CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

`Arson is a burning triggered on building, cars or other property with a wicked goal (SIR 2009). This malicious act is a crime that carries the most severe damage in terms of financial impact and property (Paterson 2009). OJJPD defines, arson is a damage caused by burning or explosion on another's property without owner's pleasure (OJJPD 2010). Arson is a very difficult crime to investigate due to the lack of physical evidence link to suspect. This is because most of the evidence was destroyed in the fire (Ahmad et al. 2008).

Petroleum-based accelerants always found at the scene of fires. Examples of petroleum-based accelerants that always detected in forensic laboratories during analysis is a mixture of automobile gasoline, diesel and mixture of other volatile substances (Almirall & Furton 2004). Most of the arsonist used this type of petroleum-based accelerants because of their low costs and easy availability (Bodle & Hardy 2007).

Detection and classification are very important in arson investigation (Tan et al. 2000). Petroleum-based accelerants consist of mixture of complex hydrocarbon molecules. Thus the detection and identification of these molecules is very difficult. The situation becomes worst with the pollution from the pyrolysis of the materials such as carpets and plastics at the scene (Lu 2010). In the study by Lennard et al. (1995), Almiral & Furton (2004) and Sandercock (2008), commonly found burning substances produces target compounds in a mixture of flammable liquid waste. The sources of

these compounds includes subtract background, pyrolysis products and combustion products. The presence of these products will affect the identification of flammable liquid waste, especially in cases where the quantities of present are very little.

Generally accelerants have similar chemical properties but large range of boiling point relatively. These variations caused changes in accelerants composition during the process evaporation. The more volatile hydrocarbons will evaporate faster leaving the heavier hydrocarbons in residue fire. After a while, the accelerants will be less volatile. Quantity of material remaining after the fire depends on various factors such as the quantity and the type of accelerants used, the properties of the material that poured into the accelerants, the time interval after the fire and the fire severity. During the evaporation process, the concentration of more volatile hydrocarbons rose in the above space of accelerants. These spaces are tested with variety techniques to detect the present of the accelerants in residue fire (Ahmad & Voon 2001).

The extraction, isolation, analysis and identification of petroleum-based accelerants, solid phase microextraction with analysis by gas chromatography – flame ionization and gas chromatography-mass spectrometry are commonly used. Identification of the sample depends on the pattern matching and visualization ate time consuming and prone to wrong classification. Furthermore, the interpretation of the results is limited to the skills and experience of the analyst. Therefore, chemometric statistical technique such as principle component analysis was used in the interpretation of complex data for classification of petroleum-based accelerants based on international guidelines by American Society for Testing and Material (ASTM).

The presence provides important evidence about the willful intent in criminal (Lennard et al. 1995; Tan et al. 2000; Doble et al. 2003; Bodle & Hardy 2007).

1.2 FIRE SCENARIO IN MALAYSIA

There are three elements: oxygen, heat and fuel can cause a fire. Apart from these three elements, there is another factor that plays a crucial during a fire is chain action. Fire usually occur due to the mechanical or electrical, human negligence or natural events that combined oxygen, fuel and heat to create a fire. One of the ways how death can occur due to fire is severe scalding. The flames will produce high heat sometimes can exceed 600°C. However, according to the statistic, only a quarter of the victims died because of burns. While, the rest died due to the inhaling harmful gases in smoke or lack of oxygen at the scene (JBPM 2012).

According to the statistic by Fire and Rescue Department of Malaysia (FRDM), the source of the fire in Malaysia is mainly caused by arson or accident by electric power about 3701 and 2994 cases respectively. Based on statistic from January to June 2012, bad faith fire involving 943 cases. Besides that, other cases including cigarette, sparks and other sources. Statistic of fire causes in Malaysia show in detail in Figure 1.1.

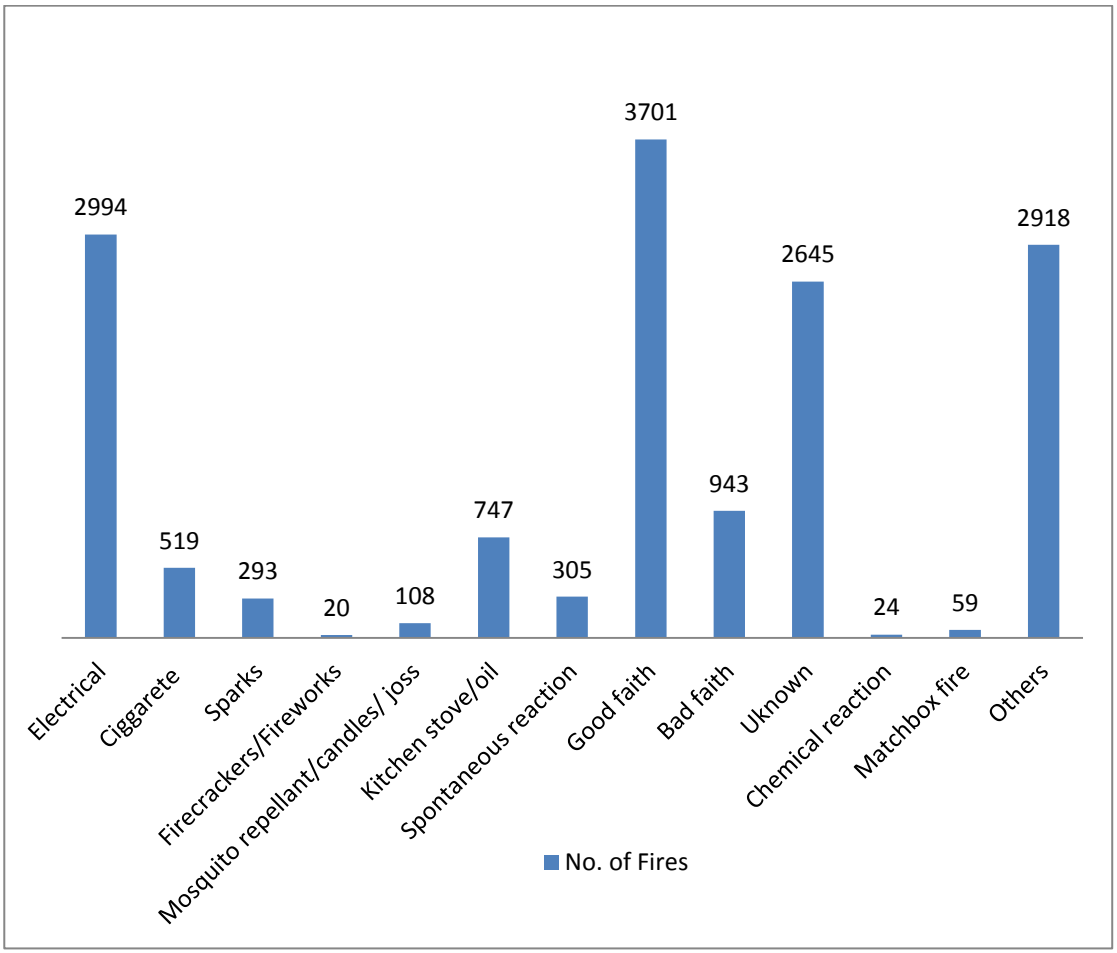

Figure 1.1: Statistic of fire causes in Malaysia for Jan-June 2012

Source: http://www.bomba.gov.my

1.3 OBJECTIVE

1.3.1 General Objective

To determine the chemical fingerprint of RON 95 commercial petrol in Malaysia by chemometric analysis

1.3.2 Specific Objective

1. To determine the chemical fingerprint of RON 95 from Petronas petrol
2. To determine the chemical fingerprint of RON 95 from Shell petrol
3. To determine the chemical fingerprint of RON 95 from BHP petrol
4. To identify the difference in petrol composition of RON 95 from different selected service stations of Petronas, Shell and BHP.

1.4 HYPOTHESIS

1. Chemical fingerprint of RON 95 petrol from Petronas, Shell and BHP can be determine from their hydrocarbon compound using chemometric analysis.
2. Petrol composition of RON 95 petrol for similar brand can be distinguished from different service station using chemometric analysis.