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CLASSIFICATION OF ILLICIT METHAMPHETAMINE TABLETS

FROM THEIR PHYSICAL AND CHEMICAL PROPERTIES

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Abstract

The use of illicit addictive drugs, especially methamphetamine, is a major social problem in Thailand. In 2005, there were more than 50,000 cases of seizure of methamphetamine drug in Thailand involving over 13.5 million pills. This study classifies the tablets according to their physical properties and main chemical composition. Random samples from 100 lots of seized methamphetamine pills that had been sent to Office of Forensic Science, Royal Thai Police, in 2010-11 for chemical analysis were selected. The shape, color, mean weight and the logo stamped on the pill were recorded for each lot. Using gas-chromatography with flame ionization detection, the major components of the pills were found to be methamphetamine, caffeine and pseudoephedrine. Pseudoephedrine is a common chemical compound that is usually employed in the illicit synthesis of methamphetamine and it can sometime be found as contaminant in the tablet.

There were only 4 colors found for the 100 lots: white, orange, green and blue. All the tablets were flat and circular in shape. There were 10 logos found. The mean weight of the pills was in the range, 70 – 80 mg. The percent (wt/wt) content of methamphetamine, caffeine and pseudoephedrine were 10-80 %, 0 – 72% and 0 – 20 %, respectively.

Keyword : Methamphetamine tablet ; Gas Chromatography; impurity

1.Introduction

The study of the classification of illicit methamphetamine tablets from their physical and chemical properties is an important issue. There has been a dramatic increase in the numbers of seizures of the illicit methamphetamine drugs in Bangkok and other provinces in Thailand. There is an expansion of illegal methamphetamine drugs into the country, especially in capital city Bangkok. The study of the main components in the methamphetamine samples by Gas Chromatography will assist in identification them number of manufacturing or packaging sources of the impounded batches of methamphetamine tablets. In 2005, there were 53,290 cases of seizure of methamphetamine drug in Thailand involving 13.5 million pills. There were 58,945 offenders arrested. This large amount of drug affects the social structure and security of the nation . Most of the pills are found to contain Methamphetamine, Caffeine, Pseudoephedrine , Ephedrine, and other substances.

Methamphetamine is expansively extended nationwide and it can be produced, sent and consumed easily. Therefore, it is well-known for all sellers and buyers. Methamphetamine is a psychostimulant of the phenethylamine and amphetamine class of drugs. It increases alertness, concentration, energy, and in high doses, can induce euphoria, enhance self-esteem, and increase libido. L-methamphetamine is simply a decongestant, and has no stimulant activity. But its optical isomer, D-methamphetamine, is the stimulant commonly known as speed.

The synthesis of methamphetamine contain amounts of precursor chemicals , intermediates and by- products.These impurities that contain in seized drugs can be used to identify the synthesis route and to identify drug seizures of the same origin .Drug profiling is important to identify the synthesis manufacturing and route of drug. In addition to this, the researcher considered that to study classification of illicit methamphetamine tablets from their physical and chemical properties to identification the number of manufacturing sources of methamphetamine tablets.

This thesis is aimed to be the advantageous part for the help of the forensic science that would be helping for the police Authorities that work for the forensic department and investigation field to unveil the major source of the producers as well as

the distributors of the drug in the future. The expected result for this thesis is ultimately to reduce the capacity of production of Methamphetamine drugs throughout Thailand.

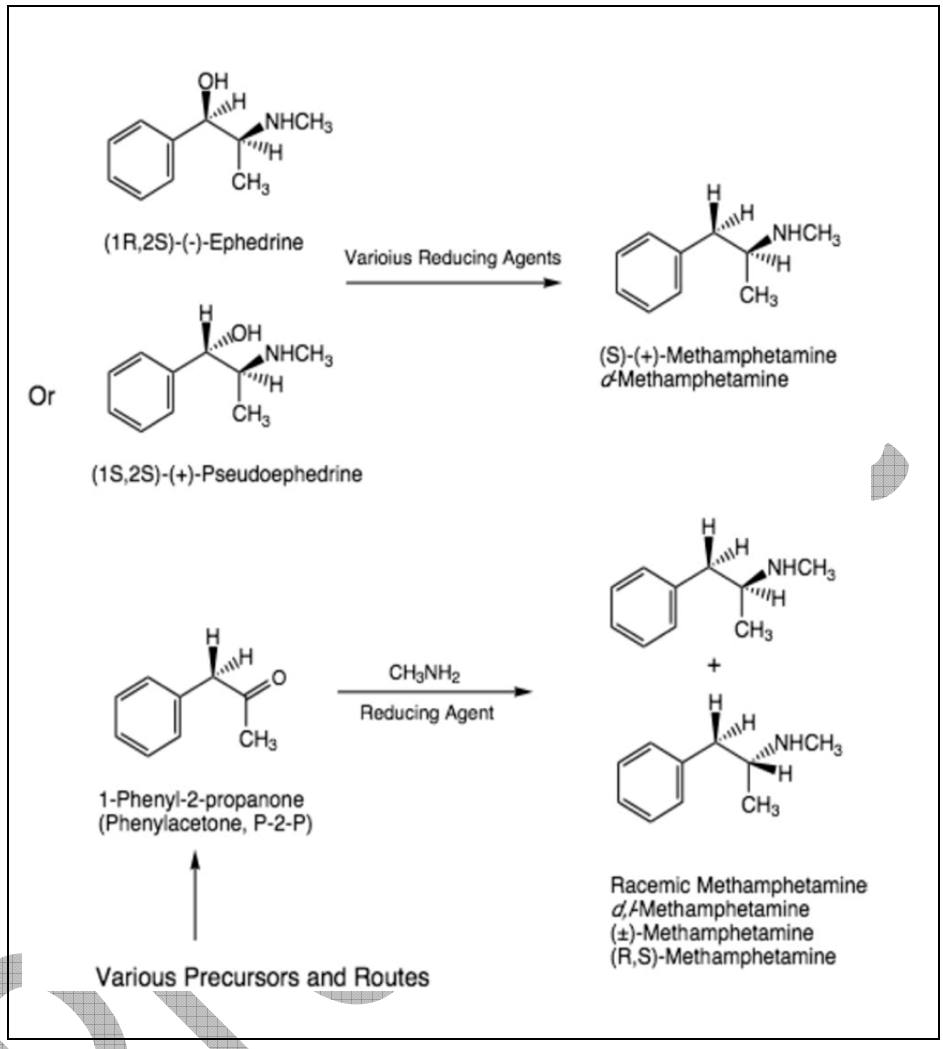


Figure 1. synthesis of Methamphetamine [source : Human Pharmacology of the methamphetamine stereoisomers write by John Mendelson, Naoto Uemura **.(** 2011)]

Scope of the study

In this study, the researcher has collected 100 lots of Methamphetamine tablet from the Office of Forensic Science, Royal Thai Police during December 2010- March 2011 to study about:1.Physical appearance such as color of Methamphetamine drugs, the symbol of the pills , weight and shape.2.Chemical components, the components of Methamphetamine drugs.

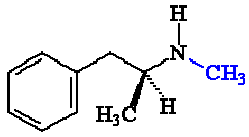
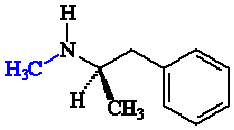
Systematic (IUPAC) name	(2S)-N-methyl-l-phenyl-propan-2-amine
Structure	 D-methamphetamine  L-methamphetamine
Molecular formula	$C_{10}H_{25}N$
Molecular weight	149.24g/mol
Percentage composition	C 80.48%, H 10.13%, N 9.39%
Melt. Point	172-174 ^{o} C
Soluble	1 in 2 of water, 1 in 4 of ethanol, and 1 in 5 of chloroform; practically insoluble in ether
Dissolation Constant	pKi 10.1
Half life	9-15 hour

Figure 2. Summary table of methamphetamine .

2. Materials and Methods

2.1 Source of data

In this study, the researcher has collected 100 lots of Methamphetamine tablet from the Office of Forensic Science, Royal Thai Police during December 2010- March 2011. These 100 lots of samples are analyzed the shape, color, mean weight and logo stamped on the pill. Out of these 100 lots of samples, the researcher had selected the

randomly 5 tablets of them for the direct analytical investigation by the use of Gas Chromatography.

2.2 Apparatus

The Gas Chromatography (GC) analysis was carried out on a GC-2010 with a flame-ionization detector. Injection of sample was made at the split mode using autosampler. The column was Rtx-5 (Column length 29.8 m = 0.25mm ID, film thickness 0.25 μm) The injector and detector temperatures were maintained at 260 ^{o} C. The oven temperature was programmed as follows: Initial temperature, 165 ^{o} C initial hold, 0.15 min; temperature program rate, 30 ^{o} C /minute; Final temperature, 230 ^{o} C final hold, 4.80 min. The carrier gas was helium at a flow rate of 1.21 ml/min. Data processing software (programme is the authorized by Shimadzu) was used for retention time compensation of Gas Chromatography and peak integration.

Figure 3 . Photograph of GC 2010 by Shimadzu corporation

2.3 sample preparation

Methamphetamine tablet is usually orange color, but occasionally white, green and blue. Size of the tablet is about 5.5 mm of diameter and 2.8 mm of thickness. Average weight is 74.68 mg. Thought the most popular logo marks are WY or wy, tablet with 555 or Ok logos also presented.

From the experiment, the researcher randomly selected the 100 samples from the total lots of Methamphetamine drug. By the way, each of the sample is selected three pills of Methamphetamine tablet to be grinded. After that, the researcher weighted the grinded Methamphetamine drug about 150 grams and dissolved in 10 mL methanol containing Diphenhydramine.HCl (1 mg/mL),as internal standard. Lastly the sample is transferred into GC vial (3ml) and1 µL injected into the GC instrument.

2.4 Data Analysis

The statistical methods used to analyze data were descriptive statistics.

3.Result and discussion

The results of this study were divided into two parts: The first part is from the study of 100 lots of samples from the physical appearance such as mean weight, shape, logo and color. The second part is from the observation of the major elements of chemical contamination by the use of Gas Chromatography. In addition to this, the Discussion is included in this chapter at the end.

Figure 4. Photograph show physical appearance of some Methamphetamine tablets

3.1 Classification by physical properties

The researcher recorded the 3-4 major different attributes of the Methamphetamine tablet as followings. From physical difference, there is the 4 different colors of Methamphetamine tablets that are brought to put in. (There are white, orange, green, and blue) and there are 10 various logos.(There are Ok , wy ,Wy , Y , y , R , 888 , 555 , *wy* , ๓)

Color	mean weight (mg)	Number	Shape	Found logo
Blue	75.61	10	Circle and flat pill	Ok,wy
Green	74.375	8	Circle and flat pill	Wy, wy, Y, y,R
Orange	74.62	67	Circle and flat pill	Wy, wy, Y, y, R, 888
White	74.13	15	Circle and flat pill	555, M

Figure 5. Result table of methamphetamine classify by physical properties.

3.2 Classification by chemical composition

From chemical composition found that the green tablets have the highest % of the methamphetamine (72.875%) , the orange tablets have % methamphetamine (70.55%), the impurities and symbol stamped on the pill similar to the green tablets. Therefore, it may be concluded that the source of the production is the same, the blue tablets have the highest % of Pseudoephedrine / Ephedrine (20.00 %) ,the % methamphetamine (34.50 %) is lower than the orange and the green tablets .Therefore, it may be concluded that these tablets are adulterated with Pseudoephedrine , the white tablets have the lowest % of methamphetamine (31.66%) and highest % of caffeine (59.36%)

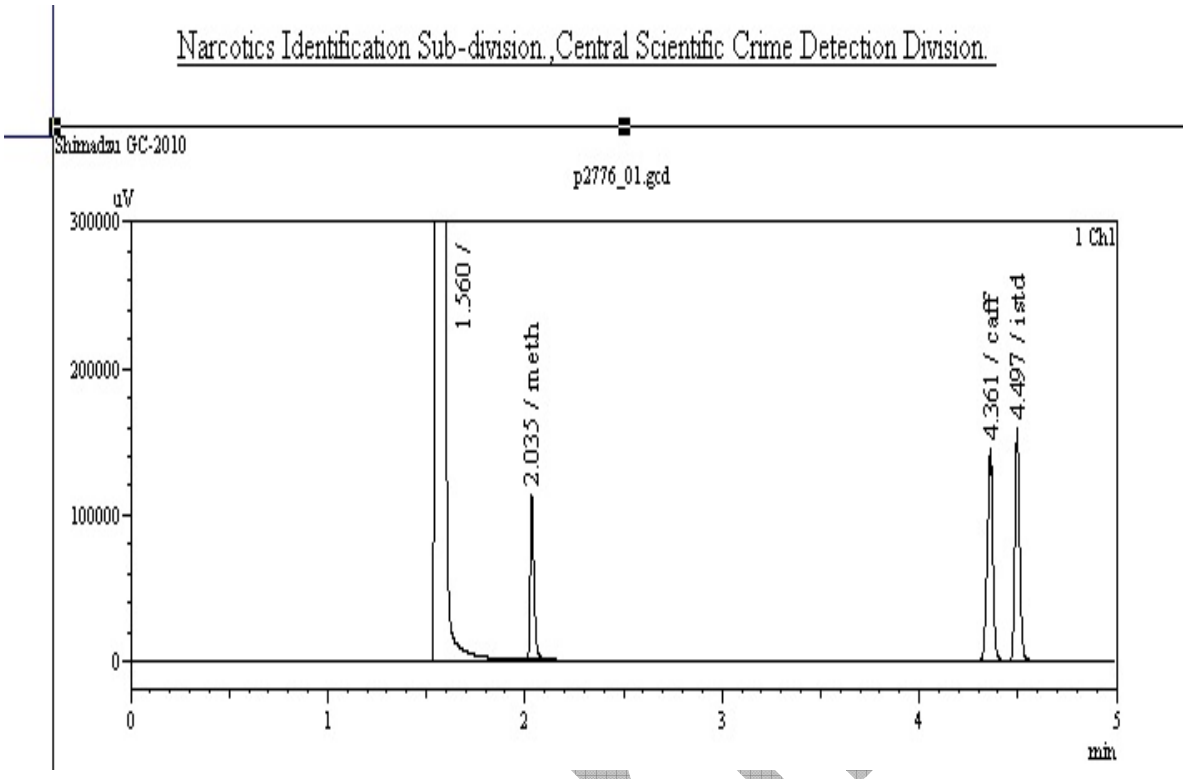


Figure 6. Example chromatogram from GC instrument

color	Mean weight	%Meth.	%Meth. average	%Caf.	%Caf. average	%Pseudo./ ephedrine	% Pseudo./ ephedrine average
Blue	75.61	10-60	25.6	5-42	25.6	18.20	19.55
Green	74.375	62-80	8.56	0-25	8.56	3.5-11.5	6.75
Orange	74.62	60-80	9.76	0-16	9.76	0-15	6.89
White	74.13	20.5-42	59.36	50-72	59.36	0-13	2.86

Figure 7. Result table of methamphetamine classify by chemical components and mean weight

4.Conclusions

From the sample 100 lots ,there can be divided into 4 classes according to their colors.The Green and Orange tablets have many logos that are the same and similar % Methamphetamine ,% Caffein and % Pseudoephedrine/Ephedrine .It can be concluded that the source of the production is the same.The Blue and White tablets have different logo and % Caffein and % Pseudoephedrine/ Ephedrine . It may be concluded that these come from different source.

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