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Fire Debris Analysis: A Need to Develop Databases



تحليل مخلفات الحرائق: الحاجة لتطوير قواعد بيانات

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Fire debris analysis is a branch of forensic chemistry which deals with the examination and analysis of fire debris samples in order to detect and identify ignitable liquid residues in them. In addition to arson, fire debris analysis is usually performed in cases of fires of suspicious origin [1]. In addition to this, petrol bombs are used in social or religious riots, and terrorist activities. In a developing country like India, “bride burning” for dowry presents another aspect of such crimes and includes cases of homicidal or suicidal burning which require such examination [2]. Fire debris analysis is performed to determine the presence or absence of ignitable liquids in samples, identify the chemical composition and the class of ignitable liquid, and to establish an association between ignitable liquid residues and its source.

A variety of petroleum and non-petroleum based ignitable liquids are used in arson cases. However, petroleum products (petrol, kerosene and diesel) are the most frequently used due to their high inflammability, cost-effectiveness and easy availability. These substances consist of a num-

ber of components of varying boiling points range which makes the determination of composition a complicated task. The chemical variations also exist due to different chemical processing during their extraction, purification, cracking and blending from crude oil. The chromatographic pattern of these petroleum products is unique and useful for visual inspection. However, detailed hydrocarbon analysis of these substances is required to correctly identify the ignitable liquids residue in sample. The evaporation level, microbial degradation and burning process also affect the composition and chromatographic profile of these substances. Therefore, there is a need to create database of these petroleum products in their neat and evaporated levels. These databases must contain chromatograms of petroleum products which are exposed to different environmental conditions for varying periods of time as it further affects the chemical composition and consequently their gas chromatograms [3,4].

Fire debris samples may include burnt and/or semi-burnt clothes, plastics, wood, soil, rubber, carpets etc. These may



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include natural, semi-synthetic and synthetic surfaces. These substrates may contain potential components which may interfere in the identification of ignitable liquids. The burning, combustion and pyrolysis products of these substrates may further complicate the identification of ignitable liquid residues. Therefore, there is an urgent need to create databases of such kind of substrates of forensic importance. The databases must contain chromatograms of such substrates showing their prominent and potential components. The chromatograms must be recorded for samples exposed to high temperature for different time periods as it presents the original conditions in arson cases in which they are burned at high temperatures. Fire extinguishing causes the moistening of debris samples. Therefore, effect of water and other commercially available extinguishers on fire debris samples must be studied and included in the database. The Technical Working Group for Fire and Explosions (TWGFEX) is an active group in this discipline and works in collaboration with the National Center for Forensic Science (NCFS) at the University of Central Florida in Orlando [5,6]. Databases of ignitable liquids and substrates are the most important need in the fire debris analysis community. Therefore, there is strong need to develop similar kind of databases of ignitable liquids and substrates of potential forensic interest in different regions of country for valuable analysis, interpretation and reporting in fire debris

or arson cases.

The present Letter to Editor describes the importance and need of databases of petroleum products and substrates of forensic importance received in arson cases in different forensic science laboratories at the national level.

Conflict of Interest

None.

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