

Ion Exchange Chromatography

Definition: It is the reversible process of separation of ions based on their affinity towards the ion exchanger.

Introduction:

1. Column used for ion exchange are characterized by the presence of charge group covalently attached to the stationary phase.
2. Anion exchanger contain bound positive group covalently attached ion exchange chromatography retention is based on attraction between the solute ions and charge sites bound to stationary phase.
3. to stationary phase whereas cation exchangers contain bound negative groups.

Instrumentation of ion exchange chromatography:

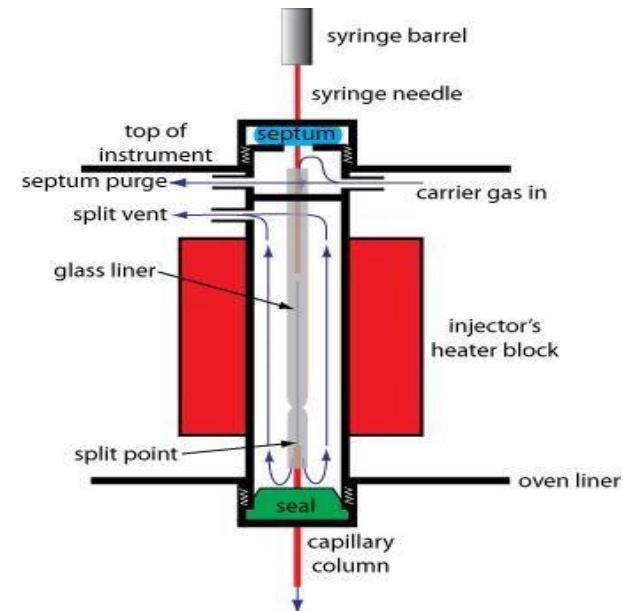
1) Pump:

The IC pump is consider to be one of the most important component in the system which has to provide continuous constant flow of the eluent though the injector, column and detector.



2) Injector:

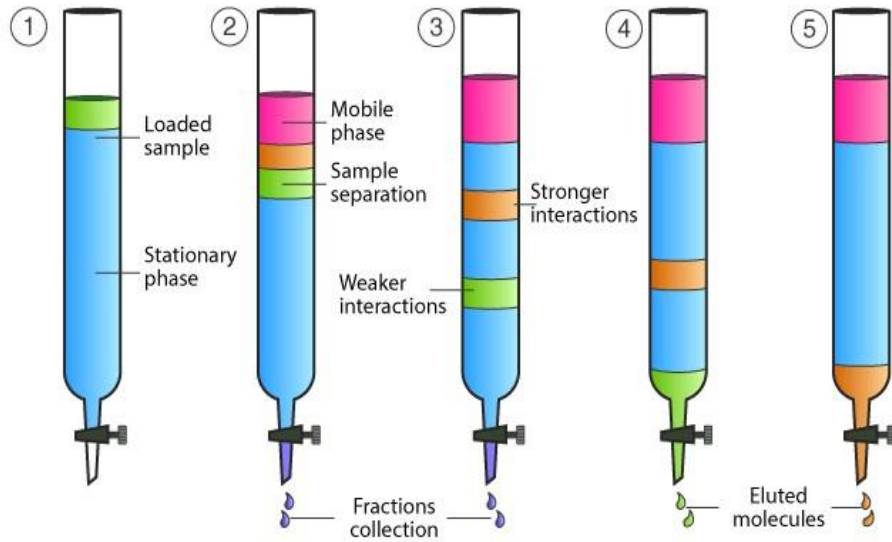
Sample introduction can be accomplished in various ways. The simplest method is to use an injection valve. Liquid samples may be injected directly and solid samples need only to be dissolved in an appropriate solvent.



3) Columns:

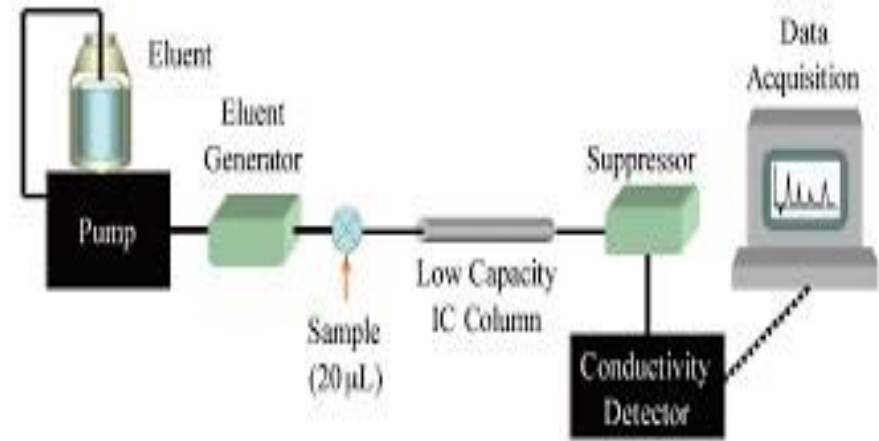
Depending on its ultimate use and area of application, the column material may be stainless steel, titanium, glass or an inert plastic such as PEEK. The column can vary in diameter from about 2mm to 5 cm and in length from 3 cm to 50 cm depending on whether it is to be used for normal

analytical purposes, microanalysis, high speed analyses or preparative work.



4)Suppressor:

The suppressor reduces the background conductivity of the chemicals used to elute samples from the ion-exchange column which improves the conductivity measurement of the ions being tested. IC suppressors are membrane-based devices which are designed to convert the ionic eluent to water as a means of enhancing the sensitivity.



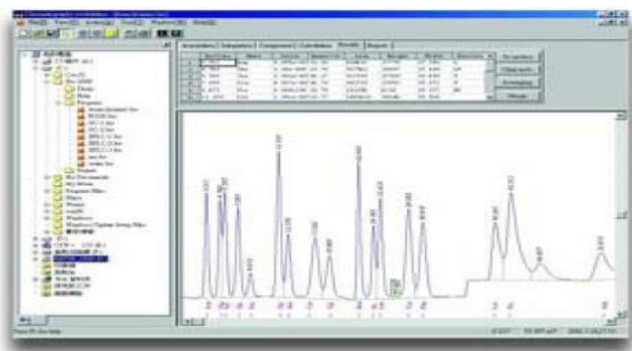
5)Detectors :

Electrical conductivity detector is commonly use.



6)Data system:

In routine analysis, where no automation is needed, a pre-programmed computing integrator may be sufficient. For higher control levels, a more intelligent device is necessary, such as a data station or minicomputer.



Classification :

1. Strongly acidic cation exchanger :

Sulphonic acid group attach to styrene and divinyl benzene co polymer.

2. Weakly acidic cation exchanger :

Carboxylic acid group attach to acrylic and divinyl benzene co-polymer.

3. Strongly basic anion exchangers :

Quaternary ammonium groups attach to styrene and divinyl benzene co polymer.

4. Weakly basic anion exchanger :

Polyalkylamine group attach to styrene and divinyl benzene co-polymer.

Physical Properties Of Ion Exchange Resin :

1. Cross Linking :

It affects swelling

2. Swelling :

When resin swell polymer chain spreads apart.

3. Particle Size And Porosity :

Increase in surface area and decrease in particle size will increase the rate of ion exchange.

4. Regeneration :

Cation exchange resins are regenerated by treatment with acid, then washing with water.

Reference :

- 1) Gurdeep R Chatwal, page no.2662 to 2672
- 2) Robert H Willard (seventh edition) page no.633
- 3) Dr.A.V. Kesture (Volume 2nd) page no.39 to 47
- 4) Arthur I Vogel page no.805 to 809

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