



The Global Connection for Polymer and Compound Solutions

Product and Application Guide



Kraton Performance Polymers, Inc.

Who We Are

Almost 50 years ago, Kraton Performance Polymers, Inc. pioneered the development of styrenic block copolymers (SBCs), opening new doors to enhanced performance, versatility, aesthetics, and durability for a wide variety of consumer and industrial products. Kraton has remained a market leader, driving innovation and developing new families of these highly engineered synthetic elastomers.

The distinctive molecular structure of Kraton™ polymers can be precisely controlled and tailored to perform in a wide variety of applications. Our work in inventing, improving, and innovating SBCs has made us the world's leading choice for SBC-related product innovation.

Kraton polymers add a soft-touch to toothbrushes, razors, and tools, and they improve the durability of the roads on which you drive. They are also used in the effective construction of hygiene products. In addition, we deliver hypoallergenic options for sensitive medical devices. Kraton produces more than 100 grades of polymers and compounds, allowing innovators to choose the options that deliver elastomer performance. These include low temperature flexibility, strength, resilience, and durability, as well as easy processing on thermoplastic equipment. Kraton polymers have a wide service temperature range, high degree of clarity, very good resistance to strong acids and bases, as well as UV and ozone resistance.

The Kraton team is committed to working with our customers to create new solutions for innovative products. Throughout our global manufacturing and research facilities, Kraton scientists and engineers continue to develop new formulations and attributes to meet evolving customer needs, while continuing to make environmentally friendly solutions a priority.

Giving Innovators Their Edge



Kraton™ Polymer Families

Versatility. Compatibility. Strength. Innovation.

Kraton polymer families demonstrate a true evolution in innovation.

Each molecule and compound has been deftly crafted with current and future uses in mind, with each design challenge presenting a new opportunity for cleaner, stronger, and more flexible thermoplastic elastomers. Let Kraton help you provide the right polymer architecture for your product or application.

Styrenic Block Copolymers (SBCs)

Styrenic block copolymers (SBCs) are a unique class of thermoplastic elastomers consisting of a two-phase structure of hard polystyrene endblocks and soft rubber midblocks. The polystyrene end blocks associate to form domains which lock the molecule into place without vulcanization. Since this is a reversible process, the material can be processed on conventional thermoplastic equipment. The polystyrene endblocks impart strength, and the rubber midblock imparts elasticity.

In addition, SBCs' versatile structure makes them compatible with many plastics, including polyolefins, styrenics, and engineering resins, in order to impart low temperature flexibility and impact resistance.

Kraton D: Unsaturated Styrenic Block Copolymers (USBCs)

Kraton D polymers are chosen when UV and ozone resistance are not required but excellent low temperature flexibility is desired. Kraton D polymers and compounds have low glass transition temperatures (T_g) of -85 °C for Styrene-Butadiene-Styrene (SBS) and -60 °C for Styrene-Isoprene-Styrene (SIS) and can be processed at temperatures of 180-225 °C. These polymers are compatible with Polyethylene (PE) and Polystyrene (PS), and some SBS grades can be cross-linked for enhanced properties.

► Kraton SIS Polymers and Oiled Polymers

This was the first family of polymers developed in the early 1960s. SIS polymers demonstrate a winning combination of high elasticity, low hardness, and low viscosity, making them ideally suited in hot-melt, pressure-sensitive adhesives and in elastic films. SIS polymers are an environmentally friendly alternative to solvent-based adhesives.

► Kraton SBS Polymers, Oiled Polymers, and Compounds

SBS polymers are the material of choice for asphalt modification, and as a construction adhesive in diapers and feminine care products, but their many applications don't end there. Its high strength and wide range of hardness makes it useful in a variety of applications, from skid resistance to impact modification.

► Kraton SIBS Polymers

A hybrid of Kraton's SIS and SBS families, the Styrene-Isoprene-Butadiene-Styrene (SIBS) polymers provide customers with unique value. The controlled distribution of monomers in the midblock allow better hot-melt stability vs. conventional SBS, sprayability, transparent blends, low temperature tack, formulating latitude, and cross-linkable reinforcement with other compounds—all at a total system cost advantage over traditional SIS polymers.

Kraton G: Hydrogenated Styrenic Block Copolymers (HSBCs)

Kraton HSBCs offer a higher service temperature range, improved compression set; and they can accept high loadings of oils and fillers for compounding. They are ideal for outdoor applications where improved UV and ozone resistance are required. This clean, synthetic material is also classified as United States Pharmacopeia (USP) Class VI, biocompatible for use in a variety of medical applications and devices. These grades can be sterilized via a variety of techniques, including EO, e-beam, gamma, and in some cases, steam sterilized. Kraton's HSBC family offers a diverse group of polymers, including:

► Kraton G SEBS/SEP Polymers, Oiled Polymers, and Compounds

These second generation SBCs, with a hydrogenated midblock of ethylene/butylene or ethylene/propylene, are the material of choice when UV resistance, high service temperature, durability, and processing stability are vital to your application. SEBS/SEP polymers truly offer superior strength with a soft touch—and are also Food and Drug Administration (FDA)-acceptable for use in direct food contact applications.

► Kraton FG Maleated Polymers/Functionalized G

By grafting maleic anhydride (MA) onto the SEBS rubber midblock, Kraton FG polymers provide superior adhesion to nylon, polyester, ethylene vinyl alcohol, aluminum, steel, glass, and other polar substrates. This material offers good UV and heat stability, improved water dispersibility, and cross-linking capability as well. It can also act as a compatibilizer for dissimilar materials, taking advantage of both the polar and non-polar moieties in one molecule.

► Enhanced Rubber Segment (ERS) Polymers

Kraton's ERS polymers feature a unique rubber segment that offers a softer product with lower viscosity, higher melt flow, and improved compatibility with polypropylene (PP). Its better miscibility with PP gives rise to clear, toughened PP products at relatively low levels. ERS polymers can also be used as modifiers and as the base for soft formulations with excellent transparency.

► Kraton A Polymers

Kraton A polymers offer versatility and value. Kraton A polymers have improved isotropic properties enabling thin part injection moldings, better compatibility with styrenics, and improved tear strength. Due to the more polar nature of this family, the ability to disperse fillers and color concentrates is excellent, and these polymers have a higher refractive index. Kraton A polymers offer improved compatibility with more polar, natural oils and can be used to gel or thicken these types of materials.

Cariflex™ Isoprene Rubber (IR) and Latex (IR Latex)

With Kraton's new solid IR rubber and IR latex, the company has branched out from the SBC world. Kraton Cariflex IR is a family of anionically polymerized, synthetic polymers that offer a clean, clear, low-odor, and hypoallergenic alternative to natural rubber with none of the associated problems with plant allergies and nitrosamines. It is ideal for use in medical applications, such as surgical gloves and catheter balloons, as well as medical stoppers and baby bottle nipples. Cariflex IR is supplied as a solid in bale form or as a latex (65% solids).

Adhesives, Sealants and Coatings

Kraton™ polymers offer improved all-around performance for a wide variety of adhesives, sealants, and coatings used in consumer and industrial applications. The unique chemical structure of SBCs allows the modification of properties such as tack, cohesive strength, holding power, stiffness, temperature resistance, and surface protection.



Applications

Adhesives

Kraton polymers can be formulated to produce a wide range of hot-melt and solvent-based industrial adhesives that range from non-pressure-sensitive to pressure-sensitive. They adhere to a variety of substrates, including paper, cardboard, polymer-coated substrates, plastics, polyolefins, fabric, and foam, and exhibit high performance. Some attributes of industrial adhesives formulated with Kraton polymers include low temperature flexibility combined with high heat resistance; low melt viscosity and application temperature; superior adhesion to a variety of substrates, including those that are non-porous; good balance of tack, peel, and shear; FDA coverage; color stability; and UV and heat stability with Kraton G polymers.

Kraton polymers can be formulated to produce adhesives with a variety of useful properties utilizing resins, plasticizers, fillers, antioxidants, and others. These adhesives are versatile and can be applied either as a hot melt or from solution. They adhere well to non-porous substrates and are more flexible and elastic down to freezer temperatures than hot-melt adhesives prepared from such polymers as EVA, PP, and PE.

Caulks and Sealants

Moisture, heat, and other destructive elements have met their match in Kraton™ polymers. Our clear polymers, which adhere to a wide variety of substrates, can be pigmented or formulated as a clear sealant to match dissimilar color surfaces and are also readily paintable. Featuring exceptional elongation and elasticity, Kraton polymers add longevity, resistance to the outdoors, and durability to windows, building materials, and other products that must withstand exposure to the elements and strong acids and bases.

And while the polymers have good thixotropic characteristics and already exhibit good low-temperature performance and flexibility, they can also be formulated to boost upper-service temperature. Kraton G and Kraton A polymer grades offer improved weatherability, color, and heat stability, while Kraton FG polymer grades adhere better to polar substrates like glass and aluminum. Kraton D SBS polymers are often used in construction adhesives where strength and load-bearing performance is important. Our Kraton polymer-based, hot-melt sealant can be formulated for lower viscosity and can be designed for improved adhesion and a wider range of product service temperatures.

Coatings

The coatings opportunities within the Kraton line of polymers offer our customers a number of clear advantages, including resilience, elasticity, elongation, adhesion promotion, and flexibility at low temperatures, as well as resistance to UV, chipping, water, strong acids, and bases. Our coatings offer a high coefficient of friction and low toxicity, meeting FDA citations, while adhering to a wide variety of substrates.

The unique properties and wide grade range of Kraton polymers provide the customer with options for various applications. For example, coatings can be processed in solvent or as a thermoplastic. Our SEBS polymers for coatings applications can make solvent-based elastomeric coatings with lower volatile organic compounds (VOC), which is important for government emissions restrictions. In addition, Kraton G polymers can be formulated with oil and sprayed on surfaces that, when peeled, leave no residue. They provide protection to metal substrates during chemical milling (etching), and offer good durability in exterior applications. Kraton FG polymers yield better adhesion to polar substrates and can be cross-linked.

Protective Films

Kraton offers compounds designed for co-extrusion film technology that provide protective film manufacturers with the best protective film solution available. Compound properties can be tailored to achieve unique performance requirements. Films made with Kraton co-ex technology are clean and provide superior protection, high flexibility, customizable peel strength, and lower system costs due to use in a one-step co-extrusion process. Protective films made with Kraton co-ex technology provide superior protection to finished goods in many industries and end-user applications, including automotive, consumer electronics, home appliances, construction, plastic laminates, furniture, glass and mirrors, and metals.

Tapes, Labels, and Decals

When it comes to hot-melt and solvent-based adhesive tapes, labels, and decals, Kraton offers the largest available grade line of SBCs in the industry that are suitable for polyolefin-based (BOPP), paper, cloth, and aluminum products. Used widely in the production of pressure-sensitive adhesives, our polymers exhibit good compatibility with resins and plasticizers, as well as low-melt viscosity and application temperature, while delivering superior ultraviolet and heat stability. Formulations containing HSBCs afford superior heat, as well as oxidative and ultraviolet light stability.

Sustainability

SIBS polymers (D1170, D1171, and D1173) can be formulated with C5/C9 resins, partially hydrogenated resins, and rosin esters. These options can help reduce C5 resin dependence. Kraton A grades, which can also be blended with SIS, and ERS grades offer adhesive solutions that can be formulated with hydrogenated resins that are not based on piperylene-based resins. Due to their more polar midblock, Kraton™ A grade polymers, can also be formulated with natural oils and resins that are considered sustainable alternatives. Kraton polymers can be formulated with exempt solvents, such as p-chlorobenzotriflouride (PCTBF) and t-butylacetate (tBAC), to help reduce VOC content in adhesive and coating formulas.

Kraton's SIS polymers are excellent options for high-speed extrusion coating lines, offering excellent pressure sensitive adhesives (PSA) properties to tape applications. SBS polymers offer high cohesive strength, lower cost, and are ideally suited for solvent coating operations. Kraton also offers SBS grades that are designed for radiation curing. Styrene-ethylene/butylene-styrene (SEBS) and styrene-ethylene/propylene-styrene (SEPS) block copolymers can be formulated as hot melts or with solvent and exhibit superior stability and aging properties.

Kraton is currently researching methods of formulating SBCs with renewable resources, reinforcing our commitment to sustainability.



Advanced Materials

Applications

Consumer Goods

Customers today expect more from the products they buy than ever before. They want them to perform well and be pleasing both to the eye and to the touch. Kraton polymer compounds have made significant improvements to many products, making products more durable, softer and more comfortable to hold, and other consumer products more flexible, versatile, and attractive. They can also be brilliantly colored or even made transparent, and many meet FDA and USP Class VI requirements.

Kraton polymers offer a wide range of hardness levels as pure polymers or in formulations, creating different textures and levels of flexibility. Overmolding onto polypropylene can be easily accomplished to create containers with tight seals. Alternatively, they can be injection-molded into thin parts and with excellent grip. Kraton G polymers are suitable for applications requiring high strength, UV resistance, and heat stability, while Kraton D polymers offer cost-effective solutions for footwear and various soft-touch applications. Our IR polymers can replace many natural rubber applications, and our FG polymers are compatible and adhere to polar polymers and substrates.

Elastic Nonwovens

Our new polymer technology offers superior softness, bi-axial stretch and solid durability. This exciting advancement in fiber technology breaks through the processing barriers of conventional SBC polymers. Kraton™ MD6705, G1643 and MD6717 are specifically created to meet the requirements in single use and durable nonwoven applications. MD6705 and G1643 can be used in a bicomponent fiber configuration as the elastic core to make elastic yarns or elastic nonwovens. These polymers are paired with sheath materials such as polypropylene, polyester, copolyester, nylon and blends of polypropylene to achieve properties in addition to stretch and flexibility. MD6717 is specifically used for melt blown processes where strength and increased elasticity are desired.

The competitive advantage of Kraton polymers lies in the design and optimization of the copolymer to retain its elasticity, while still making it suitable for high-speed processing. Kraton elastic nonwovens are proven to be drapeable, non-tacky and breathable, enabling the creation of products that are soft, quiet and discrete. Dyeing and/or printing are also possible with the proper choice of sheath material.

Kraton polymers impart the stretch and flexibility required in personal care products such as baby diapers, childcare trainers and adult incontinence products. The softness improves comfort in items such as scrub suit apparel, medical gown laminates, surgical drapes, protective apparel and wound care dressings.

Kraton™ polymers add just the right touch to a wide range of consumer products, making them more comfortable and easier to use. Consumers have become accustomed to the soft-grip handles now commonly found on toothbrushes, razors, and power tools, as well as the stretchiness of today's disposable diapers, trainers, and adult incontinence products.

Food and Medical Packaging

Packaging that comes into contact with food, medical products, cosmetics, and other product categories may be governed by specific regulatory controls for end-use. Kraton has a long history of providing low-toxicity polymers that can safely be used in a wide range of sensitive applications, with many options that meet FDA, USP, and other regulations worldwide. Kraton was recently granted approval to use SEBS polymers with foods containing free fats and oils (FCN 000679). We have developed our own standards of Good Manufacturing Practices (GMP), which ensure every activity along the polymer supply chain promotes safety, purity, and quality.

Kraton also offers compound solutions to create specific attributes. Many flexible and rigid packages contain multiple materials in compounds, blends, and co-extrusions to meet the demands of the consumer. Recent advances in materials and co-ex technologies have enabled a number of innovative breakthroughs, including the combination of clarity and barrier into flexible package designs. Kraton™ polymers can be used in these structures in a variety of ways, adding clarity, toughness, elasticity, and compatibility. They can also be used as tie layers to promote adhesion between dissimilar layers or to alter the rates of transmission of gases such as oxygen and carbon dioxide as well as moisture. Our polymer processing capabilities include blown and cast film, injection molding, extrusion, thermoforming, and blow-molding applications.

Medical Products and Devices

Kraton brings almost fifty years of experience in polymer chemistry to achieve the highest levels of quality and dependability in the medical products industry. Customers turn to us for polymers and compounds for use in intravenous solution containers and blood bags, surgical draping, compression devices, diagnostic equipment (flexible and rigid), gloves, medical films, tubing, stoppers, dental dams, physiotherapy bands, and many other applications. Our robust ranges of extremely tough, transparent, flexible and rigid polymers are compatible with a variety of materials. All of our polymers are phthalate-free and provide high performance, non-allergenic, proven alternatives to PVC.

Kraton G polymers are the polymer grade of choice for strength, UV-resistance, and heat stability, while Kraton FG polymers—functionalized Kraton G polymers—are compatible with and adhere to polar polymers and substrates. For cost-effective solutions for various soft-touch applications, Kraton D polymers are a popular choice.

Kraton's advanced materials are increasingly called upon as environmentally friendly alternatives for polyvinyl chloride (PVC) and polycarbonate materials in medical applications, as well as for wire and cable, baby care, and consumer and electronic products.

Kraton's Cariflex™ IR polymers are breakthrough synthetic polyisoprene rubbers that can be formulated to replace many natural rubber applications. For more information about Kraton Cariflex™ IR polymers, see the Emerging Business Section on page 10.

Many Kraton polymers meet FDA and USP Class VI standards. Sterilization via ethylene oxide, or radiation are possible with neat Kraton G polymers or formulated Kraton G compounds. Steam sterilization is possible when the polymers are used in combination with other materials, or in co-extrusions. Grades are offered with high resilience, low compression set, good puncture and reseal properties, and no plasticizers are required.

Kraton polymers also offer enhanced oxidation resistance, higher service temperatures, and increased processing stability. They provide formulation flexibility, ease of processing in commonly used thermoplastic technology, and enhance clarity in polyolefin blends.

Wire and Cable

Kraton polymers offer a variety of key attributes important in wire and cable applications. Superior electrical properties make them excellent candidates for insulation applications, and they are versatile enough to be used for jacketing and molded parts. Kraton polymers are lightweight because of their low specific gravity. In addition, they are halogen-free, recyclable, and can be easily colored. Their excellent low temperature flexibility and UV and ozone resistance make them suitable for outdoor applications as well.

Kraton G polymers are formulated for use in flexible cords, charger cords, earphone cables, signal cables, industrial cords, control wire, booster cables, welding cables, molded plugs, and connectors.

Kraton A polymers can achieve the best balance in strength, processibility, and compatibility with various ingredients. Kraton ERS polymers provide low hardness and high flow for injection molded parts. Kraton FG polymers can enhance compatibility between flame-retardant fillers and the polymer matrix. Kraton D polymers are cost-effective solutions for less demanding applications. Our polymers stand up to heat: they can be flame retarded to a V-0 rating and exhibit resistance to thermal aging.



Paving and Roofing

Kraton™ polymers improve the performance of asphalt in paving, waterproofing, and other applications by reducing temperature susceptibility and increasing toughness and resilience. Applications include hot-mix asphalt for paving, asphalt emulsions, modified bitumen membranes for low-slope roofing, modified shingles for steep-slope roofing, and self-adhesive waterproofing membranes. Asphalt chemistry varies with crude oil source; therefore, our wide range of products provide manufacturers with flexibility in meeting the current and future challenges of asphalt supply.



Applications

Paving

Conventional asphalt is sensitive to temperature, making asphalt pavements susceptible to deformation at high temperature and cracking at low temperature, especially in areas of heavy traffic volume or temperature extremes. Asphalt modified with Kraton D polymers can provide reduced temperature sensitivity, flexibility, elasticity, and strength. SBS polymers are the leading modifier for asphalt paving used in roads, runways, and racetracks around the world. Modifying asphalt with Kraton D polymers extends the life of the road, improves safety, and reduces the life-cycle cost. In some cases, our innovative base course solutions can reduce pavement thickness by up to 30 to 40 percent, while maintaining durability and resulting in immediate cost savings. In addition to modifying conventional asphalt pavement for roadways, Kraton offers a variety of paving solutions for airports, bridges, port facilities, and other paving applications. Highly modified crack-resistant overlays (D0243) provide the option for cost savings from thinner pavement and longer life. Highly modified thinner base courses (D0243) offer up-front cost savings with up to 40% thickness reduction, while our porous asphalt wearing surface (D1192, D0243) reduces water spray and noise with better aggregate retention. Other applications include warm-mix asphalt (D0243), pre-modified asphalt emulsions (D1192, D0243), Recycled Asphalt Pavement (RAP) modification, and crack-resistant bridge deck overlays (D0243).

Emulsions

Asphalt emulsions are used in a wide range of paving and roofing applications, particularly in pavement rehabilitation and maintenance. Low-viscosity Kraton™ SBS polymers facilitate pre-modification of asphalt prior to emulsification. This results in an emulsion product with improved stability and finished emulsion residue with improved adhesion, resilience, and toughness.

Low and steep-slope roofing

A properly designed and constructed roof is critical to the structural integrity of any building. SBS modified bitumen (mod bit) roofing membranes manufactured with Kraton™ D polymers are a mainstay of the low-slope roofing market. They can withstand large temperature fluctuations without cracking or warping, while providing excellent waterproofing. Thinner, highly modified membranes (D1189) provide improved resistance to aging, and high-efficiency modifiers (D1191) offer added toughness and superior high-temperature performance. Kraton D polymers are also used in the manufacture of asphalt shingles for the steep-slope market, where they provide improved resistance to wind uplift and resistance to damage during hail events.



Waterproofing

Asphalt-based, self-adhering waterproofing membranes are used for diverse applications including roofing underlays, foundation waterproofing, parking plazas, pond liners, and bridge decks. Our diverse array of Kraton D SBS and SIS polymers allows formulators to develop products that meet strict performance criteria while still maintaining application tack over a wide temperature range.

Our diverse array of polymers allows formulators to develop products that meet strict performance criteria while still maintaining application tack over a wide temperature range.





Emerging Businesses

Cariflex™ Isoprene

Rubber (IR) and Latex (IR Latex)

With Kraton's new Cariflex solid IR rubber and IR latex, the company has branched out from the SBC world. Kraton Cariflex IR products are a family of anionically polymerized, fully synthetic IR polymers. They are extremely high in purity, low in odor, and offer a hypoallergenic alternative to natural rubber (NR). Problems associated with NR protein allergies are eliminated when Cariflex IR or IR latex are substituted for NR. The Cariflex product family is ideal for use in medical applications such as surgical gloves, condoms, medical stoppers, medical probes, and device tips. These polymers and latices are also strong, soft, elastic, and clear. Cariflex IR is supplied as a solid in bale form or as a latex with 65% solid content.

NEXAR™ Polymers

We also offer NEXAR polymers for moisture transport, air quality, and separation/filtration applications. NEXAR polymers can be used as a coating, laminate, or additive, and it continues to serve the air quality and performance fabrics markets, including protective clothing, active outerwear, and residential air quality. Our innovation pipeline continues to develop new solutions to meet the growing demand for applications our clients need to remain innovative and competitive.



Kraton™ SBC Applications

Unsaturated Styrenic Block Copolymers (USBCS)

Kraton D Polymer Families
Kraton SIS Polymers and Oiled Polymers
Kraton SBS Polymers, Oiled Polymers, and Compounds
Kraton SIBS Polymers

Adhesives, Sealants & Coatings	Paving & Roofing	Advanced Materials
D1101	D0243	D1101
D1102	D1101	D1102
D1111	D1102	D1114
D1113	D1116	D1116
D1114	D1118	D1118
D1117	D1133	D1152
D1118	D1184	D1153
D1119	D1189	D1155
D1124	D1191	D1160
D1126	D1192	D1161
D1152	D4141	D1164
D1155	D4158	D1170
D1160		D1171
D1161		D1184
D1162		D1186
D1163		D1192
D1164		D2104
D1165		D2109
D1170		D2122
D1171		D4141
D1173		D4150
D1183		D4153
D1184		D4158
D1186		
D1192		
D1193		
D4153		
D4433		
DX405		

Hydrogenated Styrenic Block Copolymers (HSBCS)

Kraton G Polymer Families
Kraton G SEBS/SEP Polymers, Oiled Polymers, and Compounds
Kraton FG Maleated Polymers/Functionalized G Enhanced Rubber Segment (ERS) Polymers
Kraton A Polymers

Adhesives, Sealants & Coatings	Paving & Roofing	Advanced Materials
A1536	G1642	A1535
FG1901	G1643	A1536
FG1924	G1650	FG1901
G1640	G1652	FG1924
G1643	G1654	G1633
G1652	G1657	G1641
G1701	G1701	G1642
G1702	G1726	G1643
G1726		G1645
G1730		G1650
G1750		G1651
G7723		G1652
		G1654
		G1657
		G1660
		G1701
		G1702
		G1726
		G1730
		G2705
		G2832
		G2836
		G4609
		G4610
		G7705
		G7720
		G7820

Kraton's commitment to innovation means that we are constantly developing new products and new solutions to meet the needs of our customers. We look forward to working with your company on your next product development or manufacturing effort.

Kraton™ D Polymers (SIS): Summary of Properties

These are typical values and should not be used to set specifications.

Kraton D (SIS) Polymer Grades

Property	D1111 (SIS) Linear	D1113 (SIS) Linear	D1114 (SIS) Linear	D1117 (SIS) Linear	D1119 (SIS) Linear	D1124 (SI)n Radial	D1126 (SI)n Radial	D1161 (SIS) Linear	D1162 (SIS) Linear	D1163 (SIS) Linear	D1164 (SIS) Linear	D1165 (SIS) Linear	D1183 (SIS) Linear	D1193 (SIS) Linear
Tensile Strength, MPa ^{1,2}	20	4	32	8	2	15	8	21	28	10	28	21	-	18
300% Modulus, MPa ^{1,2}	1.4	0.3	1.9	0.4	1.1	3.0	2.5	0.9	-	0.5	3.1	3	-	2.6
Elongation at Break, % ^{1,2}	1,200	1,500	1,300	1,300	1,000	1,100	1,400	1,300	-	1,400	1,000	1,200	-	1,200
Set at Break, % ^{1,2}	10	20	-	15	20	26	-	-	-	-	-	-	-	20
Hardness, Shore A ³ (10 sec.)	45	23	42	33	30	54	44	32	-	25	53	59	-	53
Specific Gravity	0.93	0.92	0.92	0.92	0.93	0.94	0.92	0.92	0.95	0.92	0.94	0.93	-	0.93
Brookfield Viscosity cps at 25 °C	1,100	600	900	500	340	340	500	1,200	120	900	300	330	-	400
Melt Index g/10 min (200 °C/5kg)	3	24	9	33	25	4	15	12	35	22	12	7	14	14
Styrene/Rubber Ratio	22/78	16/84	19/81	17/83	22/78	30/70	19/81	15/85	44/56	15/85	29/71	30/70	16/84	24/76
Physical Form	Porous Pellet	Dense Pellet	Dense Pellet	Dense Pellet	Porous Pellet	Dense	Dense Pellet	Porous Pellet	Dense Pellet	Porous Pellet	Dense Pellet	Porous Pellet	Dense Pellet	Dense Pellet
Diblock, %	18	55	<1	33	66	30	30	19	<1	38	<1	20	38	20
Comments	FDA													

(1) ASTM method D412-tensile tester jaw separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

(4) Neat polymer concentration 25% in toluene

Kraton™ D Oiled Polymers: Summary of Properties

These are typical values and should not be used to set specifications.

Kraton D Oiled Polymer Grades

Property	D4141 (SBS) Linear	D4150 (SBS) Linear	D4153 (SBS) Linear	D4158 (SB) _n Radial	D4433 (SIS) Linear
Tensile Strength, MPa ^{1,2}	19 ³	19 ³	10 ³	9 ³	6 ²
300% Modulus, MPa ^{1,2}	1.7	1.1	2.5	1.6	1.0
Elongation at Break, % ^{1,2}	1,300	1,400	1,000	1,110	1,450
Set at Break, % ^{1,2}	20	25	15	10	24
Hardness, Shore A (10 sec) ³	50	45	45	41	29
Specific Gravity	0.93	0.92	0.94	0.92	0.92
Brookfield Viscosity, cps at 25 °C	1,000	850	-	4,800	350
Melt Index g/10 min (200 °C/5kg)	11	10	30	<1	29
Oil Content, %w	28.5	33	30.5	33	23
Styrene/Rubber Ratio	31/69	31/69	35/65	31/69	22/78
Physical Form	Porous Pellet Powder	Porous Pellet	Porous Pellet	Porous Pellet	Dense Pellet
Diblock, %	17	17	11	16	20
Comments	FDA-US	FDA	No	FDA-US	FDA

(1) ASTM method D412-tensile tester grip separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

Kraton D Polymers (SIBS): Summary of Properties

These are typical values and should not be used to set specifications.

Kraton D (SIBS) Polymer Grades

Property	D1170 (SIBS) Linear	D1171 (SIBS) Linear	D1173 (SIBS) Linear
Tensile Strength, MPa ^{1,2}	36	17	3
300% Modulus, MPa ^{1,2}	1.4	2.1	0.8
Elongation at Break, % ^{1,2}	1,200	1,250	1,200
Set at Break, % ^{1,2}	-	-	-
Hardness, Shore A (10 sec) ³	46	45	29
Specific Gravity	0.92	0.92	0.92
Brookfield Viscosity cps at 25 °C ⁴ (25%w)	1,100	1,000	-
Brookfield Viscosity cps at 25 °C ⁴ (15%w)	-	-	-
Melt Index 10 min. (200 °C/5kg)	13	11	14
Styrene/Rubber Ratio	19/81	20/80	18/82
Physical Form	Porous Pellet	Dense Pellet	Porous Pellet
Diblock, %	27	26	60
Comments	FDA	FDA	FDA

(1) ASTM method D412-tensile tester grip separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

(4) Neat polymer concentration 25% in toluene

These are typical properties and there may be slight differences in specific properties and test methods between the regional versions of the grades.

Cariflex™ Isoprene Rubber and Latex: Summary of Properties

These are typical values and should not be used to set specifications.

Kraton D (IR) Polymer Grades

Property	IRO307 (I) Linear	IRO310 ^{1,2} (I) Linear	IRO401 ³ (I) Latex
Specific Gravity	0.91	0.91	-
Intrinsic Viscosity, dl/g	7.8	8.0	7.8
Mooney Viscosity, MV	-	45	-
Styrene/Rubber Ratio	0/100	0/100	0/100
Physical Form	Bale	Bale	Latex
Comments	FDA	FDA	FDA

(1) Lower viscosity

(2) Easy processing version of IR307

(3) 63% solids in latex (aqueous dispersion)

Kraton™ D Polymers (SBS): Summary of Properties

These are typical values and should not be used to set specifications.

Kraton D (SBS) Polymer Grades															
Property	D0243 (SBS) Diblock	D1101 (SBS) Linear	D1102 (SBS) Linear	D1116 (SBS) Radial	D1118 (SBS) Diblock	D1133 (SBS) Linear	D1152 (SBS) Linear	D1153 (SBS) Linear	D1155 (SBS) Linear	D1184 (SBS) Radial	D1186 (SBS) Radial	D1189 (SBS) Radial	D1191 (SBS) Linear	D1192 (SBS) Linear	DX405 (SBS) Linear
Tensile Strength, MPa ^{1,2}	2	32	32	32	2	21	32	28	28	28	25	-	-	-	-
300% Modulus, MPa ^{1,2}	1.0	2.8	2.8	2.4	1.2	2.1	2.8	2.9	2.9	5.5	3	-	-	-	-
Elongation at Break, % ^{1,2}	-	880	880	900	600	800	900	800	800	820	800	-	-	-	-
Set at Break, % ^{1,2}	-	10	10	10	40	20	10	-	-	10	10	-	-	-	-
Hardness, Shore A (10 sec.) ³	70	69	66	63	64	74	66	70	87	68	74	68	68	66	53
Specific Gravity	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.96	0.94	0.94	0.94	0.94	0.94	0.94	
Brookfield Viscosity cps at 25 °C (25%w)	315	4,000	1,100	9,000	630	4,800	1,000	1,650	600	>20,000	-	TBD	>20,000	1,500	
Brookfield Viscosity cps at 25 °C ⁴ (15%w)	-	-	-	2,500	-	420	-	-	-	1,100	1,200	TBD	1,100	-	2,000
Melt Index g/10 min. (200 °C/5kg)	20	<1	14	<1	10	<1	8	3	14	<1	<1	<1	<1	<1	3
Styrene/Rubber Ratio	33/67	31/69	28/72	23/77	33/67	36/64		29/71	40/60	31/69	30/70	31/69	33/69	30/70	24/76
Physical Form	Porous Pellet	Porous Pellet Powder	Porous Pellet	Porous Pellet Powder	Porous Pellet Powder	Porous Pellet Powder	Porous Pellet	Porous Pellet	Porous Pellet Powder	Porous Pellet Powder	Porous Pellet Powder	Porous Pellet Powder	Porous Pellet Powder	Porous Pellet	
Diblock, %	75	16	17	16	78	34	15	<1	<1	16	10	16	18	<1	<1
Comments	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	FDA	-

(1) ASTM method D412 grip separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

(4) Neat polymer concentration in toluene

Kraton's commitment to innovation
means that we are constantly
developing new products and solutions
to meet the needs of our customers.

We look forward
to working with
your company on
your next product
development or
manufacturing effort.

Kraton Compounds: Summary of Properties

These are typical values and should not be used to set specifications.

"Ready to Use" compounds for injection molding and extrusion.

Kraton D Compound Grades ¹				
Property	Unit	D2104	D2109	D2122
Hardness, ASTM D2240				
Compression Molded ³	Shore A	-	-	-
Injection Molded	Shore A	39	-	52
Extruded	Shore A	41	48	-
Tensile Properties ASTM D412 ¹				
Tensile Strength	MPa	9	11 ³	9
300% Modulus ¹	MPa	1.7	2.1 ³	-
Elongation at Break ¹	%	1,750	1,200 ³	1,130
Tear Resistance, ASTM D-624, Die C	KN/m	35.1	19.3	31.5
Specific Gravity		0.92	0.94	0.93
Melt Index g/10 min	200 °C/5kg	22	15	21
Physical Form	Dense Pellet	Dense Pellet	Dense Pellet	
Standard Color		Clear	White, Natural	Natural
Ozone Resistance	Stressed Unstressed	Poor Fair	Poor Fair	Poor Fair
Comments		FDA	FDA	FDA

(1) Values are typical of injection molded samples except where noted

(2) Film grade

(3) Typical values on polymer composition compression molded at 177 °C for Kraton D

These are typical properties and there may be slight differences in specific properties and test methods between the regional versions of the grades.

Kraton™ A Polymers

These are typical values and should not be used to set specifications.

Kraton A Polymers		
Property	A1535	A1536
Tensile Strength, MPa ^{1,2}	28	>34
300% Modulus, MPa ^{1,2}	7.9	6.4
Elongation at Break, % ^{1,2}	>600	660
Set at Break, % ^{1,2}	-	-
Hardness, Shore A (10 sec.) ³	83	61
Specific Gravity	0.96	0.93
Brookfield Viscosity ⁴ cps at 25 °C ⁴ (25%W)	-	-
Brookfield Viscosity ⁴ cps at 25 °C ⁴ (10%w ⁴)	230	-
Melt Index g/10 min. (230 °C/5kg)	<1	3
Styrene/Rubber Ratio	58/42	42/58
Physical Form	Powder	Powder
Comments	FDA	FDA

(1) ASTM method D412 tensile tester grip separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

(4) Neat polymer concentration in toluene

Kraton ERS Polymers

These are typical values and should not be used to set specifications.

Kraton ERS Polymers					
Property	G1640	G1641	G1642	G1643	G1645
Tensile Strength, MPa ^{1,2}	>20	>20	>21	>10	10
300% Modulus, MPa ^{1,2}	4.5	4.3	-	-	
Elongation at Break, % ^{1,2}	>800	>800	>1200	>600	600
Set at Break, % ^{1,2}	-	-	-	-	-
Hardness, Shore A (10 sec.) ³	60	58	48	52	35
Specific Gravity	0.91	0.91	0.90	0.90	0.89
Brookfield Viscosity ⁴ cps at 25 °C ⁴ (25%W)	>50,000	1,330	1,300	200	-
Brookfield Viscosity ⁴ cps at 25 °C ⁴ (10%w ⁴)	1,300	670	-	-	-
Melt Index g/10 min. (230 °C/5kg)	<1	<1	<1	75	13
(230 °C/2.16kg)	<1	-	<1	19	3.5
Styrene/Rubber Ratio	32/68	33/67	21/79	19/81	13/87
Physical Form	Fluffy	Fluffy Crumb	Powder	Dense Pellet	Dense Pellet
Diblock, %	-	-	-	7	7
Comments	FDA	FDA	FDA	FDA	FDA

(1) ASTM method D412 tensile tester grip separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

(4) Neat polymer concentration in toluene

Kraton™ G Polymers: Summary of Properties

These are typical values and should not be used to set specifications.

Kraton EB Based Polymers								
Property	G1633 (SEBS) Linear	G1650 (SEBS) Linear	G1651 (SEBS) Linear	G1652 (SEBS) Linear	G1654 (SEBS) Linear	G1657 (SEBS) Linear	G1660 (SEBS) Linear	G1726 (SEBS) Diblock
Tensile Strength, MPa ^{1,2}	-	35	>28	31	>28	23	32	2
300% Modulus, MPa ^{1,2}	-	5.6	-	4.8	-	2.4	5.5	-
Elongation at Break, % ^{1,2}	-	500	>800	500	>800	750	800	200
Hardness, Shore A (10 sec.) ³	-	70	70	70	70	47	68	70
Specific Gravity	0.91	0.91	0.91	0.91	0.91	0.89	0.91	0.91
Brookfield Viscosity, cps at 25 °C ^{25%W⁴}	-	8,000	>50,000	1,800	>50,000	4,200	8,000	200
10%W ⁴	-	50	1,800	30	410	65	50	10
—Melt Index g/10 min. (5kg)	200 °C	<1	<1	<1	<1	8	<1	65
	230 °C	<1	<1	<1	5	<1	22	<1
Styrene/Rubber Ratio	30/70	30/70	30/70	30/70	33/67	13/87	31/69	30/70
Physical Form	Fluffy Crumb	Powder/ Fluffy Crumb	Powder/ Fluffy Crumb	Fluffy Crumb	Fluffy Crumb	Dense Pellet	Dense Pellet	Dense Pellet
Diblock, %	-	<1	<1	<1	<1	29	-	70
Comments	FDA							

(1) ASTM method D412 tensile tester grip separation speed 10 in./min.

(2) Typical properties determined on film cast from toluene solution

(3) Typical values on polymer compression molded at 177 °C

(4) Neat polymer concentration in toluene

Maleated SEBS Polymers

These are typical values and should not be used to set specifications.

Kraton FG Polymer Grades		
Property	FG1901 (SEBS) Linear	FG1924 (SEBS) Linear
Tensile Strength, MPa ¹	34	23
300% Modulus, MPa ¹	-	-
Elongation at Break, % ¹	500	750
Hardness, Shore A (10 sec) ²	71	49
Specific Gravity	0.91	0.89
Brookfield Viscosity, 25%W ³ (toluene solutions) cps at 25 °C 10%W	5,000	19,000
	110	270
Melt Index g/10 min (5kg)	200 °C	5
	230 °C	22
Styrene/Rubber Ratio	30/70	13/87
Physical Form	Dense Pellet	Dense Pellet
Diblock, %	-1	29
Comments	FDA 1.7% bound functionality	FDA 1.0% bound functionality

(1) ASTM method D412-tensile tester grip separation speed 10 in./min.

(2) Typical values on polymer compression molded at 177 °C

These are typical properties and there may be slight differences in specific properties and test methods between the regional versions of the grades.

Kraton G Polymers: Summary of Properties

These are typical values and should not be used to set specifications.

Kraton EP Based Polymers and Oil-Extended EB Based Polymers							
Property	G1701 (SEP) Diblock	G1702 (SEP) Diblock	G1730 (SEPS) Linear	G1750 (EP)n Star	G1765 (EP)n Star	G4609 (SEBS) Linear	G4610 (SEBS) Linear
Tensile Strength, MPa ^{1,2}	2	2	20	<0.3	<0.3	-	-
300% Modulus, MPa ^{1,2}	-	-	-	-	-	-	-
Elongation at Break, % ^{1,2}	<100	<100	>800	100	120	-	-
Hardness, Shore A (10 sec) ²	64	41	61	11	12	22	36
Specific Gravity	0.92	0.91	0.90	0.86	0.86	-	-
Brookfield Viscosity, 25%W ³ (toluene solutions) cps at 25 °C 10%W	>50,000	50,000	1,980	8,700	12,800	11,000	>50,000
	-	280	35	140	1,805	50	240
Melt Index g/10 min. (5kg)	200 °C	<1	<1	3	8	<1	<1
	230 °C	<1	<1	11	-	<1	<1
Styrene/Rubber Ratio	37/63	28/72	20/80	0/100	0/100	33/67	33/67
Physical Form	Powder	Powder	Dense Pellet	Bale	Bale	Powder	Powder
Diblock, %	100	100	<1	-	-	<1	<1
Comments	FDA	FDA	FDA	FDA	FDA	FDA	FDA

(1) ASTM method D412 tensile tester grip separation speed 10 in/min

(2) Typical values on polymer compression molded at 177 °C

(3) Neat polymer concentration in toluene

Kraton™ Compounds: Summary of properties

These are typical values and should not be used to set specifications. "Ready to Use" compounds for injection molding and extrusion.

Kraton G Compound Grades ¹							
Property	Unit	G2705	G2832 ²	G7705	G7720	G7723	G7820
Hardness, ASTM D2240							
Injection Molded	Shore A	55	-	45	60	-	91
	Shore D	-	-	-	-	-	41
Extruded	Shore A	54	44	-	-	78 ⁴	-
Tensile Properties ASTM D412¹							
Tensile Strength	MPa	6	11 ³	4	5	17	12
300% Modulus ¹	MPa	2.8	1.4 ³	2.1	2.4	12.1 ⁴	6.2
Elongation at Break ¹	%	700	620 ³	700	300	400 ⁴	650
Tear Resistance, ASTM D-624, Die C	KN/m	24.5	-	17.5	22.8	-	49.1
Specific Gravity		0.90	0.90	1.18	1.19	0.94	1.14
Melt Index g/10 min. 200 °C, 5kg		-	13	-	-	<1	-
Physical Form		Dense Pellet	Dense Pellet	Dense Pellet	Dense Pellet	Dense Pellet	Dense Pellet
Standard Color		Translucent	Translucent	Natural, Black	Natural, Black	Amber Black	Natural, Black
Ozone Resistance	Stressed	High	High	High	High	High	High
	Unstressed	High	High	High	High	High	High
Comments		FDA	FDA	-	-	-	-

(1) Values are typical of injection molded samples except where noted
(2) Film grade
(3) Tensile values are typical of extruded samples
(4) Typical values on polymer composition compression molded at 204 °C for Kraton G

These are typical properties and there may be slight differences in specific properties and test methods between the regional versions of the grades.



Our Core Values

Safety. Integrity. Verve. Relationships. Innovation. Results.

These are the values that have guided Kraton's culture and character since its inception. Our team is dedicated to the highest standards of safety, compliance, product stewardship, and world-class customer service. Along with our reputation for innovation and excellence, it's an important part of the reason why our customers choose us again and again.

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Disclaimers

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If the finished article is intended for use in food contact and packaging applications, toys, or other human contact areas, manufacturers of the final product should observe all relevant regulations. Some of these regulations require tests to be carried out on the final product, such as migration. These are the responsibility of the final product manufacturer.

Information on the food packaging clearances of individual products is available from Kraton Polymers, LLC.

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Kraton Polymers' products should not be used in any devices or materials intended to be implanted in the human body as defined by the U.S. Food and Drug Administration (FDA) under 21 CFR 812.3(d) and 21 CFR 860.3(d).

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(exclusive of packaging or delivery applications)
- ▶ 2. Drugs and other pharmaceuticals
(exclusive of packaging or delivery applications)
- ▶ 3. 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.

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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," by British Rubber Manufacturers Association Limited (<http://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 Kraton 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 that, by all accounts, are non-toxic and biologically inactive.

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