Product Data Sheet

AMBERLITE™ IRP88 Ion Exchange Resin

Pharmaceutical Grade Cation Exchange Resin (Polacrilin Potassium NF)

Description

AMBERLITE™ IRP88[1] resin is a weakly acidic potassium form cation exchange resin supplied as a dry powder. It can be used as a tablet disintegrant in oral dosage formulations of drug products. AMBERLITE™ IRP88 is the potassium salt of a crosslinked polymer derived from methacrylic acid. Its swelling properties upon hydration provide its utility as a tablet disintegrant. AMBERLITE™ IRP88 has been proposed for use in taste masking applications, specifically for B-lactam antibiotics.

[1] The use of AMBERLITE™ pharmaceutical grade ion exchange resins as components of drug formulations is subject to the Food, Drug, and Cosmetic Act as amended.

Typical Properties

AMBERLITE™ IRP88 complies with the compendial specifications for Polacrilin Potassium NF when tested in conformance to the compendial test methods presented in current USP/NF.

These compendial properties are shown below A Drug Master File ("DMF") for this product is maintained with the United States Food and Drug Administration.

Physical Properties	
Copolymer	Crosslinked acrylic
Type	Weak acid cation
Functional Group	Carboxylic acid
Physical Form	Fine powder
Chemical Properties	
Ionic Form as Shipped	K^+
Loss on drying [1]	10.0 % maximum
Iron [1]	100 ppm maximum
Sodium [1]	0.20% maximum
Heavy metals [1]	0.002% maximum
Potassium [1]	20.6%–25.1%
Residual Methacrylic acid [1]	200 ppm max.
Organic volatile impurities <467>[1]	Meets standard specifications
Particle Size §	
> 0.150 mm [1]	1.0% maximum
0.075–0.150 mm [1]	30.0%

§[1] Appears in current USP/NF

Letters of authorization to the U.S. FDA granting limited access to the DMF in support of NDA (New Drug Application) and ANDA (Abbreviated New drug Application) submittals may be provided upon written request. Similar help may also be offered in support of the registration of formulations containing AMBERLITE™ IRP88 in many other countries worldwide. AMBERLITE™ IRP88 is manufactured in accordance with Good Manufacturing Practices (cGMP) for bulk pharmaceutical chemicals.

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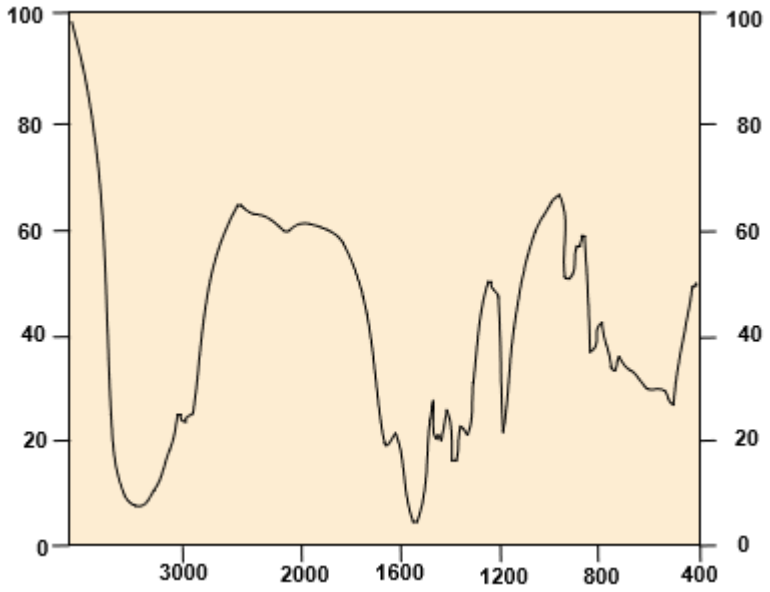
Identification

AMBERLITE™ IRP88 can be identified by infrared spectroscopy, as shown in the example Figure 1.

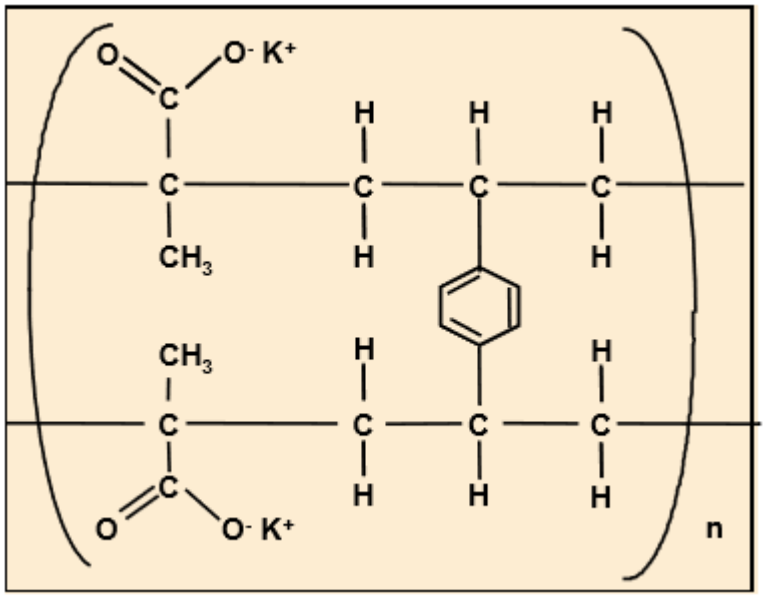
Figure 1. AMBERLITE™ IRP88 Resin IR Spectrum



Chemical Properties

AMBERLITE™ IRP88 is a crosslinked polymer of methacrylic acid and divinylbenzene, supplied as the potassium salt (CAS 39394-76-5). The structure is shown in Figure 2.

Figure 2. AMBERLITE™ IRP88 Resin Chemical Structure



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Applications

Tablet Disintegrant

Many drugs are supplied as tablets for oral administration. In some cases, the effectiveness of the drug depends on the rate at which the tablet disintegrates in the gastrointestinal tract. AMBERLITE™ IRP88 is an effective table disintegrant due to its extremely large swelling capacity in aqueous solutions. Water can exert force between particles within tablet pores, but this force is relatively low. In the presence of AMBERLITE™ IRP88 these forces are enhanced, resulting in rapid tablet disintegration. AMBERLITE™ IRP88 can be used effectively at 1–2 % (weight) of a typical solid dosage formulation.

Water Adsorption

AMBERLITE™ IRP88 adsorbs water rapidly due to its hydrophilic nature. Upon hydration, the resin particles swell. When incorporated into a tablet, the swelling of AMBERLITE™ IRP88 exhibits sufficient force to rupture and disintegrate even those tablets which have been subjected to very high compression force in the tableting process.

Disintegration times for tablets based upon a matrix of calcium-phosphate-carbonatecomplex at various concentrations of some disintegrants are presented in Table 3. These data are presented graphically in Fig. 3. The exceptional rate at which AMBERLITE™ IRP88 adsorbs water when exposed to high humidity air, as compared to other disintegrants, is presented in Fig. 4.

Adhesion

The bonding of particles in compressed tablets must be overcome in order for a tablet to disintegrate, thereby releasing the drug for bioavailability. Some disintegrants are adhesive in nature and are thus ineffective in overcoming particle bonding. This deficiency is particularly associated with cellulosic materials. Sodium carboxymethyl cellulose and calcium sodium alginate are not effective in overcoming this bonding due to their adhesive nature. AMBERLITE™ IRP88 is nonadhesive and is frequently much more effective as a disintegrant in such formulations.

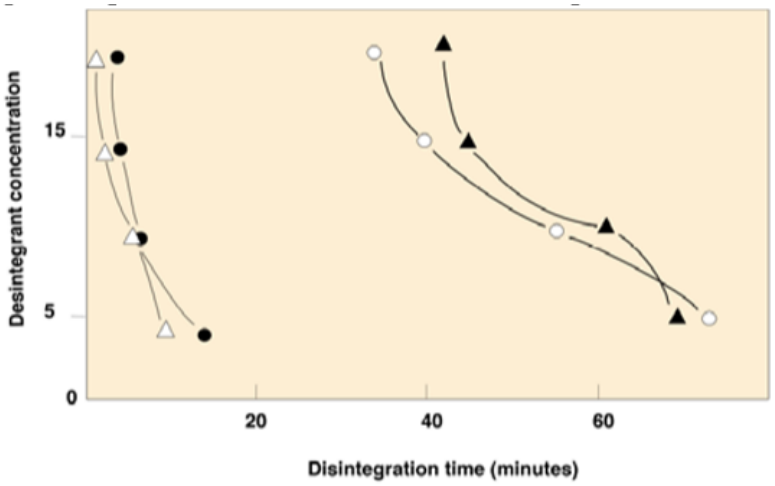
Tablet Hardness

Hardness is an important factor which prevents the tablets from dusting or breaking up during packaging and shipping. Increasing the compressive force to reduce dusting can frequently retard the rate of subsequent disintegration. Table 2 presents data which shows that increasing the compressive force in the formation of tablets containing 2% by weight AMBERLITE™ IRP88 enhances the disintegration rate of the tablet.

Table 2. Effects of increasing pressure on disintegration time of dicalcium phosphate dihydrate tablet with 2% AMBERLITE™ IRP88 Resin

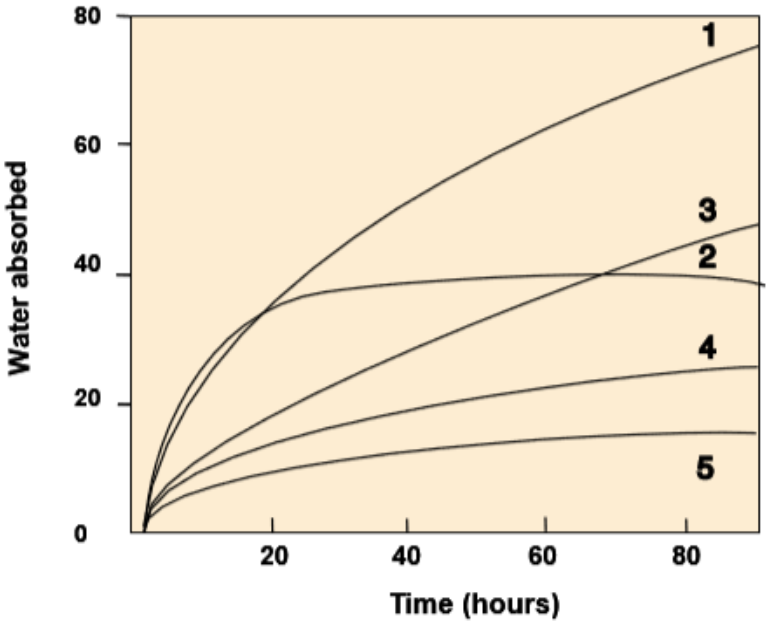
Tablet Pressure Increase from 1–4	Tablet Hardness (Erweka)	Disintegration Time (minutes)
P1	1.5	120
P2	7.0	15
P3	9.0	10
P4	9.5	8

Figure 3. The effect of disintegrant concentration on the disintegration times of tablets prepared from calcium phosphate carbonate complex



Δ AMBERLITE™ IRP88 Resin
● Alginic acid
○ Sodium carboxymethylcellulose
▲ Calcium sodium alginate

Figure 4. The rate of water absorption of disintegrant powders at 25ºC and 98% humidity



1) AMBERLITE™ IRP88 Resin
2) Sodium carboxymethycellulose
3) Calcium sodium alginate
4) Alginic acid
5) Cornstarch

Table 3. Effects of Concentration of Disintegrants on the Disintegration Time of a Calcium-Phosphate-Carbonate-Complex Tablet

Disintegrant	Amount of Disintegrant in Tablet (%)	Tablet Hardness (Monsanto)	Disintegration Time (minutes)
Cornstarch	5 10 15 20	3.0 3.0 3.0 3.0	>120 >120 >120 >120
Calcium sodium alginate	5 10 15 20	4.0 3.5 3.5 2.5	67 60 45 42
Sodium Carboxymethyl Cellulose	5 10 15 20	4.5 4.5 5.0 3.0	70 54 42 37
Alginic acid	5 10 15 20	4.6 3.8 3.8 3.5	13 5 5 3
AMBERLITE™ IRP88	5 10 15 20	4.0 4.0 4.0 4.0	7.5 5 3.3 2

Applications Reference List

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Product Stewardship

DuPont has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with DuPont products—from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

DuPont strongly encourages its customers to review both their manufacturing processes and their applications of DuPont products from the standpoint of human health and environmental quality to ensure that DuPont products are not used in ways for which they are not intended or tested. DuPont personnel are available to answer your questions and to provide reasonable technical support. DuPont product literature, including safety data sheets, should be consulted prior to use of DuPont products. Current safety data sheets are available from DuPont.

Please be aware of the following:

- **WARNING:** Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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