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Commentary

Use of Chromatography in Forensics

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DESCRIPTION

Chromatography is a process for separating the components of a mixture, or solutes, based on the relative quantities of each solute dispersed between a moving fluid stream, known as the mobile phase, and a contiguous stationary phase. A liquid or a gas can be the mobile phase, while a solid or a liquid can be used as the stationary phase. Mikhail Tsvet in Russia in 1900 discovered chromatography, a laboratory technique for separating chemicals within a mixture. Chromatography is divided into two phases: Mobile and stationary phase. The combination of the mixture is dissolved in fluid either a gas, a solvent, or water and then passed through a system (for example, a column or a capillary tube) on which a substance is affixed. This is the point when everything comes to a stop. In the mixture different chemicals have different affinities for the stationary phase. These chemicals can stay fastened to a substance for longer or shorter lengths of time depending on their interaction with it. Because the chemicals in the mixture travel at various speeds in the mobile fluid, they separate. For example, a molecule that binds more securely to the stationary phase moves more slowly through the mobile phase. Solute molecules are continually exchanged between the two phases due to kinetic molecular motion. If the distribution favors the flowing fluid for a specific solute, the molecules will spend the majority of their time flowing with the stream and will be carried away from other species whose molecules are held for a longer amount of time by the stationary phase.

Law enforcement agencies and other organizations throughout the world can hire forensic scientists to examine a broad range of substances, from ink and lipstick to explosives used in bombings.

Planar chromatography

Banknote ink (and the same ink on criminal's hands), forgeries, dyes, and other narcotics may all be detected using planar techniques. TLC is a popular approach for this, in which analytes are drawn through a thin layer of stationary phase at different rates by capillary action, allowing for simple compound identification. Planar methods are useful as they are rapid and low-cost. Complex chromatographic methods, on the other hand, are significantly more suited for forensic purposes.

HPLC

In forensics, the column-based HPLC is commonly utilized. Rather than being dripped down the column as in other liquid chromatography methods, the mobile phase is pushed through it at high pressure in this approach. As a solute, the material to be studied is added to the mobile phase. The mobile phase takes on the role of a solvent. Because different chemicals used in explosives have different retention durations based on their chemical and physical properties, HPLC is commonly used to analyze the contents of explosives. In investigations into terrorism, cartels, drug trafficking, murders, and large criminal syndicates, HPLC is commonly employed to detect particular compounds.

Gas chromatography

Gas-liquid chromatography is a popular chromatography method that employs a liquid stationary phase and a gaseous mobile phase, unlike other chromatography methods. Gas chromatography is used in toxicology screening in forensic investigations to identify if a deceased individual took drugs or drank alcohol before death. It can also be used to determine if a criminal victim has been poisoned. This information is vital for investigators when determining the cause of death. GC may also been used to analyze samples like blood and fibers.

CONCLUSION

Mass spectrometry is a powerful tool that may be used in conjunction with other chromatography methods. After being separated by chromatography, materials can be sorted by size using a spectrometer. This enables for a more exact identification by reducing the number of possible chemicals. Both GC-MS and LC-MS processes have been shown to be useful in forensics for detecting a wide range of compounds present in explosives, drugs, and a number of other substances that must be identified as part of an effective investigation. In forensics, both the GC-MS and LC-MS techniques have been

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proved to be successful in detecting a wide range of chemicals found in explosives, narcotics, and a variety of other substances that must be identified as part of an effective investigation. Chromatography processes are a well-established and effective collection of techniques in forensic science.