



## Implications of Electrophoresis in Forensic Science

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### DESCRIPTION

It is necessary to begin a detailed two-dimensional gel electrophoretic mapping of the proteins of the human brain in normal individuals and those with various genetic neurological disorders to know at a molecular level the basis of the pathological and normal genetic differences between individuals. The gels are parted into 20 sub-sections, based on standards with known molecular masses and isoelectric points. Groups of polypeptides within these sub-sections are identified by a number and a letter; the individual proteins are recognized by a number.

Whenever a crime is committed, trace evidence can be shown in a crime scene. A forensic specialist is frequently called upon by investigating agencies to study the trace evidence. In past decades, huge numbers of tests were exposed for discovery of such traces. But most of these chemical and biological tests have disadvantage that they are nonspecific and so they are of very little used when working directly on material. Most of the forensic samples are complex in nature and therefore they need separation of the molecule prior to the analysis. It is necessary to employ such methods which will resolve the complex mixture into a single component. Electrophoresis technique is such technique that is used for the departure of molecules. It is a helpful tool for the separation of forensic samples, particularly when the sample size is too small.

### Separation of nucleic acid and proteins

There are many types of electrophoresis, but one of the most common techniques used in the laboratory application is Gel Electrophoresis. It is influential analytical tool which has confirmed suitable for the separation, identification and analysis of biomolecules like DNA, RNA, and proteins. Among the different forms of electrophoresis agarose gel electrophoresis has been generally used for the separation of the DNA fragments. As DNA has a uniform charge ratio, DNA molecules are divided on the basis of size of fragment and the rate of relocation of fragments depends on the molecular weight of the fragment. So

agarose gel electrophoresis has most broadly used tool in the DNA fingerprinting *via* analysis of PCR products.

Though agarose gel electrophoresis has long been recognized as the standard separation methods for DNA fragments Capillary electrophoresis has proved to be swift and extremely efficient substitute for personal identification and paternity testing. Capillary electrophoresis along with the traversed linked polyacrylamide gel has been used for the separation of DNA fragments.

### Analysis of explosives compound and residue

Capillary electrophoresis plays a vital role in the trace analysis of organic and inorganic gun-shot remainder and explosives. Capillary electrophoresis is precisely used for the inorganic explosives residues. Carbon based components of gunpowder like nitroglycerin, diphenylamine, and ethylcentralite can be analyzed by using Micellar Electro Kinetic Capillary Chromatography (MEKC).

### Analysis of drugs of abuse

Various biological samples like tissue, nails, hair, organs, and body fluids like blood, urine, and saliva are most significant in spotting illegal drug. Different capillary electrophoresis assays have been established for the analysis of illicit drugs like cocaine morphine from different biological samples.

### Ink analysis

Substantiation and confirmation of printed and handwritten documents required the analysis of ink in order to classify the writing tool used in the commission of crime. As the different ink contains different components having property, separation techniques can be used to analyze such components. The micellar electrokinetic chromatography mode of capillary electrophoresis can help in examining such components of inks. This technique can divide not only the ionic dyes but also the neutral dyes and pigments present in the inks.

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## CONCLUSION

From the past decades, electrophoresis has been established to provide an accurate and effective method for the separation of

the large variety of substances. Electrophoretic analysis has been broadly used in the different discipline of forensic science for the analysis of trace evidence.