

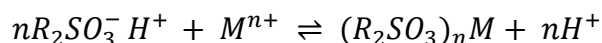
## Ion Exchange

Ion-exchange chromatography retains analyte molecules on the column based on coulombic (ionic) interactions. The stationary phase surface displays ionic functional groups (R-X) that interact with analyte ions of opposite charge.

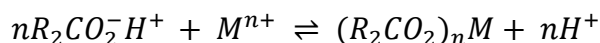
An **ion-exchange resin** or **ion-exchange polymer** is an insoluble matrix normally in the form of small (1–2 mm diameter) beads fabricated from an organic polymer substrate. The material has highly developed structure of pores on the surface of which are sites with easily trapped and released ions. The trapping of ions takes place only with simultaneous releasing of other ions; thus the process is called ion-exchange. Ion exchangers are either **cation exchangers** that exchange positively charged ions (cations) or **anion exchangers** that exchange negatively charged ions (anions).

Cation exchanger:

- strongly acidic (typically, sulfonic acid groups, e.g. sodium polystyrene sulfonate or polyAMPS)

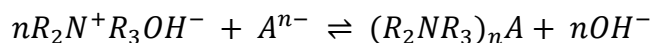


- weakly acidic (mostly, carboxylic acid groups)

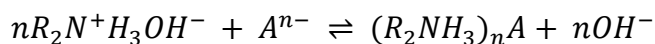


Anion exchanger:

- strongly basic, (quaternary amino groups, for example, trimethylammonium groups, e.g. polyAPTAC)



- weakly basic (primary, secondary, and/or tertiary amino groups, e.g. polyethylene amine)



## **(5): Determination of total ion concentration using ion exchange chromatography**

### **Purpose:**

Positive ions concentration is determined using cation exchanger. Cation exchange resin is the stationary phase and the solvent containing the analyte ion is the mobile phase. The cation is separated from the sample at par with the displacement of hydrogen protons from the column. The liberated  $H^+$  are equal to the concentration of cation. The liberated  $H^+$  are titrated with a strong base, NaOH to determine the concentration of cation.

### **Tools and materials used:**

Column packed with cation exchanger Amberlite resin IR-120, burette, pipette 25 ml, conical flask, mixture of HCl/KCl, mixture of HCl/MgSO<sub>4</sub>, distilled water, ph.ph, NaOH.

### **Procedure:**

1. Pipette 25 ml from the mixture in a conical flask.
2. Titrate with NaOH + two drops from ph.ph.
3. Calculate the concentration of HCl.
4. Pipette 25 ml from the mixture in the column and open the tap.
5. Wash the column with distilled water three times (25 ml each time) and collect distilled water in the same flask.
6. Titrate with NaOH + two drops from ph.ph.
7. Calculate the concentration of HCl.