

Cariflex™ Polyisoprene Products

The Clear Alternative

Manufacturers are faced with increasing consumer demands for the latest and most cost effective in rubber-based products: medical stoppers should be safe but convenient, shoe soles must combine comfort, long-life and fashion trends; protective gloves should be strong, but tactile and kind to skin. The pressure is on to find raw materials that can meet these challenges, and help keep customers' products competitive.

For applications where strength, comfort and protection are key, the demands placed on raw materials are particularly high. Cariflex IR, with its non-allergenic character, transparency, lack of odor, softness, hysteresis and good consistency, offers the ideal alternative to existing material solutions.

Traditionally, natural rubber has been selected for use in a wide range of applications because of its key properties of durability, high tensile strength, tear resistance, ready availability and relatively low price. However, naturally occurring substances present in natural rubber are the source of a brownish color, odor and lack of consistency. Substances such as protein and protein derivatives can also cause skin irritation and allergies. These are major challenges for certain finished products subject to stringent regulations or for applications where transparency is preferred. In such situations, Cariflex IR synthetic polyisoprene rubber provides a valuable alternative to natural rubber as it can improve the overall quality and performance of finished products without sacrificing the benefits of natural rubber.

Cariflex IR has similar performance benefits to natural rubber, such as elasticity and durability, combined with the added advantages of transparency, light color, softness, lack of odor and absence of natural proteins.

Table 1

	IR0307	IR0310
Characteristics/applications		Easy processing version of IR0307
Cis-1,4 content %, min	90	90
Volatile matter ¹ max	0.5	0.5
Total ash ¹ max	0.1	0.1
Oil ¹ naphthenic	0.0	0.0
Stabiliser ¹ non-staining	0.06-0.1	0.1-0.3
Limiting viscosity number, dl/g	6.7-9.2	6.5-9.5
Mooney viscosity ² , MU	n/a ³	40-50

For test methods – see relevant grade data sheets:

1. % mass;
2. MML + 4 (100 °C);
3. Data not available for this grade which is specified by limiting viscosity number.



Minimizing Allergenic Reactions

The high quality of Cariflex IR is derived from the simplicity and efficiency of the polymerization process – an anionic solution polymerization initiated by an alkyl-lithium catalyst. A very low amount of catalyst (a few parts per million) is required to polymerize the isoprene monomer. Residual monomer content in the final product is also kept extremely low because the process enables high conversion of isoprene and removal of residuals.

With the exception of an antioxidant, no other additives are used in the production of the clear Cariflex IR grades.

The anionic solution polymerization process helps to avoid branching. Lack of branching eliminates the presence of particles that cannot be dissolved or melted, commonly referred to as 'gels', and a more consistent finished product can be achieved.

Since Cariflex IR is a totally synthetic product not expected to contain natural proteins, the possibility of skin irritations and allergies caused by these proteins in finished products can be reduced to the minimum.

To help manufacturers source a rubber with the appropriate properties for their application, Cariflex IR is available in two grades (see table 1).

End Use Requirements

If the finished article is intended for use in food contact applications, toys, or human contact areas, manufacturers of the final product should observe all relevant regulations. Detailed information is available from Kraton Polymers. For food packaging, manufacturers of the final product should ensure that all ingredients used comply with applicable regulations. Some of these regulations require tests to be carried out on the final product, e.g. migration. These are the responsibility of the final product manufacturer.

Restriction on Medical/Health care Applications and Trademark Usage

No customer of Kraton Performance Polymers, Inc and/or any of its direct or indirect subsidiaries ("Kraton Polymers"), or any other party, shall, without the express written consent of Kraton Polymers for each specific, individual application, be permitted to manufacture, use, sell, process, or otherwise supply, directly or indirectly, any Kraton Polymers product, or any compound containing or made from any Kraton Polymers Product, in any of the following applications:

Cosmetics (exclusive of packaging or delivery applications);

Drugs and other Pharmaceuticals (exclusive of packaging or delivery applications);

and Medical devices; provided, that any medical device that satisfies any one of the following definitions shall not be deemed to fall within the foregoing medical device restriction: (a) any medical device falling within the definition of either a Class I or Class II medical device, as defined in any federal law or regulation of the United States or Canada, or (b) any medical device falling within the definition of a Class I or Class II(a) medical device, as defined by any applicable regulation of the European Union or any member state thereof.

Kraton Polymers has no specific expertise in the medical/health care market or medical/health care

applications and does not intend to perform testing, clinical studies or other investigations of the suitability of its products for these specific applications intend to perform testing, clinical studies or other investigations of the suitability of its products for these specific applications. Kraton Polymers makes no warranty of merchantability or fitness for a particular purpose (including medical/health care applications for its products.

Each customer or use of Kraton Polymers' products is solely responsible for determining the suitability of the materials it selects for the intended purpose. For medical/health care applications, each customer or user must conduct its own studies, registrations, and other related activities to establish the safety and efficacy of its products.

Do not use Kraton Polymers' trade names, trademarks, logos or other similar identifying characteristics for the manufacture, sale or promotion of products intended for Medical/Health care Applications.

Safety and Handling Precautions

Read the Material Safety Data Sheet for Kraton Polymers' products carefully and thoroughly before beginning any work with such products. Additional information relating to the health, safety, storage, handling and processing of Kraton Polymers' products can be found in the Kraton Polymer HSE Fact Sheet (K0155), available from your local Kraton Polymers Sales Representative. Kraton Polymers also recommends that customers or users consult other sources of safety information, for example, the current edition of the "Code of Practice on the Toxicity and Safe Handling of Rubber Chemicals," British Rubber Manufacturers Association Limited (www.brppa.co.uk/). Kraton Polymers' products and compounds can accumulate electrostatic charges when rubbed, chafed or abraded. Processing and storage equipment for use with Kraton Polymers' products should provide a means of

dissipating any charges that may develop.

When processing Kraton Polymers' products, maintain a fire watch if the material reaches 225 °C (437 °F) for Cariflex™ IR and Kraton D (polymers and compounds), and 280 °C (536 °F) for Kraton G (polymers and compounds). The temperatures listed above are indicated only for safety reasons (risk of fire and product degradation) and are not necessarily recommended for processing. Degradation of the polymer (polymer breakdown) will start at lower temperatures depending on the specific processing conditions. Therefore, operating below these temperatures does not guarantee the absence of product degradation. Kraton Polymers' products (the neat resin or the base product) are high molecular weight polymers which by all accounts are non-toxic and biologically inactive.

Warranty

The information contained in this publication is, to the best of Kraton Polymers' knowledge, true and accurate, but any recommendations or suggestions that may be made are without guarantee, since the conditions are beyond Kraton Polymers' control. The customer understands that it shall make its own assessment to determine the suitability of a Kraton Polymers' product for a particular purpose. Further, nothing contained herein shall be construed as a recommendation to use any Kraton Polymers product in conflict with existing patents. All products purchased from or supplied by Kraton Polymers are subject to terms and conditions set out in the applicable contract, order acknowledgement and/or bill of lading. Kraton Polymers warrants only that its products will meet those specifications designated therein.

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