Kraton

Giving Innovators Their Edge

# Polymers and Compounds

Product and Application Guide

# GIVING INNOVATORS THEIR

## Kraton Polymers, LLC

### *Who We Are*

Almost 50 years ago, Kraton Polymers, LLC 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 the 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.

## 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.

# EDGE

## *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 (Tg) 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 provides 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.

## Kraton Isoprene Rubber and Latex (IR Latex)

With Kraton's new solid IR rubber and IR latex, the company has branched out from the SBC world. Kraton 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. Kraton IR is supplied as a solid in bale form or as a latex (65% solids).

# APPLICATIONS

## *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, waterproofing, and surface protection.

**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 our 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 grades, 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 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.

# APPLICATIONS

## *Advanced Materials*

Kraton adds 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. 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.

**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**—Kraton polymers break through the previous processing barriers of SBCs to provide flexibility and stretch for functional nonwoven applications. Superior softness, biaxial stretch, and durability are achieved with two options for spunbond (MD6705 and G1643) and one for melt blown (MD6717).

Pellet-to-fabric is now possible, creating new types of nonwovens for hygiene and apparel products including diapers, trainers, adult incontinence, feminine care, wound dressings, medical and protective apparel, and uniforms. Aesthetic properties can be improved with dying, printing, and texturing for durable or single use applications.

Kraton polymers are available in commercial quantities for high-speed spinning processes. These fabrics can be manufactured in fewer steps than most commercial elastic laminates. No pre-drying of the polymer is required and they remain elastic after aging. Spunbond grades utilize an elastic Kraton polymer core in bicomponent fibers, coextruded, and spun with polypropylene, polyamide, or polyester sheaths.

**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 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 compatability 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.

# APPLICATIONS

## *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.

**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 underlayments, 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

### *Kraton 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 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 lattices are also strong, soft, elastic, and clear. Kraton 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'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 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 D (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 |
| Tensile Strength, MPa [1,2] | 20 | 4 | 32 | 8 | 2 | 15 | 8 | 21 | 28 | 10 | 28 |
| 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 |
| 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 |
| Set at Break, % [1,2] | 10 | 20 | - | 15 | 20 | 26 | - | - | - | - | - |
| Hardness, Shore A[3] (10 sec.) | 45 | 23 | 42 | 33 | 30 | 54 | 44 | 32 | - | 25 | 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 |
| Brookfield Viscosity cps at 25° C | 1,100 | 600 | 900 | 500 | 340 | 340 | 500 | 1,200 | 120 | 900 | 300 |
| Melt Index g/10 min (200 °C/5kg) | 3 | 24 | 9 | 33 | 25 | 4 | 15 | 12 | 35 | 22 | 12 |
| 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 |
| Physical Form | Porous Pellet | Dense Pellet | Dense Pellet | Dense Pellet | Dense Pellet | Porous Pellet | Dense | Dense Pellet | Porous Pellet | Dense Pellet | Dense Pellet |
| Diblock, % | 18 | 55 | <1 | 33 | 66 | 30 | 30 | 19 | <1 | 38 | <1 |
| Comments | FDA | FDA | FDA | FDA | FDA | FDA | FDA | FDA | FDA | FDA | FDA |

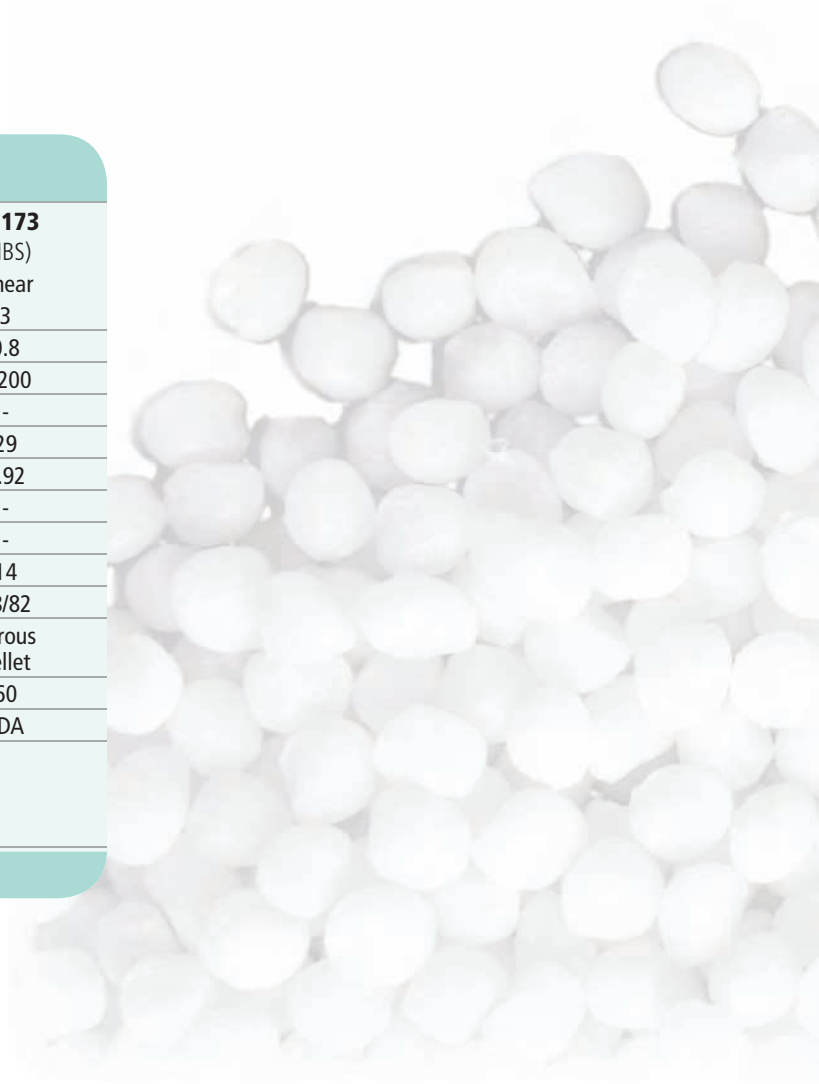
(1) ASTM method D412-tensile tester jaw separation speed 10 in./min
(2) Typical properties determined on film cast from toluene solution
(3) Typical values on polymer compression molded at 177 °C
(4) Neat polymer concentration 25% in toluene

## Kraton D (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 in toluene



| D1165 (SIS) Linear | D1183 (SIS) Linear | D1193 (SIS) Linear |
|---|---|---|
| 21 | - | 18 |
| 3 | - | 2.6 |
| 1,200 | - | 1,200 |
| - | - | 20 |
| 59 | - | 53 |
| 0.93 | - | 0.93 |
| 330 | - | 400 |
| 7 | 14 | 14 |
| 30/70 | 16/84 | 24/76 |
| Dense Pellet | Porous Pellet | Dense Pellet |
| 20 | 38 | 20 |
| FDA | FDA | FDA |

## Kraton D Oiled 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 °/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 (IR) Summary of Properties

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

### Kraton D (IR) Polymer Grades

| Property | IR307 (I) Linear | IR310[1,2] (I) Linear | IR401[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 (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) Radial | 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 | 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 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 | D3158 |
|---|---|---|---|---|---|
| **Hardness**, ASTM D2240 | | | | | |
| Compression Molded[3] | Shore A | - | - | - | 39 |
| 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 | 0.98 |
| **Melt Index** g/10 min | 200 °C/5kg | 22 | 15 | 21 | - |
| **Physical Form** | | Dense Pellet | Dense Pellet | Dense Pellet | Porous Pellet |
| **Standard Color** | | Clear | White, Natural | Natural | Black |
| **Ozone Resistance** | Stressed | Poor | Poor | Poor | - |
| | Unstressed | Fair | Fair | Fair | - |
| **Comments** | | FDA | FDA | FDA | Asphalt Modifier |

(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

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 A Polymers

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

### Kraton A Polymers

| Property | A1535 Linear | A1536 Linear |
|---|---|---|
| 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%w4) | 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 Linear | G1641 Linear | G1642 Linear | G1643 Linear | G1645 Linear |
|---|---|---|---|---|---|
| Tensile Strength, MPa[1,2] | >20 | >20 | >21 | >10 | 10 |
| 300% Modulus, MPa[1,2] | 4.5 | 4.3 | - | - | |
| Elongation, %[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[4]) | >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

## 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 | | 5,000 | 19,000 |
| (toluene solutions) cps at 25 °C | 10%w | 110 | 270 |
| Melt Index g/10 min (5kg) | 200 °C | 5 | 11 |
| | 230 °C | 22 | 40 |
| Styrene/Rubber Ratio | | 30/70 | 13/87 |
| Physical Form | | Dense Pellet | Dense Pellet |
| 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

## Kraton G 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%w[4] | | - | 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 | <1 | 8 | <1 | 65 |
| | 230 ˚C | <1 | <1 | <1 | 5 | <1 | 22 | <1 | >100 |
| 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 | Powder Fluffy Crumb | Powder/ Fluffy Crumb | Dense Pellet | Powder | Dense Pellet |
| Diblock, % | | - | <1 | <1 | <1 | <1 | 29 | - | 70 |
| Comments | | FDA | FDA | FDA | 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 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] | | >50,000 | 50,000 | 1,980 | 8,700 | 12,800 | 11,000 | >50,000 |
| (toluene solutions) cps at 25 ˚C | 10%w | - | 280 | 35 | 140 | 1,805 | 50 | 240 |
| Melt Index g/10 min. (5kg) | 200 ˚C | <1 | <1 | 3 | 8 | 4 | <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 |
| | | | | | | With 12% oil | G1651 With 45% oil | G1651 With 31% oil |

(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 D412[1] | | | | | | | |
| 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

## *Our Core Values*

Integrity. Teamwork. Relationships. Problem-solving. Resilience. 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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Kraton
Giving Innovators Their Edge

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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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- 1.Cosmetics (exclusive of packaging or delivery applications);
- 2.Drugs and other Pharmaceuticals (exclusive of packaging or delivery applications); and
- 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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