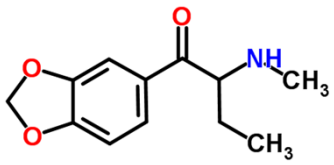
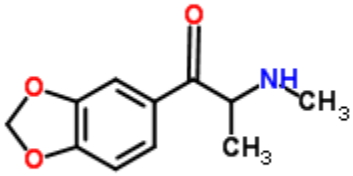
1. SUBSTITUTED CATHINONES

A. Description: Substituted cathinone is a general name for a chemical that can be derived from cathinone. Cathinone occurs naturally as a CNS stimulant found in the plant *Catha edulis* (khat plants), however substituted cathinones are synthesized with substitutions at one or more locations of the cathinone molecule.

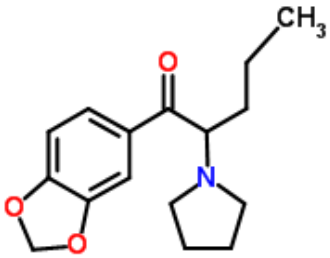
B. Structure, Empirical Formula, Molecular Weight:



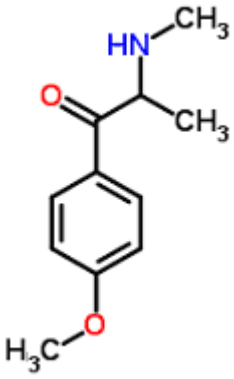
Butylone
$C_{12}H_{15}NO_3$
MW 221.2



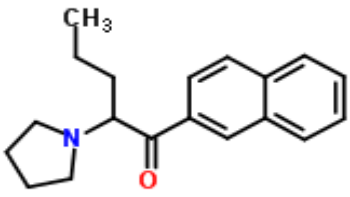
Methylone
$C_{11}H_{13}NO_3$
MW 207.2



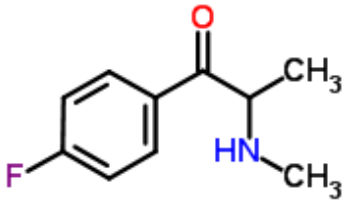
MDPV
$C_{16}H_{21}NO_3$
MW 275.3



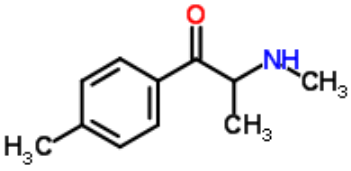
Methedrone
$C_{11}H_{15}NO_2$
MW 193.2



Naphyrone
$C_{19}H_{23}NO$
MW 281.3



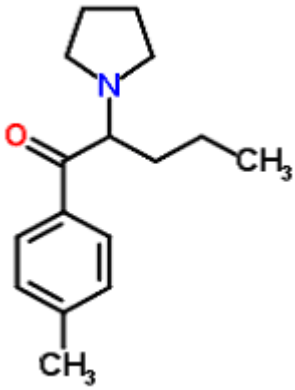
Flephedrone
$C_{10}H_{12}FNO$
MW 181.2



Mephedrone

$C_{11}H_{15}NO$

MW 177.1



Pyrovalerone

$C_{16}H_{23}NO$

MW 245.3

C. Synonyms:

Name	Synonyms
Butylone	BK-MBDB, β-keto-N-methylbenzodioxolylpropylamine, 2-methylamino-1-(3, 4-methylenedioxyphenyl)-butan-1-one, 1-(1,3-benzodioxol-5-yl)-2-(methylamino)-1-butanone
Flephedrone	FMC, Fluoromethcathinone
Mephedrone	4-MMC, 4-Methylephedrone, 4-Methylmethcathinone, M-cat, Meow Meow
Methedrone	4-Methoxymethcathinone, bk-PMMA, PMMC, Methoxyphedrine, 4-Methedrone, p-Methoxymethcathinone, 4-MOMC
Naphyrone	1-(2-naphthalenyl)-2-(1-pyrrolidinyl)-1-pentanone, 2-Naphyrone, β-Naphyrone, O-2482, NRG-1, Naphthylpyrovalerone
Methylone	1-(1,3-benzodioxol-5-yl)-2-(methylamino)-1-propanone, 3,4-Methylenedioxy-N-methylcathinone, bk-MDMA, 3.4-MDMC
MDPV	1-(1,3-benzodioxol-5-yl)-2-(1-pyrrolidinyl)-1-pentanone, Methylenedioxypyrovalerone, 3, 4-methylenedioxypyrvalerone, 3,4-MDPV
Pyrovalerone	1-(4-methylphenyl)-2-(1-pyrrolidinyl)-1-pentanone, Centroton, Thymergix, Valerophenone

D. Drug Action: Reported stimulants however pharmacodynamics of each substance has not be extensively studied.

E. Common pharmaceutical/street forms: Commonly found in mixtures of white/off-white crystalline powders being sold as bath salts, plant food, glass cleaners and other products.

F. Solubility:

Name	Solubility
Butylone	Organic solvents including ethanol, dimethyl sulfoxide (DMSO) and dimethylformamide (DMF)
Flephedrone	Organic solvents including ethanol, DMSO and DMF
Mephedrone	Organic solvents including ethanol, DMSO and DMF
Methedrone	Organic solvents including ethanol, DMSO and DMF
Naphyrone	Organic solvents including ethanol, DMSO and DMF
Methylone	Organic solvents including DMSO and DMF
MDPV	Organic solvents including ethanol, DMSO and DMF
Pyrovalerone	Organic solvents including ethanol, DMSO and DMF

G. Extractions:

(1) Dry Extraction

Note: If poor chromatography occurs, the samples may be basified and extracted as in (2)

(a) Dissolve in C15 methanol.

(b) Filter to remove any insoluble material if necessary.

(2) Liquid/liquid extraction for illicit powders/tablets

(a) Basify with 10% sodium hydroxide.

(b) Extract with diethyl ether.

(c) Evaporate diethyl ether and reconstitute with C15 methanol.

H. Chemical Indicator Tests:

Name	Marquis	$Co(SCN)_2$	SNP	Liebermann's
Butylone	Yellow	Flash blue w/ clear extract	Blue	Green/brown
Flephedrone	NR	NR	NR	Yellow
Mephedrone	NR	Flash blue w/ clear extract	Blue	Yellow
Methedrone	NR	Flash blue w/ clear extract	Blue	Orange

Name	Marquis	$Co(SCN)_2$	SNP	Liebermann's
Naphyrone	Orange → green	Blue w/ extract	(1) Yellow (2) NR	Green → black
MDPV	Yellow	Blue w/ extract	NR	Yellow/green
Methylone	Yellow	Weak blue w/ clear extract	Blue	Green → black
Pyrovalerone	NR	Blue w/ extract	NR	Yellow

I. TLC: N/A

J. Comments:

Fluoromethcathinone can be present as 2-, 3- or 4-fluoromethcathinone. Appropriate standards should be used to detect the correct isomer.

Pyrovalerone was used as an anorectic, however it is currently not prescribed due to the prevalence of more effective medications.

K. GC/MS: Analyze using "DRUGS1" program.

Note: Non-controlled substituted cathinones should be analyzed using "DRUGS3" program

L. Reporting: Arizona controls some substituted cathinones by name and some by class (Cathinomimetic substance). Refer to ARS 13-3401 for the most current listing of cathinomimetic substances. Report as:

(1) "_____" , a dangerous drug

(2) Cathinomimetic substance "_____" , a dangerous drug

(3) Cathinomimetic substance indicated "_____" , a dangerous drug,

M. References:

(1) Archer, R.P., Fluoromethcathinone, a new substance of abuse, Forensic Science International (2009), 185: 10-20.

(2) Power, J.D. et al., The analysis of substituted cathinones. Part 1: Chemical analysis of 2-,3- and 4-methylmethcathinone, Forensic Science International (2011), 212: 6-12.

(3) McDermott, S., et al., The analysis of substituted cathinones. Part 2: An investigation into the phenylacetone based isomers of 4-methylmethcathinone and N-ethylcathinone, Forensic Science International (2011), 212:13-21.

(4) Kavanagh, P., et al., The analysis of substituted cathinones. Part 3: Synthesis and characterization of 2,3-methylenedioxy substituted cathinones, Forensic Science International (2012), 216:19-28.

(5) Prosser, J. and Nelson, L., The Toxicology of Bath Salts: A Review of Synthetic Cathinones, Journal of Medical Toxicology (2012) 8: 33-42.

(6) Toole, K. et al., Color Tests for the Preliminary Identification of Methcathinone and Analogues of Methcathinone, Microgram, Vol 9, No. 1, 2012, pp. 27-32.

(7) Material Safety Data Sheets. 2011-2012. 25 Jun 2012 <http://www.caymanchem.com>

(8) SWDRUG Mass Spectral Library, Version 1.4. April 11, 2012.

(9) ChemSpider. 2012. 25 Jun 2012 <http://www.chemspider.com>