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Identification of unknown lachrymatic chemical-A case study

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Abstract

The present work describes the identification of unknown lachrymatic chemical, which were spilled during transportation caused suffocation and left several persons with tears and results panic in public. By applying chemical colour tests and gas chromatographic analysis, the chemical identified as formalin, which is used as preservative for biological specimens.

Key words: Formalin, Formaldehyde, G.C.

Introduction

The industrial and chemical pollution are not very uncommon in society we are familiar with Bhopal gas tragedy and several other industrial mishaps which claims several innocent lives.

Lachrymatic substance are those chemical compounds which brings tears in eyes several lachrymatic compounds are known in the literature like Dimethylchloroarsine (DM), Chloroacetophenone (CN), Orthochlorobenzylidenemalanonitrile (CS), 1:4 (b,f) Dibenzoxazepine (CR) etc. out of them in India Chloroacetophenone (CN) chemical is in use it does not leave any permanent after effects in the areas where it is used. It is most widely used as lachrymatic chemical agent by law enforcement agencies. It is a white crystalline solid, which is volatile, and with fumes heavier than air its melting point is 54 °C. The CN vapours have a tendency to settle down on ground in windless atmosphere. The low melting point creates a problem of storage in tropical countries like ours where temprature rise upto 48°C in certain areas during summers.

Case Description

In one of the case in the busy market of Indore all of sudden a unknown chemical spilled during transportation which creat havoc in the busy market several persons got affected by this unknown chemical the main symptoms of this unknown chemical. Persons which were exposed to this chemical were suffering from lachrimation, breathlessness, burning sensation in eyes, mouth and throat persons affected by this chemical treated by local health centers.

Police lodged complaint and seized a container and sent to forensic science laboratory Sagar for identification of this unknown chemical. The seized container contains colourless pungent odoured liquid with lachrymatic properties.

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Material and Methods

All reagents were analytical reagent grade. Distilled water was used throughout the study.

Colour tests

1. One ml of 1% phenyl hydrazine hydrochloride and 1 ml of 5% potassium ferricyanide solution is added to this unknown chemical it is further acidified by adding 5 ml of concentrated hydrochloric acid. Appearance of rose red colour confirms presence of formalin.

2. One ml of phenyl hydrazine solution is mixed with 1 ml of freshly prepared solution of sodium nitro prusside. It is now added to 1 ml of unknown chemical. The solution is made alkaline by adding excess of sodium hydroxide solution a deep blue colour develops which changes via green brown to red with time clearely suggests the presence of formalin.

Gas Chromatographic analysis

The gas chromatographic analysis was performed on the Chemito 8610 HT Gas chromatograph the G.C. conditions was:

1. Sample injection 1 µl
2. Oven temp. 70-100^{O}C
3. Air flow 1.4 bar
4. Flow of hydrogen gas 1.2 bar
5. Flow of carrier gas (nitrogen gas) 1.0 bar
6. Injection temperature 150^{O}C
7. Detector temperature 180^{O}C
8. Detector FID
9. Column Carbowax 15% CH
10. Chart speed 0.5 cm/min.

One micro liter (1µl) of each unknown chemical and formaline were injected and the chromatograms were compared under identical conditions.

Results and Discussions

It is the time to raise awareness among the vendors, transporters and in public regarding safe handling of such type of hazardous chemicals to avoid such type of mishaps and government should release clear instructions regarding the packing and safe handling of these chemicals which will prevent

further causalities of innocent persons and above all it is high time to concentrate on industrial pollution and development of new branch of environmental forensics.

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