

## Ion Exchange Resins a Curse or a Boon for Pharmaceutical Industry-A Study

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**ABSTRACT:** Ion exchange resins are supposed to be progressive specialists is broadly being utilized in drug industry with a few benefits, due to their one of a kind properties talked about in the survey. IER are being utilized as taste veiling specialist, break down, stabilizer, in novel medication conveyance framework, improve disintegration and furthermore in different formulations.

**Keywords:** Ion exchange resins cross linking, targeted drug delivery.

### I. INTRODUCTION

Ion Exchange Resins are appropriately high sub-atomic weight strong polymers having emphatically and contrarily charged utilitarian gatherings that can trade their portable particles equivalent accuse of encompassing medium. Because of their high atomic weight and insolubility, resins are not consumed by body.

Complexation among medication and sap is an interaction of dispersion of particles among gum and encompassing medium for example drug arrangement.

In future trend ion exchanges resins are not only being used as taste masking agents but also for the development of sustain released dosage forms.

#### Ideal Characteristics of an ION Exchange Resin:

- It should be fine streaming powders.
- Molecule size should be ranges between 25 - 150 microns.
- It should be fit for trading particles and additionally ionic gatherings.
- It should be insoluble on the whole solvents at all ph.
- It ought not to be consumed by the body.

#### Classification of ION Exchange Resin:

Ionizable gatherings connected to gum decide the utilitarian capacity of particle trade ability of resin.

Ion exchange resins are named as:

- Solid corrosive cation trade saps (SACER)
- Feeble corrosive cation trade gums (WACER)
- Solid base anion trade saps (SBAER)
- Feeble base anion trade gums (WBAER)

SACER can kill solid base and convert salts into their comparing acids. These resins get their usefulness from sulfonic corrosive groups (HSO<sub>3</sub>- or NaSO<sub>3</sub>-).

SBAER can neutralize strong acids and converts neutral salts into their corresponding bases. SBAER are deriving their functionality from quaternary ammonium groups.

Two type of quaternary ammonium groups are used as type I (having 3 methyl groups) and type II similar to type I except one methyl group replaced by ethanol group. Type I is more stable than Type II.

WACER and WBACER are able to neutralize strong bases and acids respectively. These resins are used for de-alkalization and partial de-alkalization. WACER derive their functionality from carboxylic group. (-COOH or -COOK)

WBACER are deriving from primary, secondary and tertiary amines.

Cation exchange resins are not significantly affected by temperature as compared to anion exchange resins.

#### Mechanism of Working:

The wonder of stacking of medication into resin is because of electrostatic collaboration among resins and oppositely charged medication particles. This electrostatic association causes harmony appropriation of medication among sap and arrangement of medication. It was additionally located that the Vander Waal's force or chemisorption's measure alongside drug trade during complexation process complexation measure among medication and sap will be as per the following:



The drug release process will be as follow



Where X<sup>+</sup> is ions in GIT  
 Drug release from DRC (drug Resin Complex) is done by partial diffusion and film diffusion process

**Table 1:** Types of Ion exchange resin.

Type	Exchange species	Ionic Form	Polymers Backbone	Commercial Name
Weak acid	-COO	(1,2,5) Hydrogen (3,4) Potassium	(1,3) Methacrylic acid divinylbenzene (2,4) Crosslinked polyacrylic acid (5) Crosslinked Polymethacrylic	AMBERLITE™ IPR64 INDION204, INDION21 4, KYRONT- 114, TULSION335 AMBERLITE™ IPR88 (4) INDION 234, INDION 234S, INDION 294 (5) INDION 464
Strong acid	-SO <sub>3</sub>	Sodium	Styrene divinylbenzene	AMBERLITE™ IPR69
Strong base	-N <sup>+</sup> (R) <sub>3</sub>	Chloride	Styrene divinylbenzene	DUOLITE™ AP143

### Essential Properties of ION exchange resins

#### Crosslinking

This is the property greatly affecting actual physical structure, porosity and growing property of resin. If there should arise an occurrence of low level of cross connecting will result into higher expanding with addition of water and turns out to be delicate and hard yet turns out to be hard and fragile in the event of serious level of cross linking. Henceforth as cross linking expands stacking effectiveness of medication will diminish.

#### Capacity

IER capacity includes total number of synthetic identical accessible for exchange per unit weight or per unit volume of resin. The limit communicated as meqvt./gm for dry gum or meqvt./ml for wet resin. Feeble corrosive cation resins having higher exchanging limit than solid corrosive cation, frail base anion and solid base anion exchange resins.

#### Particulate size

Rate of ion exchange is conversely relative to molecule size of resin. Consequently lower the molecule size of resin implies higher will be the rate of ion exchange for less time will be taken to accomplish balance.

#### PH

H<sup>+</sup> in the arrangement diminishes complexation at lower ph. Protonated parts of tolerably feeble corrosive or essential medication and weak functionality resin goes through changes in this manner increment or reduction drug sap communication and medication stacking.

#### Porosity and swelling

Porosity is the proportion of volume of material it's mass. Measure of cross linking substance utilized influenced by its porosity. Higher number of hydrophilic utilitarian gatherings joined to the polymer grid will cause higher swelling.

#### Form of resin

Protonated resin having higher loading limit in view of it gains lower pH than the sodium particles.

#### Counter ion selectivity

Higher medication stacking was discovered in ions with low selectivity for protonated resin due to simple substitution of H<sup>+</sup>.

#### Stirring time

It is discovered that as the stirring time builds drug stacking essentially expands in light of surface absorptive phenomenon.

## Methods of Complexation

### Batch process

Resins are for soaking in water for a certain period of time. By then medication was added and mixed unendingly for a predefined time span to set concordance. Resins are then washed with deionized water to a couple of times and dried.

### Column process

Resin was pressed into glass section by delicate tapping and afterward watery medication arrangement was gone through this resin packed glass segment and left to set equilibrium.

Uses of ION Exchange Resin:

### Targeted drug delivery system

With the use of IER, anticancer drug was released in controlled fashion, in case of cancer medication.

For gastro retentive framework to trade the gastric home time bicarbonate just as medication stacked onto IER.

For sigmoid delivery framework Eudragit RS (AER) restricted quaternary ammonium gathering (SBAER) is covered over globules with sugar center encompassed by natural corrosive and medication blend. The ionic climate initiated by expansion of a natural corrosive to framework, was discovered to be liable for pulsatile discharge.

### Tastemasking

It is seen that the greater part of the medications are incredibly unpleasant in taste, such medications are stacked in IER to make dull either by bunch interaction or section measure. Pisal et al did Formulation of complex ciprofloxacin with Indion 234 particle trade pitch. Betty et al detailed a combination of covered and uncoated sulfonic corrosive gum stacked with Dextromethorphan for taste veiling. Patricia et al structure a steady pseudoephedrine Dowex 50 WX8 unpredictable, discovered less harsh taste covered suspension.

### Nasal Drug Delivery

An IER complex methodology was utilized to convey remedial peptides or manufactured medications by means of Nasal mucosa, a creation was created to convey nicotine in a pulsatile design to the fundamental dissemination through nasal course.

### Stabilization of drugs

Nutrient B12 having most basic issue of stability, it gets fall apart upon capacity henceforth

requires overages result into increment in the expense of formulation. To dodge overages complexation V corrosive cation (Indion 264) was done which was discovered to be same as free type of Vitamin B 12, for the immobilization of chemicals to give broadened action at confined site, IER can be utilized as transporter.

### Controlled or support discharge drug conveyance framework

Support arrival of medication might be hard to accomplish because of numerous factors. This issue defeats by covering to particle trade tar drug complex particles, making drug discharge from these particles dissemination controlled. SeongHoonJeonget a created support discharge quick deteriorating tablet of dextromethorphan utilizing different polymer covered IER buildings and noticed dissemination inside the tar network is the rate controlling advance

Different plan figured utilizing resinated of solid sulfonic cation trade gum are accessible in checked which give more moderate delivery than carboxylic corrosive pitch.

### Tablet Disintegration

Some IER having property to swell significantly when exposed to water. This property is well significantly used to increase disintegration of tablets.

Polymethacrylic carboxylic acid IER due to its large swell in capacity used as a tablet disintegrant such as polyacrilin potassium salt of weakly acidic cation exchange resin.

### Transdermal Drug Delivery System

Transdermal iontophoresis includes developments of ionic medication across skin utilizing an incredibly applied expected contrast. The expansion of IER to get or other composite vehicles confounds the interaction of latent medication discharge. Arrival of medication was estimated by current thickness and NaCl focus utilizing a novel an iontophoretic cells.

Vuorio M et al concentrated on resinated of cationic medications, for example, ambroxol and chlorpheniramine and examined measure of medication discharge from arranged resinated by synchronous stacking of the two medications was not vary from the old style ambroxol or chlorpheniramine resinated however was discovered to be higher than simultaneous organization of two traditional resinated. Thus it was inferred that

simultaneous organization of resinates can be utilized as transporter in particle trade drug conveyance framework.1

#### Dissolution Enhancer

Ineffectively dissolvable ionizable medication shows moderate disintegration and low solvency. The pace of arrival of ineffectively solvent ionizable medications from resinates can be made quicker than that of pace of disintegration of strong type of unadulterated medication. Change in atomic condition of captured drug from translucent structure to indistinct state cause improvement in disintegration rate.

#### Polymorphism

Resin in ion exchange are incredible when developing for Pharma industry to determine the issue of polymorphism. Drug resinates are nebulous in nature and can't be take shape or even structure hydrates. Arrival of medication from resinates discovered to be free of precious stone structure which was utilized to dispenses with the issue emerges from polymorphism.

#### Deliquescence

Property of solids to assimilate such measure of water it is hard to address and requires utilization of extraordinary hardware or more mindful planning of creation during dry seasons. Resinates of deliquescent medication retain n properties of pitch, isn't deliquescent subsequently gum of deliquescent medication can deal with without need of unique assembling condition.

## II. CONCLUSION:

Ion exchange resins having its own significance in novel medication conveyance framework because of its complexation property y with drugs with no association with medication and medication can be discharge at wanted site of activity. As a result of its complexation property it utilized as disintegrator, disintegration enhancer, taste veiling specialist, in novel medication conveyance framework, to improve soundness, and for treatment of deliquescent and hygroscopic substances.

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