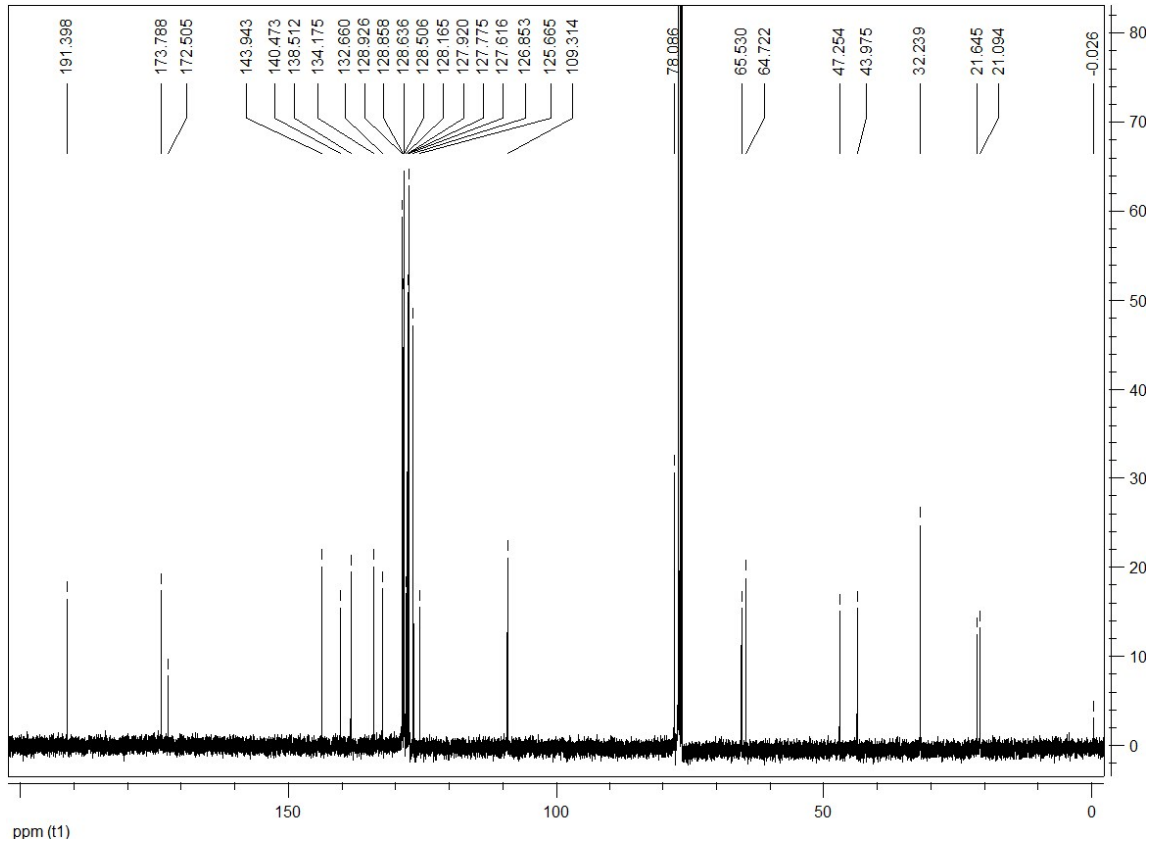
1-Benzyl-5-chloro-3'-(4-methylbenzoyl)-1'-phenyl-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2b):



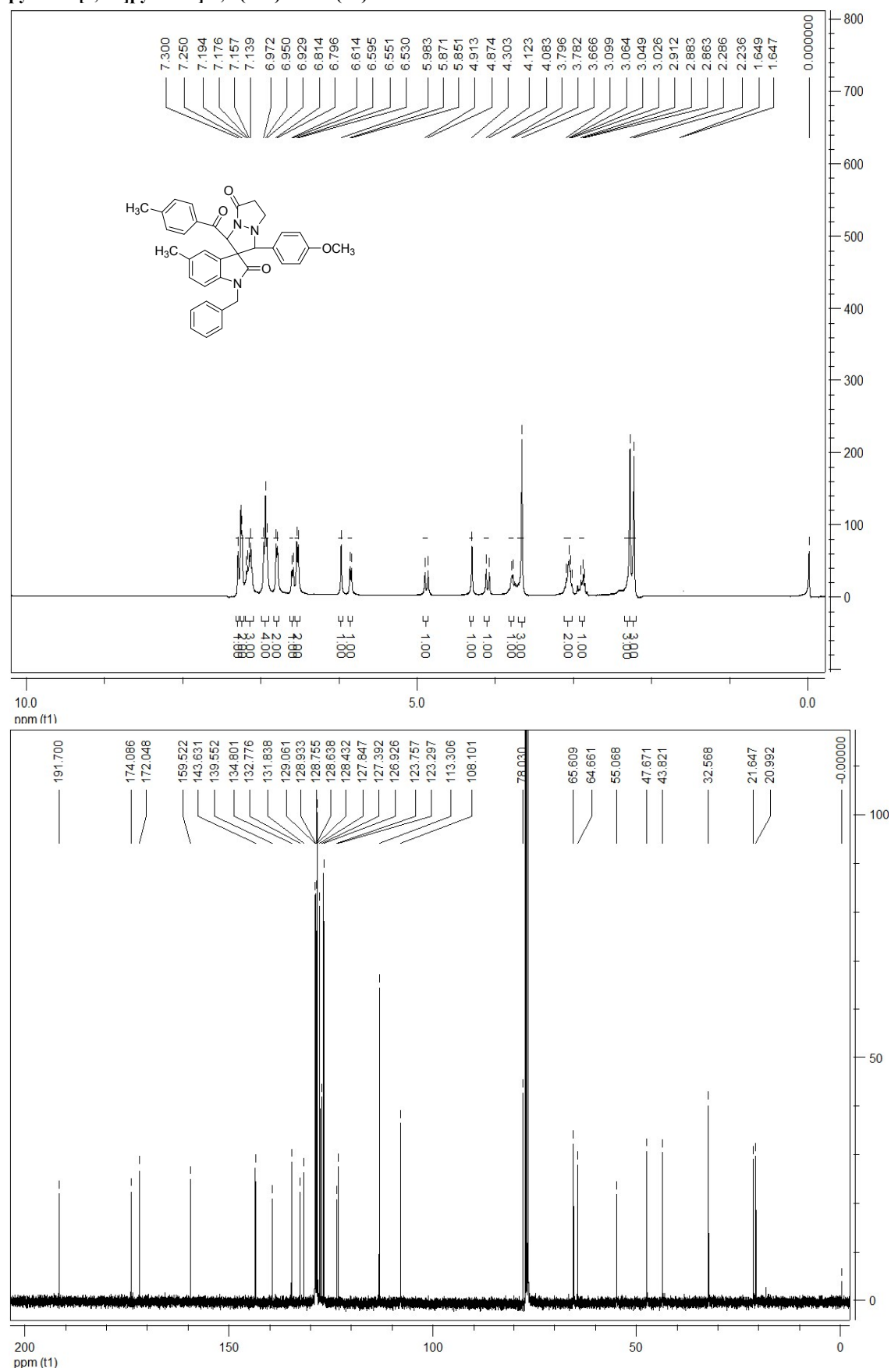


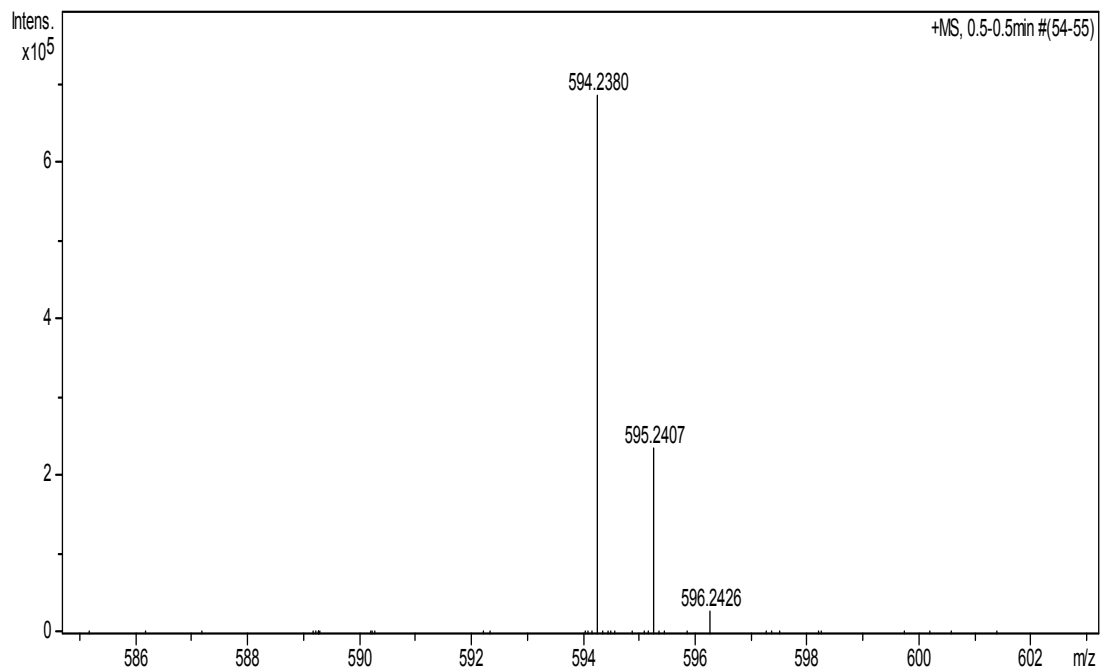
1-Benzyl-5-chloro-3'-(4-methylbenzoyl)-1'-(p-tolyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2c):



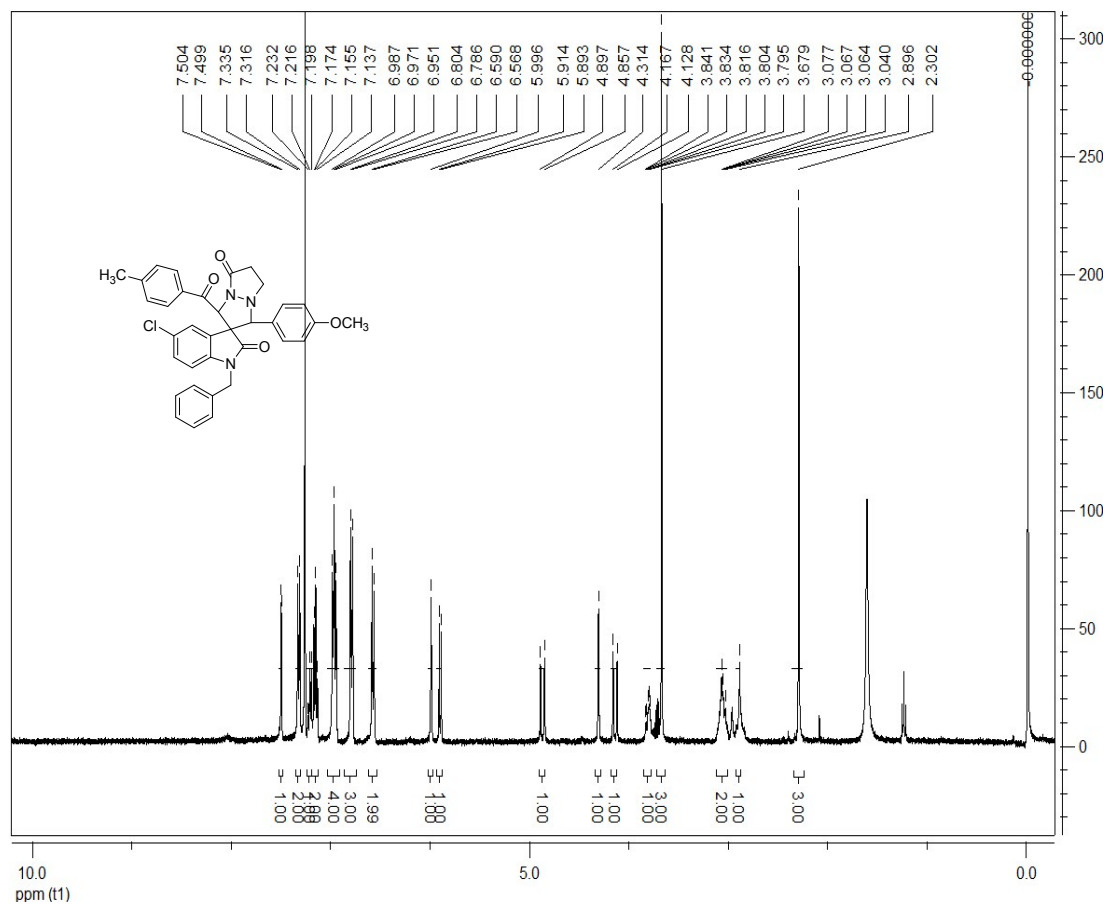


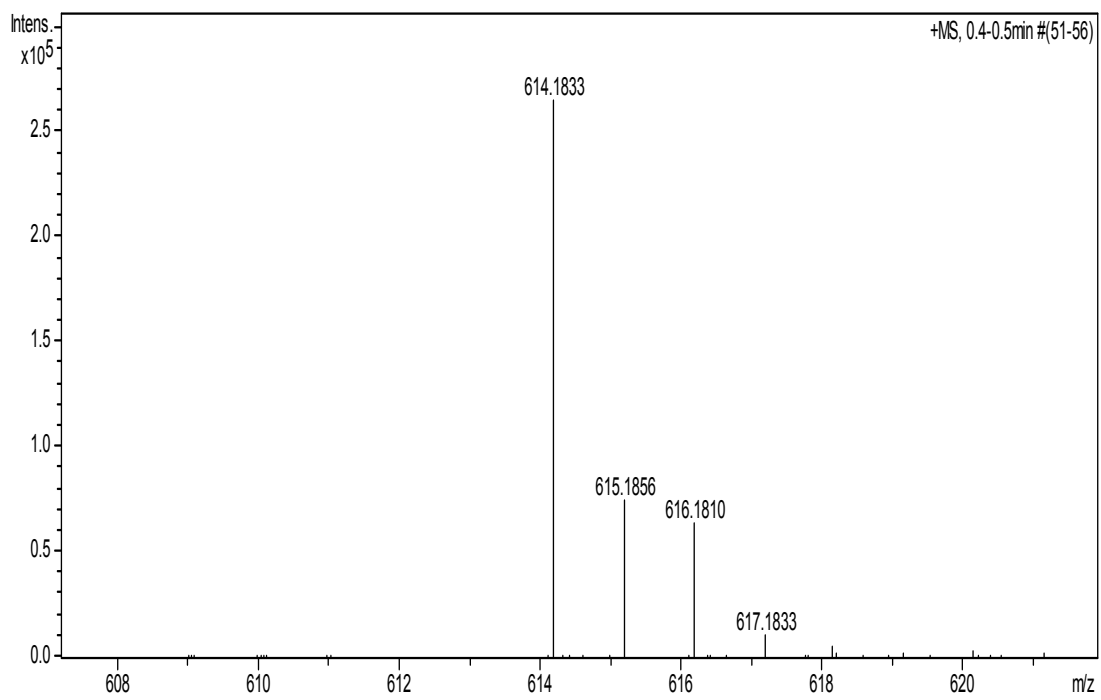
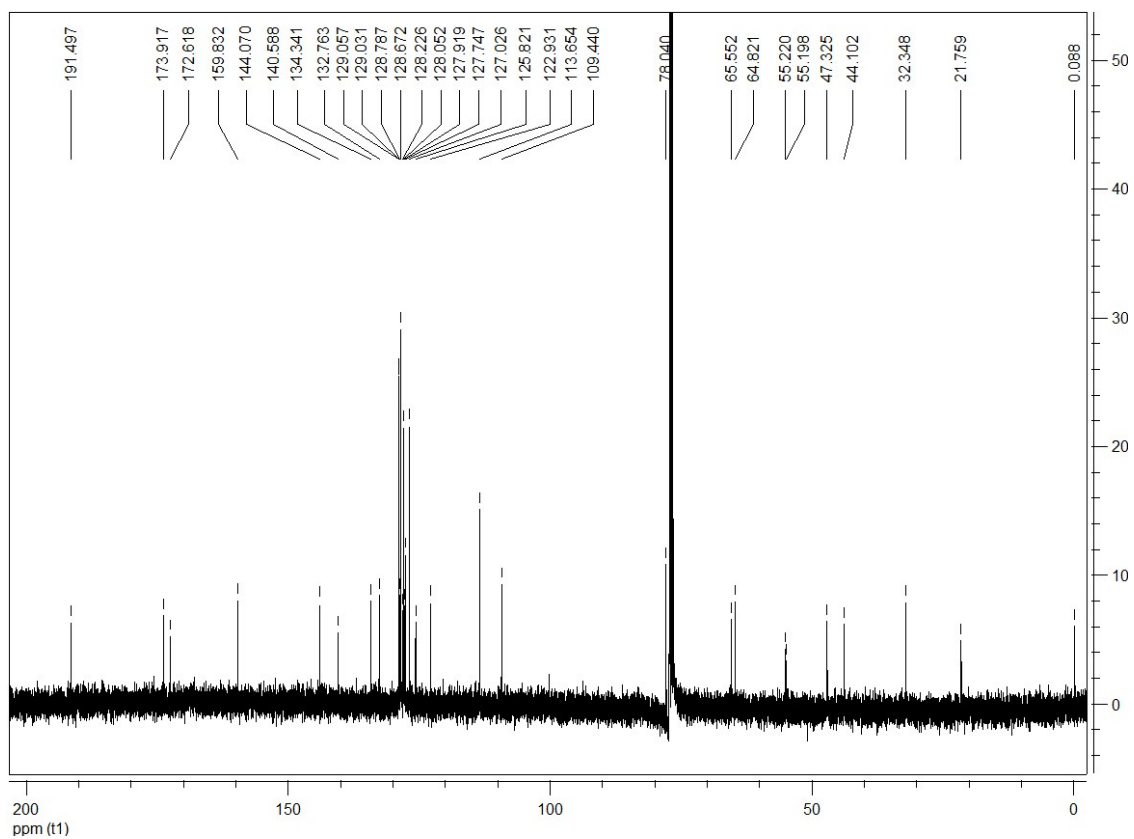
1-Benzyl-1'-(4-methoxyphenyl)-5-methyl-3'-(4-methylbenzoyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2d):



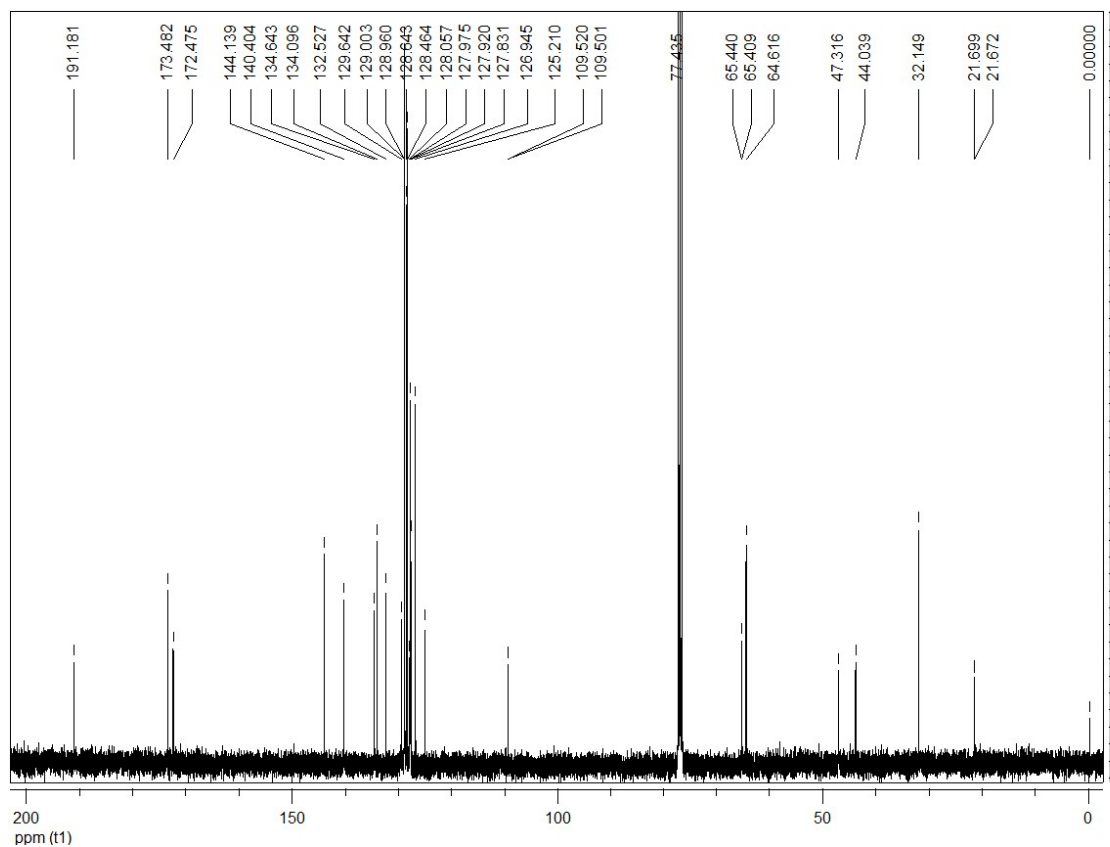
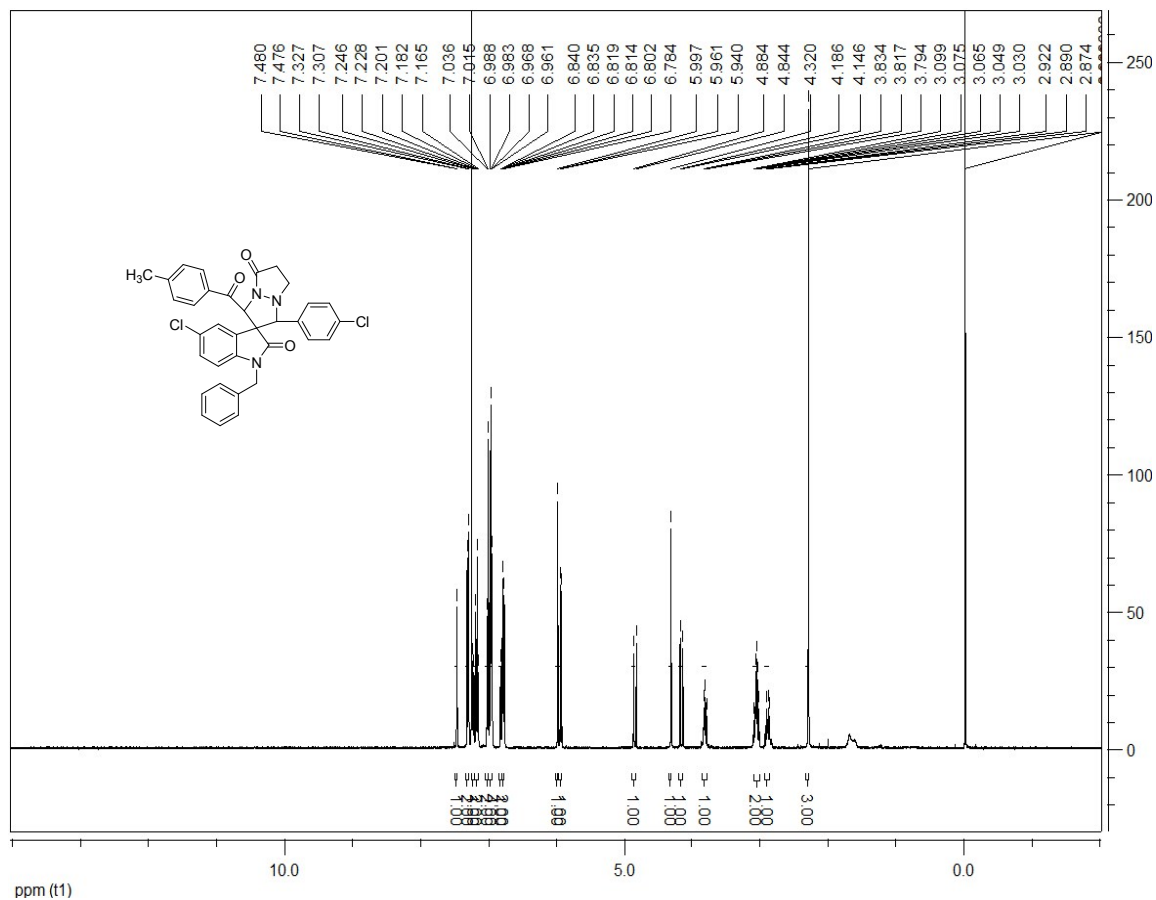


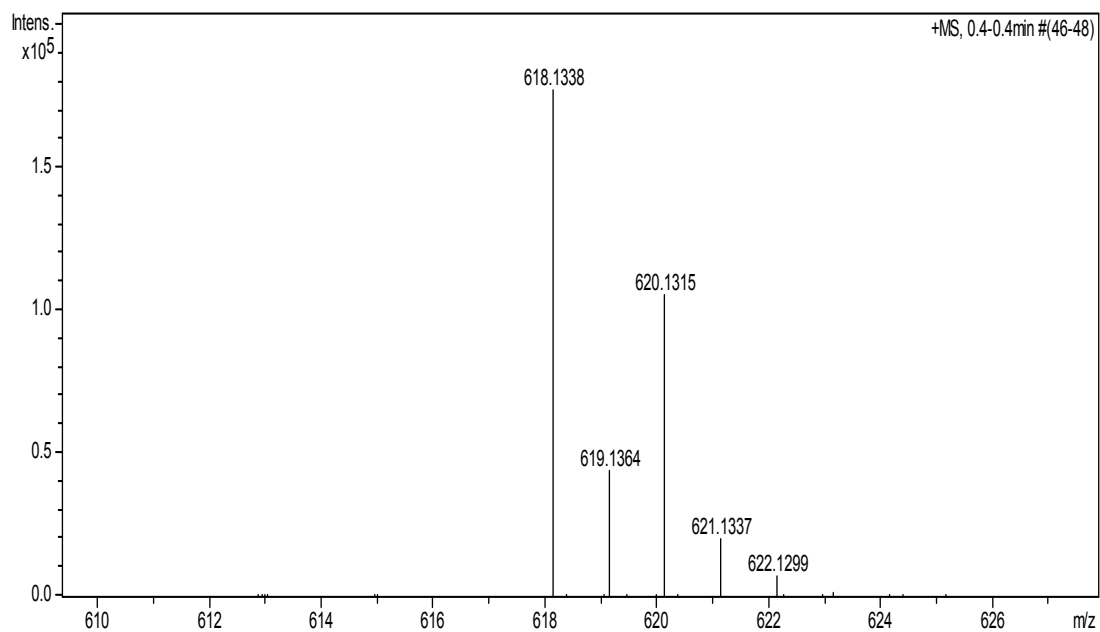
1-Benzyl-5-chloro-1'-(4-methoxyphenyl)-3'-(4-methylbenzoyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2e):



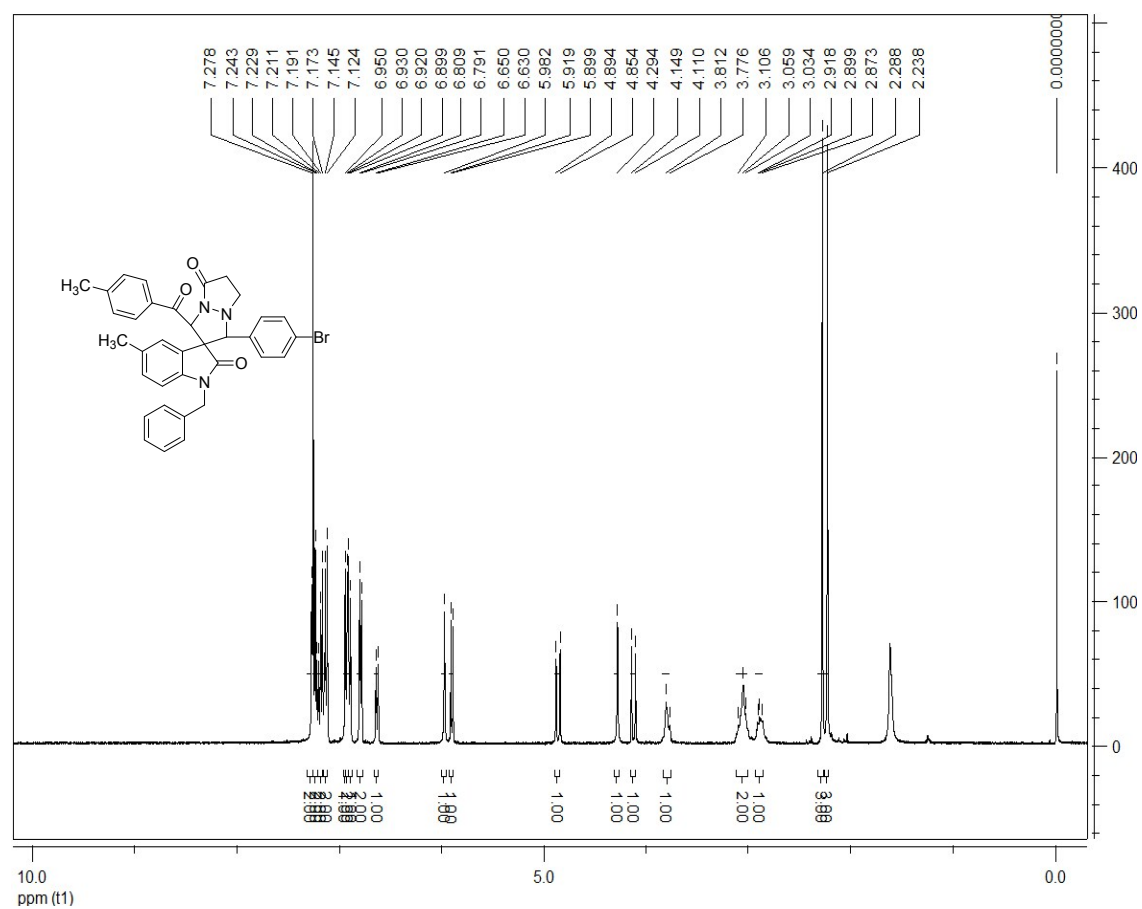


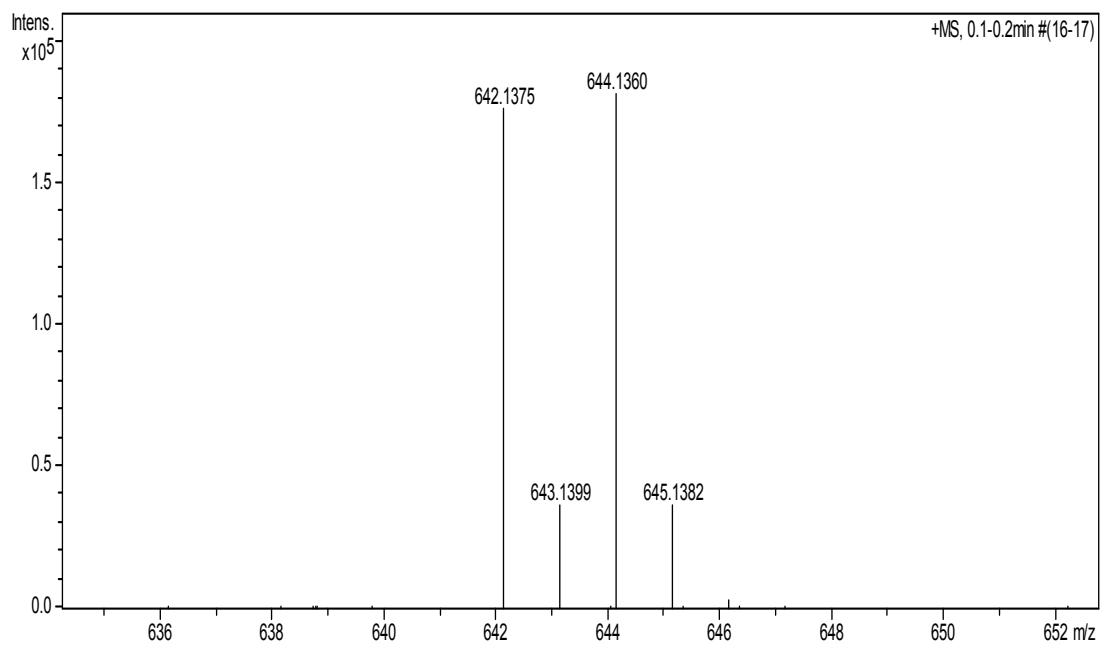
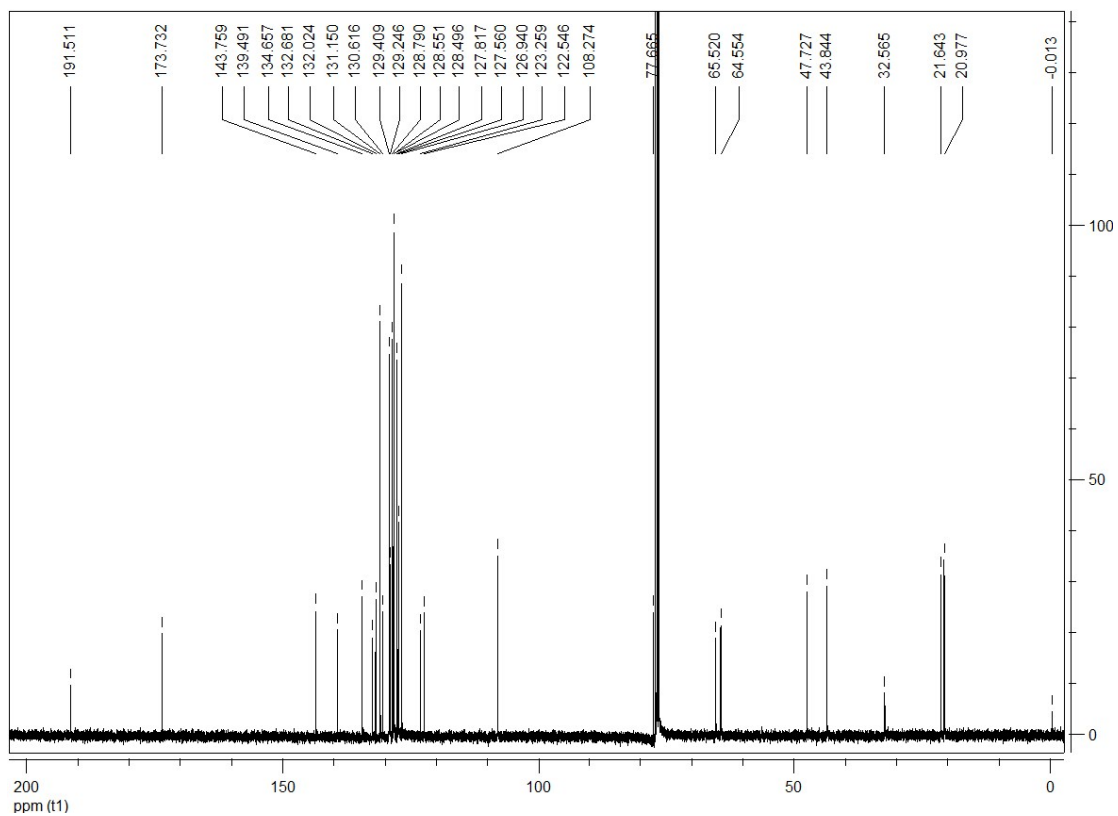
1-Benzyl-5-chloro-1'-(4-chlorophenyl)-3'-(4-methylbenzoyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2f):



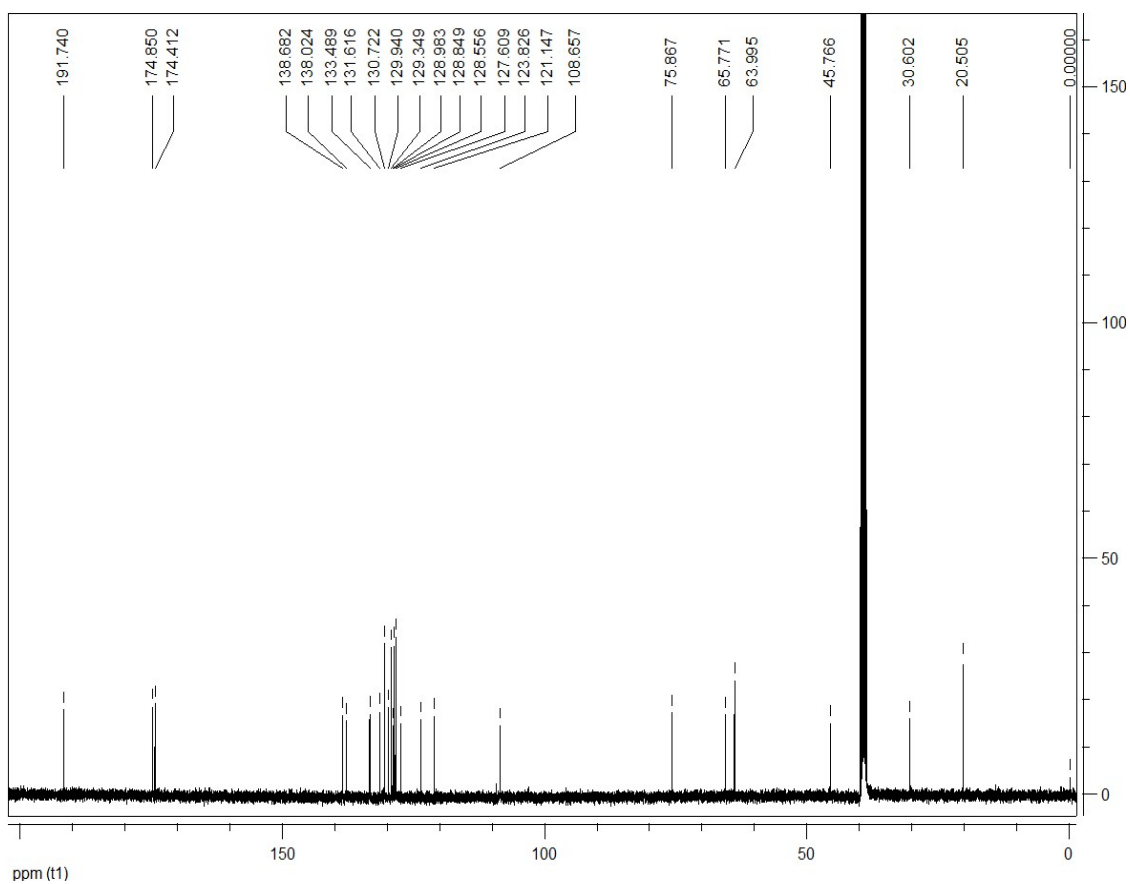
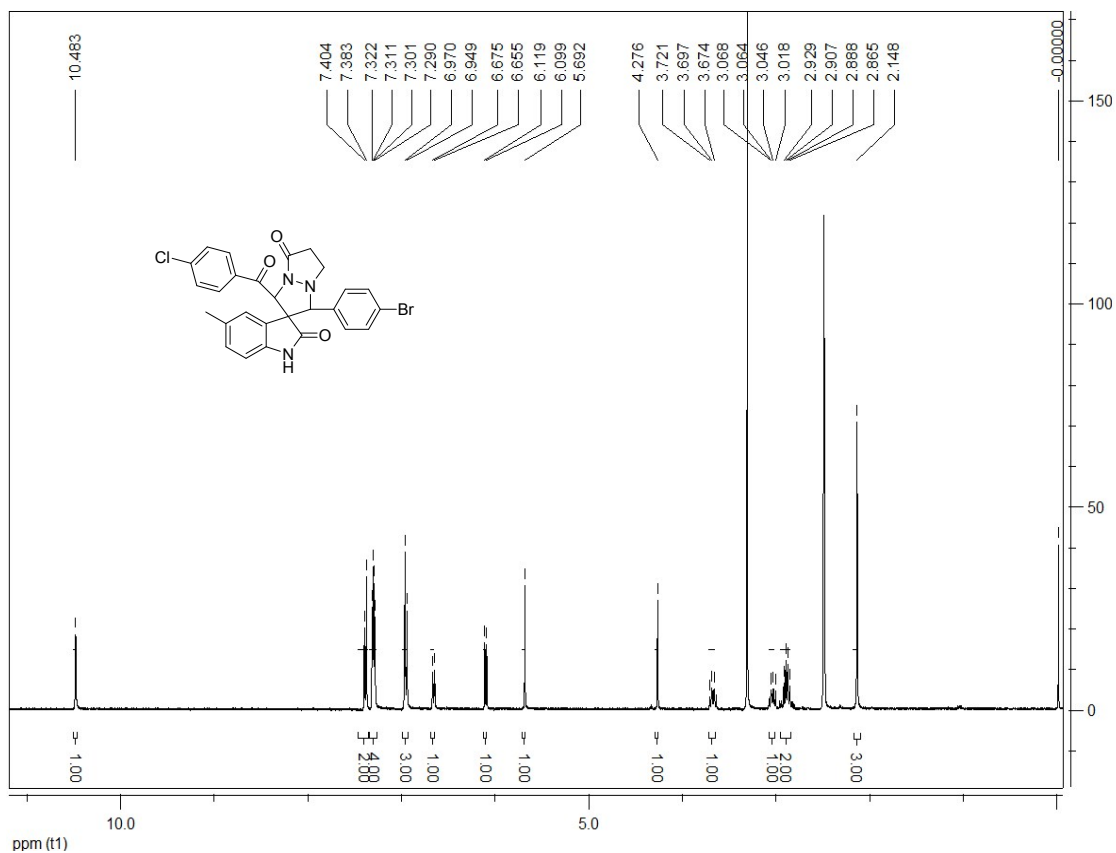


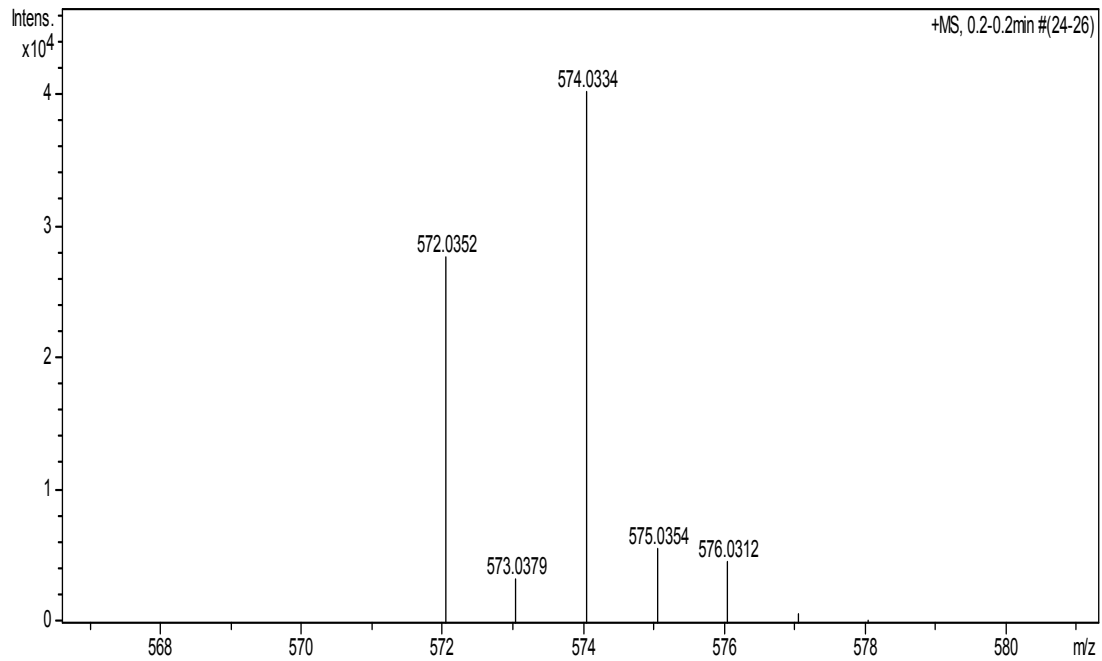
1-Benzyl-1'-(4-bromophenyl)-5-methyl-3'-(4-methylbenzoyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2g):



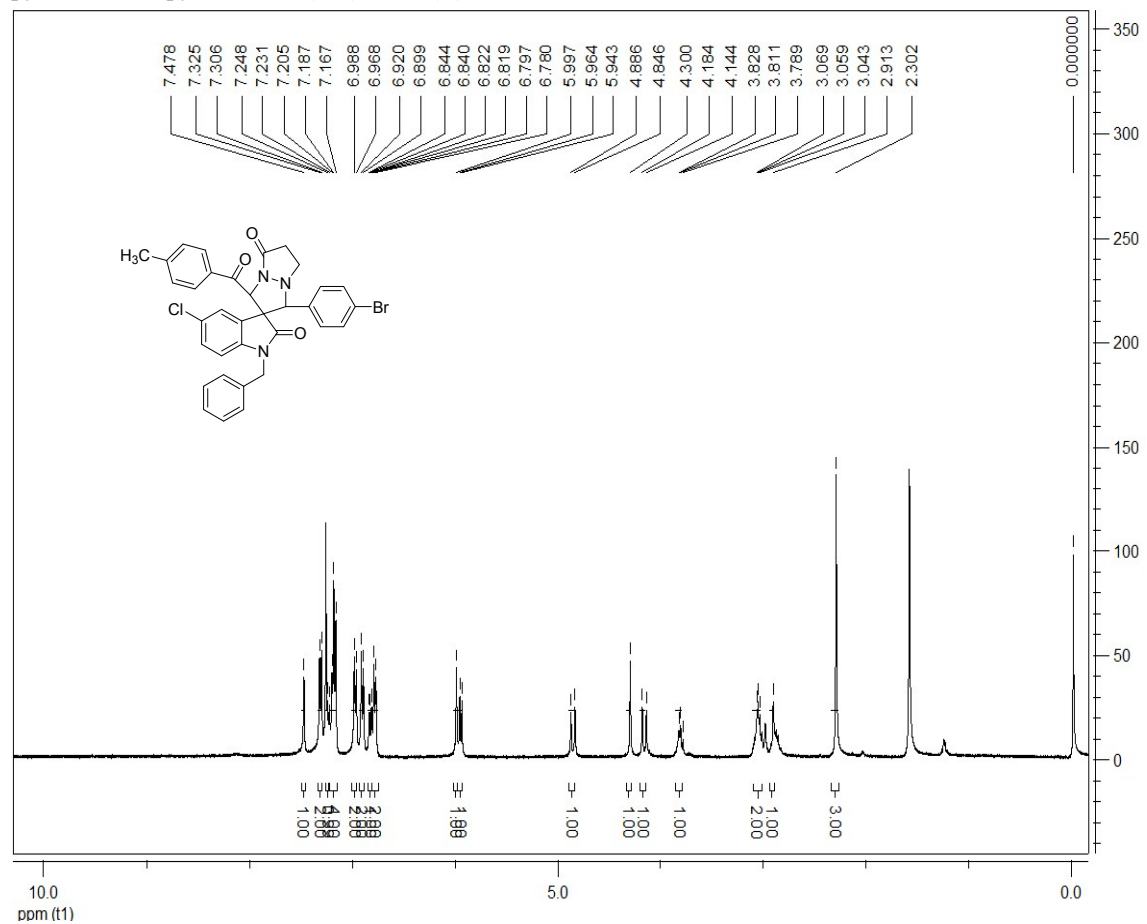


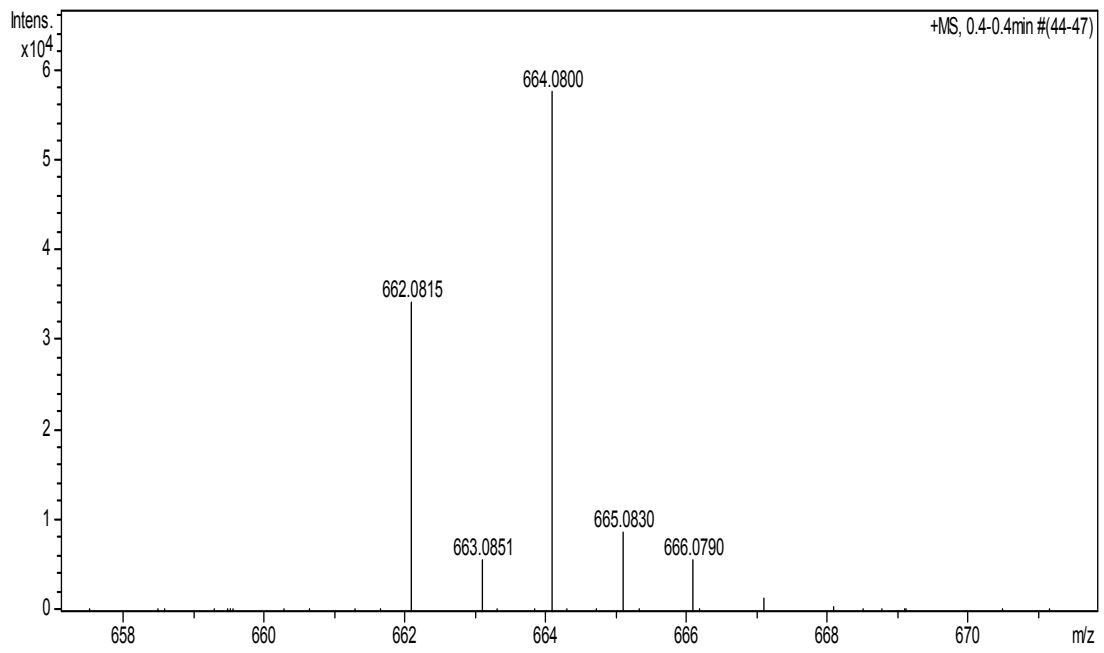
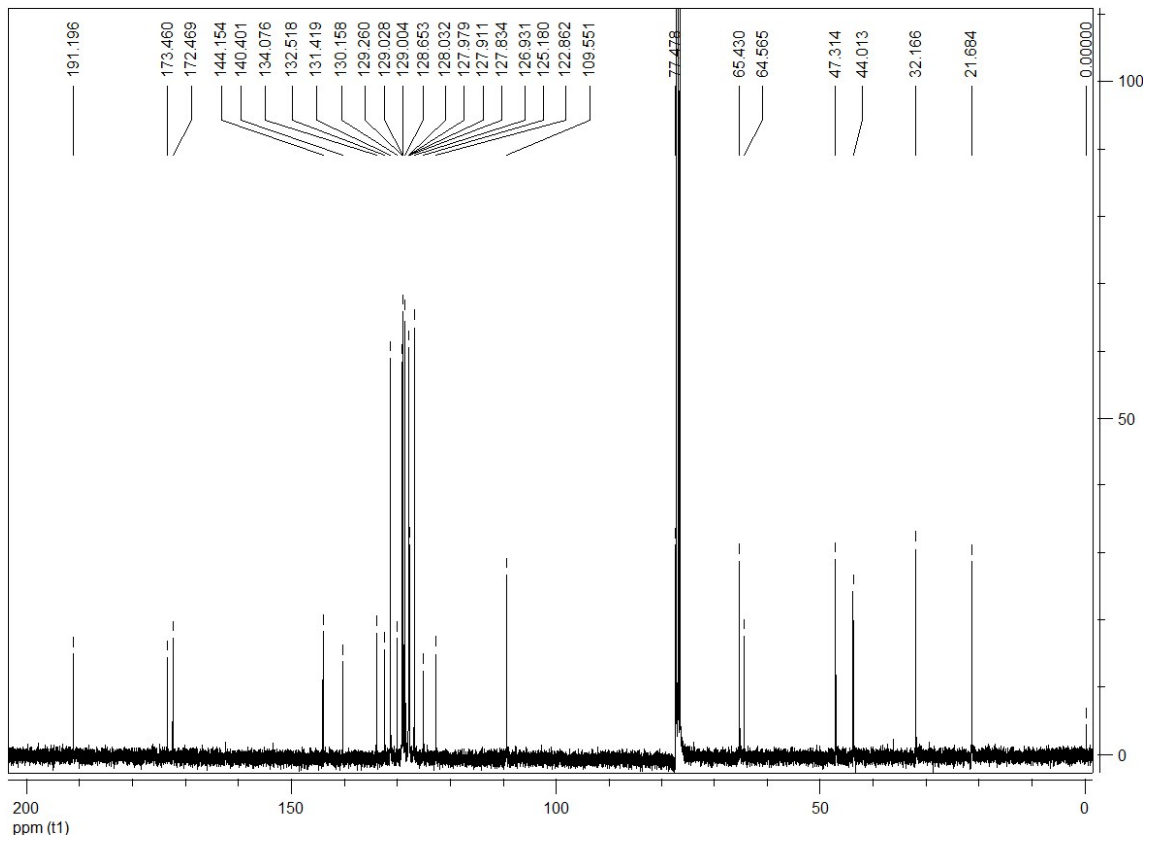
1'-(4-Bromophenyl)-3'-(4-chlorobenzoyl)-5-methyl-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2h):





1-Benzyl-1'-(4-bromophenyl)-5-chloro-3'-(4-methylbenzoyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2i):





1-Benzyl-1'-(4-bromophenyl)-5-chloro-3'-(4-chlorobenzoyl)-6',7'-dihydro-1'H-spiro[indoline-3,2'-pyrazolo[1,2-a]pyrazole]-2,5'(3'H)-dione (2j):

