MITSUBISHI CHEMICAL

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Strongly Basic Anion exchange resins

DIAION SA Series

The Anion exchange resins (AERs) are IERs that can exchange anions such as Cl- and SO42- and are classified into two groups; one is the group of the strongly basic anion exchange resins (SBAERs) and the other is of the weakly basic anion exchange resins (WBAERs).

The resins with quaternary ammonium groups (N+) as their functional groups, such resins dissociate and show as strong basicity as inorganic bases like NaOH or KOH. They are called as the strongly basic anion exchange resin.

The quaternary ammonium groups (N+), active groups in these resins, are strongly basic and they dissociate not only in acidic solutions but also in alkaline solutions to N + OH- form. SBAERs can exchange their counter ions even with neutral salts as with inorganic acids, as shown in Equations I-2-8 and I-2-9. They can exchange anions with weak acids such as silicic acids and carbonic acids. Thus the SBAERs are ion-exchangeable in all pH range.

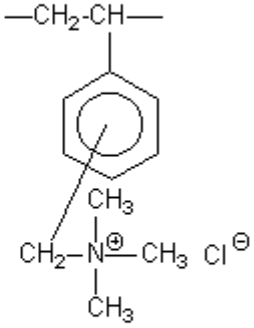
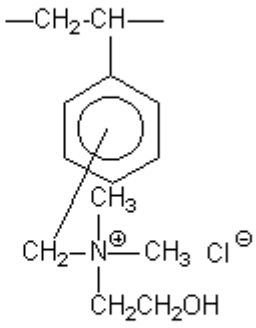
- R-N·OH + NaCl → R-N·Cl + NaOH (I-2-8)
- R-N·OH + HCl → R-N·Cl + H2O (I-2-9)

The SBAERs are usually regenerated with 4% NaOH aqueous solutions. Weakly basic NH4OH can hardly regenerate SBAERs.
Eq.I-2-10 shows the regeneration reaction of Cl-form SBAER.

- R-N·Cl + NaOH → R-N·OH + NaCl (I-2-10)

Since the SBAER is strongly basic, it needs much more regenerants than the theoretical amount to regenerate SBAERs as same as the SACERs.

There are two types of SBAERs; type I has trimethylammonium groups, R-N+(CH3)3 , as ion exchange groups and type II has dimethylethanolammonium groups, R-N+(CH3)2·CH2CH2OH.
Both types I and II are strongly basic, type II is slightly weak in basicity and thus somewhat easy to be regenerated. DIAION™ SA10A and SA20A, the typical products of Type I SBCERs, are the highest basicity. They can adsorb anions strongly. So they are used for making high-grade demineralized water. But it needs much regenerants because of the strength of their adsorbability. The type II of the SBCERs are slightly weaker in basicity than the type I. So the quality of demineralized water made by them is inferior compared with the type I, but for that reason we can reduce regenerants

Base	type I				type II	
Product	DIAION™ SA10A	DIAION™ SA11A	DIAION™ SA12A	DIAION™ NSA100	DIAION™ SA20A	DIAION™ SA21A
Chemical structure						
Ionic form	Cl					
Appearance index	> 90					
Apparent density (g/L-R)	685	650	675	650	700	650
Ion-exchange capacity (meq/mL)	> 1.3	> 0.85	> 1.3	> 1.3	> 1.3	> 0.8
Water content (%)	43-47	55-65	48-55	37-44	39-44	55-65
Particle size distribution > 1180 μm < 300 μm	< 5 % < 1 %					
Effective size (mm)	> 0.40					
Uniformity coefficient	< 1.6					
Maximum temperature (ºC)	< 60 (OH form) < 80 (Cl form)				< 40 (OH form) < 60 (Cl form)	