

# Determination of Low Molecular Organic Acid Using Two Phase Separation Process

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## Abstract

This paper proposes the new method for identifying the low molecular acids using the electric potential in the capillary tube. This method will identify the different acids concentration on the different materials. This paper describes the capillary electrophoresis method to identify the acidic content of the materials. Generally the low molecular acids are weak acid these acids cannot completely separate from water. In this paper there is variety of materials are taken for the experiment such as environmental, food and biological materials etc.

**Keywords** — Low molecular mass organic acid, Capillary electrophoresis, Chromatography

## I. INTRODUCTION

The organic compounds which having the acidic properties are called organic acid. The carboxylic acid is the most common low molecular acid which contains more number of carboxylate functions. These types of acid are commonly present in the natural components due to human and natural activities. Generally the low molecular mass organic acids such as formic acid, lactic acid, citric acid, acetic acid, uric acid and malic acid are soluble in water but the inorganic acids has higher molecular mass so these types of acids are insoluble in water. For identifying the short chain carboxylic acid the most commonly used method is chromatography. The chromatography is the process of separating the molecular from the water by categorizing the characteristics of molecules in ideal state and mobile state. The separated molecules are isolated and inspecting the quantity and quality of the separated molecules. In the mobile phase the sample are flow through the cascaded columns and separates the molecules on each stage, the three stages of mobile phase are gas liquid and super critical fluids. The remaining portion of the paper will describes the low molecular mass organic acid, capillary electrophoresis and chromatography process.

## II. ORGANIC ACID

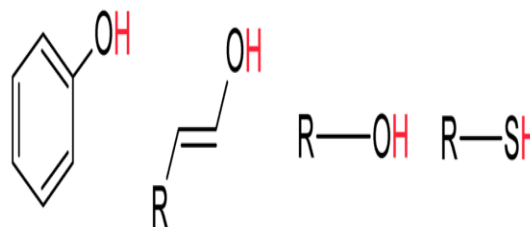
The acid which is present in the organic components are called as organic acids. The organic acids has low molecular mass so that they can easily

diluted with water and also it is difficult to remove it completely from the water. But the organic acids are strong in nature so it is easily miscible with water. Some of the organic acids which are present in the water are as follows

- Formic acid
- Malic acid
- Citric acid
- Acetic acid
- Lactic acid
- Oxalic acid
- Uric acid

The organic acids are low strength in nature so that it is used for oil well application where ever the continuous contact of acid with pipe is needed the organic acids are used. Because these acids are less reactive with metals. The figure shows the structure of some weak acids phenol, enol, alcohol, thiol.

Fig.1 Some of the Organic Acids



The organic acids play an important role in food preventions. The foods having more possibilities to affect by bacteria, the organic acids will provide more resistance against bacterial affection, these acids directly enter in to the cell of bacteria and will kill them. The important uses of organic acids are providing protection against the diseases. Prevention of diseases and protection of spread must be taken in modern animal protection. Generally feed materials are affected by the microorganism particularly bacteria and fungi during growth and harvesting.

## III. FUNDAMENTALS OF CAPILLARY ELECTROPHORESIS

The capillary electrophoresis is a new method for separating the organic acids. The ions of organic

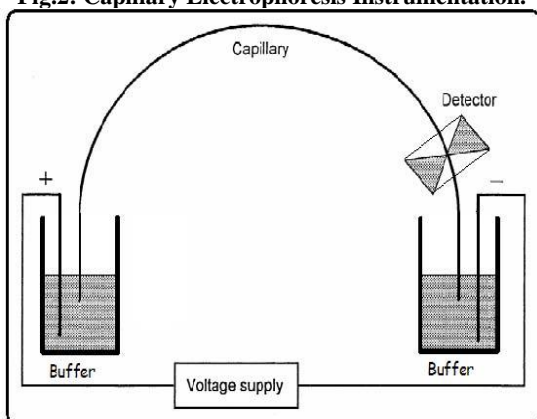
materials are absorbed by electrically charged particles. This separation is take place in thin capillary tube with diameter of several micrometers. The inner wall of the silica capillary is negatively charged and the electro kinetic potential is formed here.

The ions are attracted and the remaining portion of the liquid will flow through the capillary tube. Due to the effect of electro osmotic and electro migration the organic particles are separated smoothly by the effect of continuous process. The electrophoresis method of separation is based on the different velocity of the flow in constant field of electricity. The buffer system is used to limit and regulate the flow of molecules in tube.

The reverse electro osmotic flow is applied for the determination of anions. The electrophoresis is used for the following reasons

- Small amount of sample is required
- Low cost
- Provides different information
- Easy to analyze

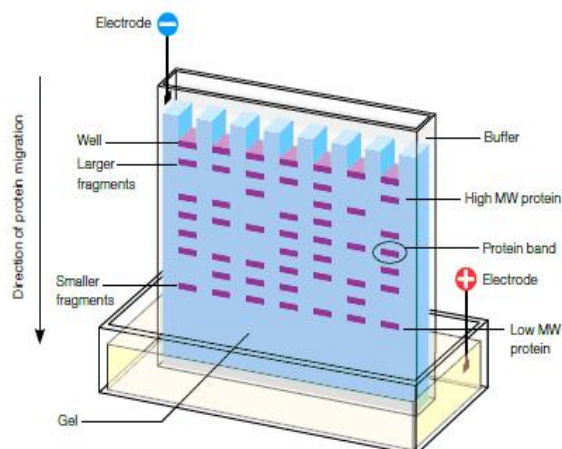
Fig.2: Capillary Electrophoresis Instrumentation.



The ions in the samples are migrates with different viscous rate. This difference is based on the quality of charge compared to the hydrodynamic size which is related to the molecular mass. It is called as charge to mass ratio. The different of mobility is used for separating the low mass organic acids. Capillary Electrophoresis is very efficient to separate similarly structured components. The charge emits from the electrode are observed by the background electrode and provides electricity that is needed for the capillary tube. The water molecules in the background electrolytes are moved to the cathode. Both the electro osmotic flow and electrophoresis mobility are occurs in the capillary tube. The components of capillary electrophoresis construction is given bellow

- Catholyte
- Anode
- Cathode
- Power
- Anolyte
- Capillary
- Data acquisition method
- Detection method

Fig.3 Electrophoresis Workflow



#### IV. CHROMATOGRAPHY

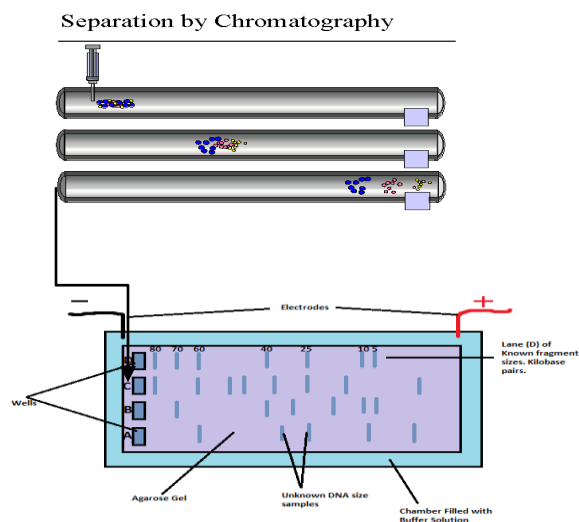
Chromatography is physical method which is used by the most of the scientist to separate and analyzes the different molecular mixtures. The separated components are fed to the stationary phase and mobile phase. The input given to the chromatography is a mixture of components and the different components are separated at different rate. All the chemical industries need this method of separation to remove the components from the mixture. The equipments used in the chromatography are solvent tank, pump, feed injection, oven, detector and flow meter. The column is the important component of the chromatography, which is used for separation; it may be made up of glass or stand. The column may be arranged as a tabular bed or as open glass. The mixture molecules are flow through the column and the stationary is occurred in the column.

#### V. IMPLEMENTATION OF TWO PHASE ORGANIC ACID SEPERATION

The implementation of the new method of organic acid separation combines two separate constructions. One is chromatography and another one is electrophoresis. The output of the chromatography is further fed to the electrophoresis construction. In the electrophoresis method the electricity is used to observe the ions from the mixture components and finally separates the materials which having lower molecular mass. The separation is take place in the capillary tube with diameter in some micrometer. Inner portion of the

capillary is electrically charged anode and electro kinetic potential formed there. Due to electro migration and electro osmotic effect the particles are separated smoothly. The separated particles and components are further filtered in the chromatography method. This method is used to separate and analyze the different compounds from the mixture of samples.

**Fig.4 Implementation of Two Phase Organic Acid Separation**



## VI. CONCLUSION

There are lot of chemical separation methods are available to separate the organic acid but the method proposed in this paper provide a accurate separation of compounds from the chemical mixture. This combined method of separation will increase the cost of installation and maintenance. The cost reduction, maintenance and method of handling are taken as a future work.

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