

# The Characterization of N-methylphthalimide (NMP)

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**ABSTRACT:** The analysis and characterization of N-methylphthalimide (NMP) is presented. Analytical data includes the results from specific color tests, gas chromatography/mass spectrometry (GC/MS), Fourier transform infrared (FTIR) spectroscopy, and nuclear magnetic resonance (NMR) spectroscopy.

**KEYWORDS:** N-methylphthalimide, GC/MS, NMR, FTIR, forensic chemistry

N-methylphthalimide (NMP) is an indole-based heterocyclic compound (Figure 1) traditionally used as an intermediate for organic syntheses or as a building block for plastics and dyes. There are no known medical uses for NMP. Beginning in the latter part of 2009, low to moderate amounts of NMP have been detected in a variety of “ecstasy” tablets from many regions of the United States, such as those shown in Figure 2. In most cases, 3,4-methylenedioxyamphetamine (MDMA) was the primary constituent of the illicit tablets; however, in at least one seizure from Texas, no MDMA was present. In this case, only 1-(3-trifluoromethylphenyl) piperazine (TFMPP) and caffeine were identified along with NMP.

## Experimental and Results

### Chemicals, Reagents, and Materials

N-methylphthalimide was obtained from Sigma-Aldrich (Milwaukee, WI).

### Presumptive color tests

Sodium nitroprusside: No color change.

Marquis: No color change.

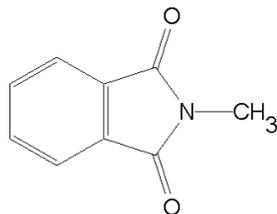


Figure 1 - N-methylphthalimide

Chemical Formula/CAS Number: C<sub>9</sub>H<sub>7</sub>NO<sub>2</sub> / [550-44-7]

Molecular Weight: 161.16 amu

Melting Point: 129-132°C

Boiling Point: 286°C at 760 mm Hg

IUPAC Name: 2-methylisoindole-1,3-dione

Synonyms: 2-methyl-1H-isoindole-1,3(2H)-dione

2-methyl-1H-isoindole-3(2H)-dione

2-methyl-isoindole-1,3-dione

N-methyl-phthalimid

N-methylphthalimide

phthalimide-N-methyl

2-methyl-1H-isoindole-1,3(2H)-dione

1H-isoindole-1,3(2H)-dione, 2-methyl-

### Gas chromatography/mass spectrometry (GC/MS)

The mass spectrum of NMP (Figure 3) was acquired on a Agilent Model 5975C quadrupole mass-selective detector (MSD) interfaced with an Agilent 7890A gas chromatograph (GC). The MSD was operated in the electron ionization (EI) mode with an ionization potential of 70 eV, a scan range of 40-500 amu, and 5.4 scans/s. The GC was fitted with a 15 m x 0.25 mm I.D. fused silica capillary column coated with 0.25 μm 5% phenyl 95% dimethylpolysiloxane (HP-5). A total ion chromatogram (Figure 4) is shown for a representative ecstasy tablet exhibit that contained NMP as well as other more commonly encountered adulterants.

### Nuclear Magnetic Resonance (NMR) Spectroscopy

The <sup>1</sup>H-NMR spectrum (Figure 5) was obtained on a Varian Mercury 400 MHz spectrometer. The sample was analyzed in deuteriochloroform (CDCl<sub>3</sub>) at ambient temperature using standard Varian pulse sequences.

### Fourier Transform Infrared Spectroscopy (FTIR)

The spectrum (Figure 6) was collected using a Thermo Nicolet Avatar 370 DTGS spectrometer equipped with an attenuated total reflectance (ATR) attachment. The spectrum was collected using 16 scans between 4000 cm<sup>-1</sup> and 400 cm<sup>-1</sup> at a resolution of 4.0 cm<sup>-1</sup>.

### References

1. [http://www.chemicalbook.com/ProductChemicalPropertiesCB8473039\\_EN.htm](http://www.chemicalbook.com/ProductChemicalPropertiesCB8473039_EN.htm)



Figure 2 - Ecstasy tablets containing N-methylphthalimide.

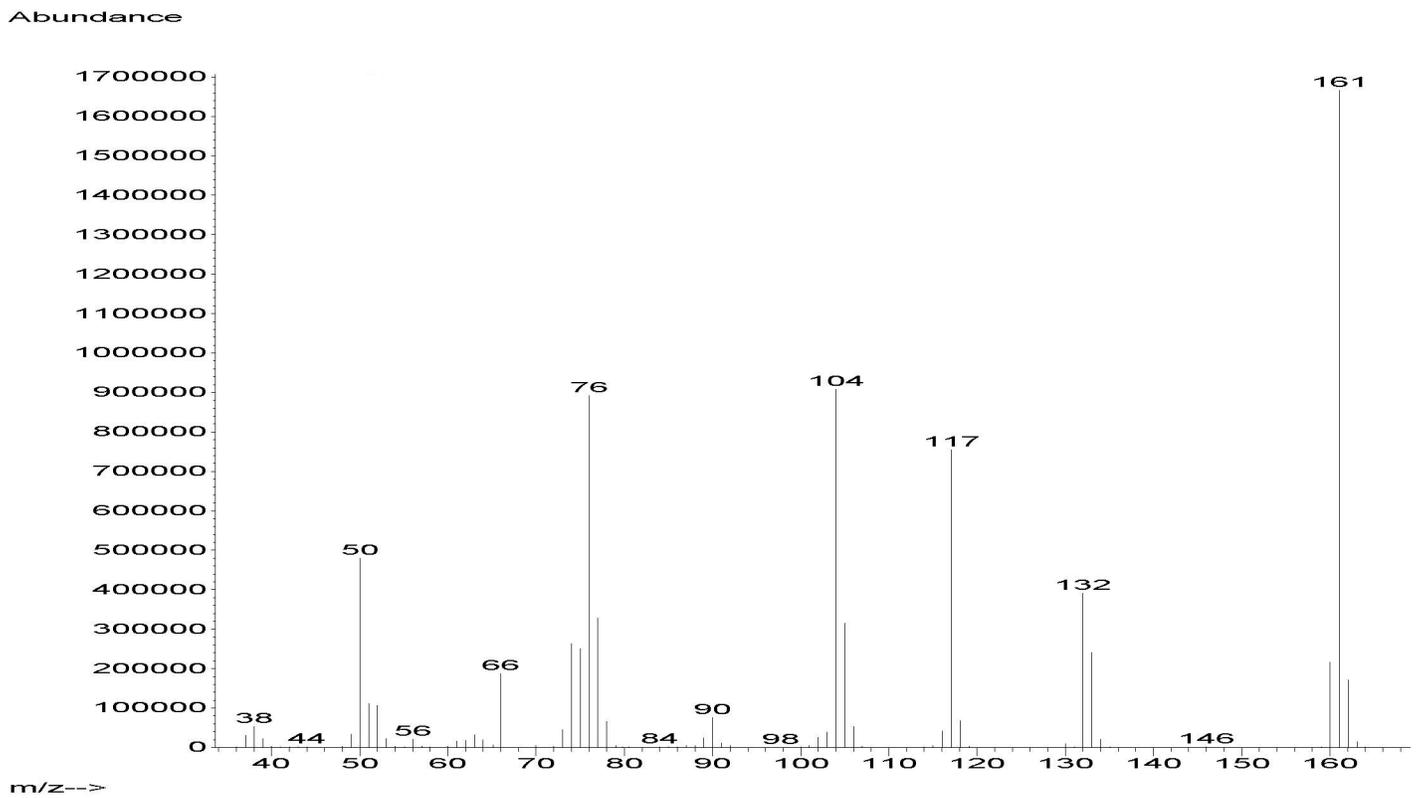


Figure 3 - Mass spectrum of N-methylphthalimide.

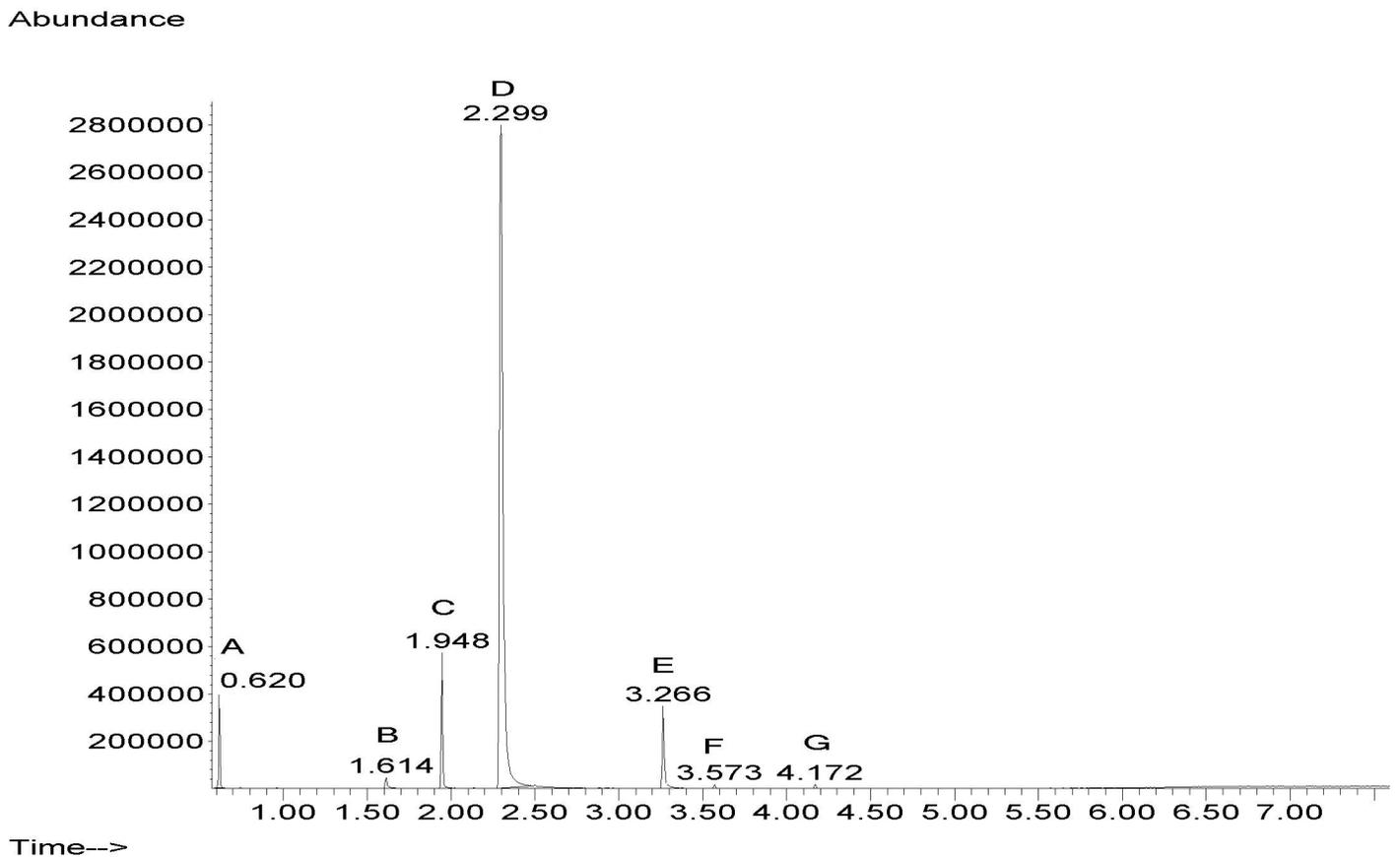


Figure 4 - Total ion chromatogram for adulterated ecstasy tablet (A: dimethylsulfone, B: phthalic anhydride, C: N-methylphthalimide, D: MDMA, E: caffeine, F: palmitic acid, and G: stearic acid).

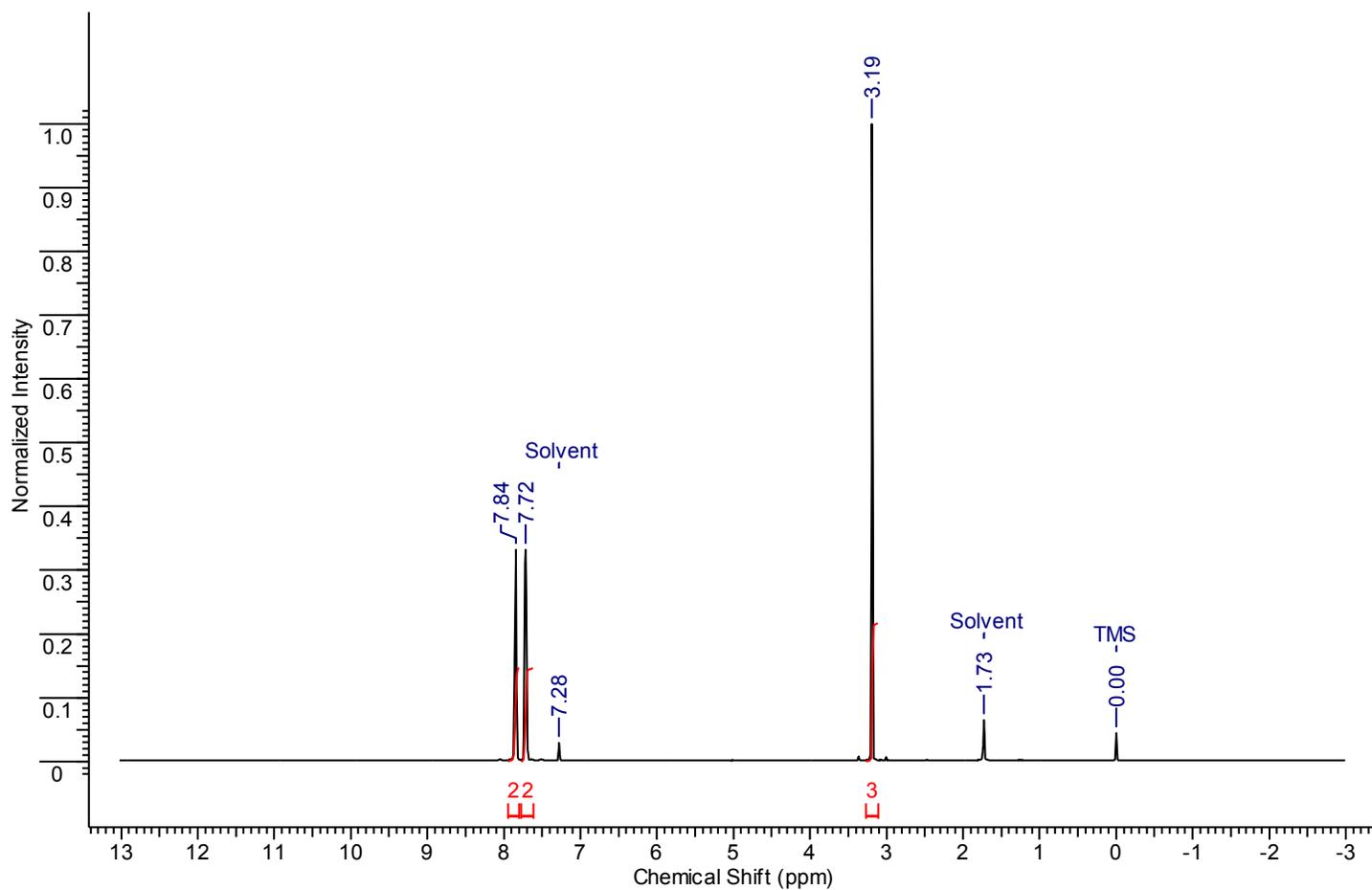


Figure 5 - NMR spectrum for N-methylphthalimide.

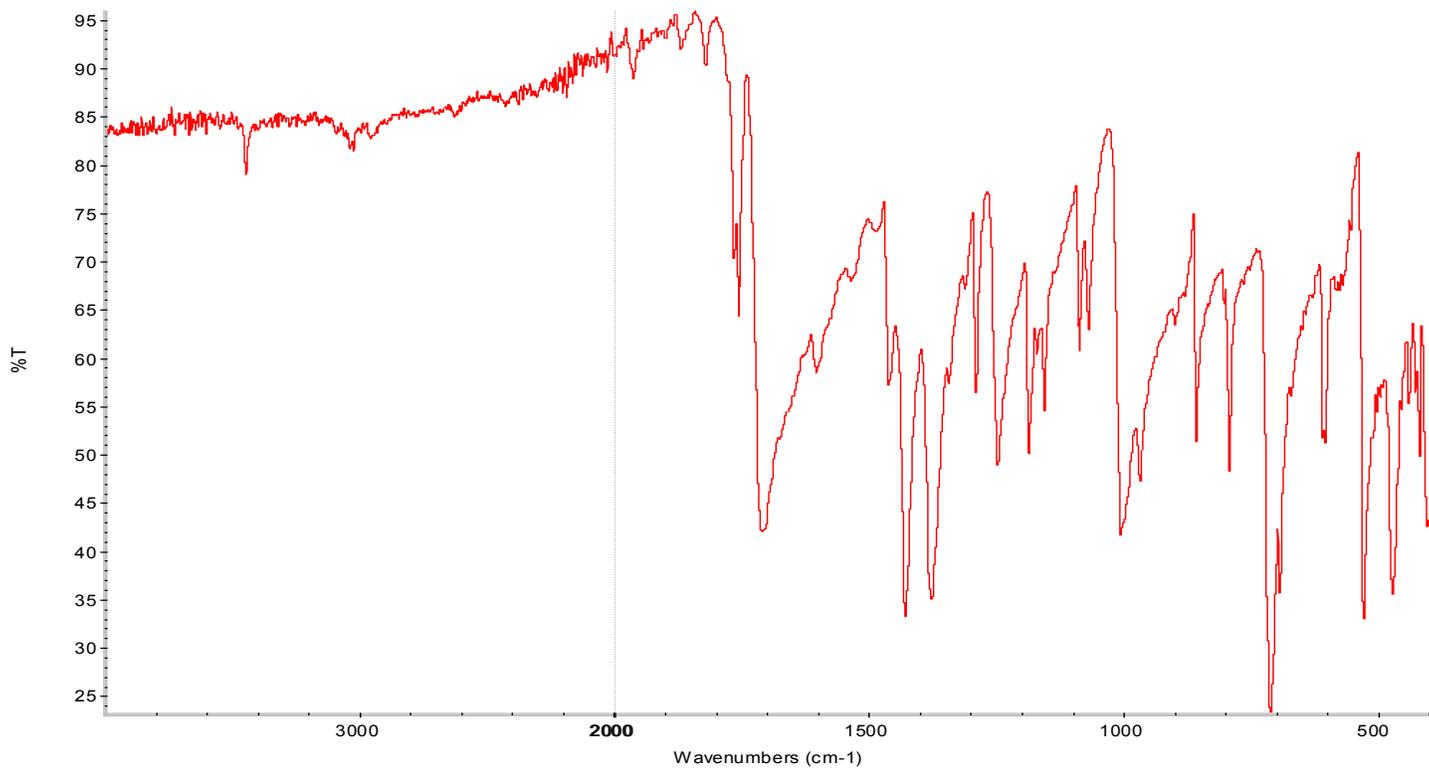


Figure 6 - FTIR spectrum for N-methylphthalimide.