



B70 Trace Elements in Illegal Drugs — X-Ray and Position Tagged Spectrometry- Marijuana, Cocaine, and Heroine

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Upon completion of this paper, participants will learn a simple method, x-ray and position tagged spectrometry to identify the trace elements in illegal drugs rather than time consuming chemical modifications and subsequent instrumental analysis. The advantage of this technique is that it involves no hazardous solvents, and requires only very minute amounts of the sample and needs no sample preparation.

This presentation will impact the forensic science community in tracing connections in the illicit traffic. Moreover it will give an awareness of the actual chemical substances, the dose being purchased, or the contaminants that may be present in the illegally purchased drugs.

Drug abuse is a national problem that plagues university campuses all over the world, which makes identification and characterization of illicit drugs more important and demanding more research attention. Drugs prepared for street sale are either typically impure or mixture of psychoactive chemicals. The users of illegally purchased drugs are totally unaware of the actual chemical substances, the dose being purchased, or the contaminants that may be present in the sample. Many of these contaminants produce toxic reactions. The study of amount of trace element will also throw light on the toxic effects of metals on the drug users.

The purpose is to propose a simple method, X-ray and position tagged spectrometry to identify the trace elements in illegal drugs rather than time consuming chemical modifications and subsequent instrumental analysis. The advantage of this technique is that it involves no hazardous solvents, and requires only very minute amounts of the sample and needs no sample preparation.

Initial visual examination of the sample is done with a light and polarized microscope. A cam Scan 44 electron microscope equipped with energy dispersive X-ray spectrometer fitted with a PGT prism 2000 thin window Si(Li) is employed for morphology and composition analysis. Spot light/position tagged spectrometry is carried out to identify and follow the distribution of trace elements present in the sample.

Marijuana, heroin and cocaine are studied using this method. The illicit marijuana usually appears as a brown mixture of dried, shredded leaves, stems, seeds, and flowers. But only microscopic examination can identify each part in detail. The surface features help the botanical identification. Cystolithic hairs on the surface of the leaf pointing to the tip of the leaflet are characteristic of marijuana. These hairs are short and fat due to calcium carbonate deposits in the base of the hair. The spectrum reveals the presence of calcium, potassium, and silicon in the marijuana sample. The presence of calcium is ascribed to the presence of calcium carbonate in the base of the cystolithic hair. Other elements are due to the soil in which the plant has cultivated. The element iron is also encountered in the spectrum analysis of the other specimens of the same sample.

Electron micrograph combined with the X-ray spectrum is also used for the characterization of heroin and cocaine. V- Shaped brilliant colored microcrystal under a crossed polar identifies the cocaine where as blade like crystal in rosettes confirm heroine. However no trace elements that characterize the illicit nature are found in the spectrum. The presence of chlorine in both these drugs shows that they are in the hydrochloride salt form.

Illegal Drugs, Scanning Electron Microscopy, Marijuana