kuraray

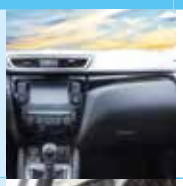
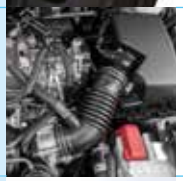
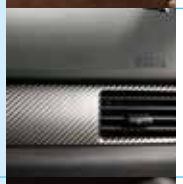
Kuraray's Elastomers

Automotive Applications

Kuraray's Elastomers
Improving safety and quality on the road

The challenges for the automotive industry are constantly changing: emissions & noise reduction, performance & safety improvement, light weighting, interior air quality, greater comfort and affordability. Kuraray helps achieve these goals by providing a wide range of high performance materials combined with expert technical service ensuring you find the right solution for your specific requirements.

Automotive applications examples

Field		Application	Product	Function
INTERIOR		Soft-Touch Over Molding	SEPTON™	Soft-touch Good adhesion force to Polyolefin
EXTERIOR		Structural Adhesives Coatings	Kuraray Liquid Rubber (K-LR)	Adhesion promoter
		Molded Parts Sealants	SEPTON™ HYBRAR™ Kuraray Liquid Rubber (K-LR)	Broad temperature range performance, Light weight, shock absorbing
UNDER THE HOOD		Hoses and Gaskets Cables	SEPTON™ V-series Kuraray Liquid Rubber (K-LR) SEPTON™	Long term compression set Low VOC Improved compression set
DECORATION AND PROTECTION		Protective Films	SEPTON™ HYBRAR™ HSFC*	Clean removability Damping High Adhesion
		Spray-able Films	SEPTON™	Creep resistance Hysteresis
		Decorative Films	SEPTON™ Q-series	Noise Reduction Abrasion Resistance
TIRES		Tires	Kuraray Liquid Rubber (K-LR)	Reactive plasticizer Grip improver

*Hydrogenated Styrene-Farnesene Copolymer

INTERIOR

Soft-Touch Over Molding

SEPTON™ 4000-series provides excellent oil retention due to its novel soft block structure. Using SEPTON™ 4000-series helps avoid discoloration and staining caused by oil migration. Good haptics, excellent adhesion to common thermoplastics and wide hardness ranges are key advantages of soft-touch over molding with Kuraray's elastomers. Typical applications include grips, airbag-covers and molded parts for impact modification.

EXTERIOR

Kuraray's Elastomer products are often used in various automotive exterior applications. The most popular ones are introduced in the following applications.

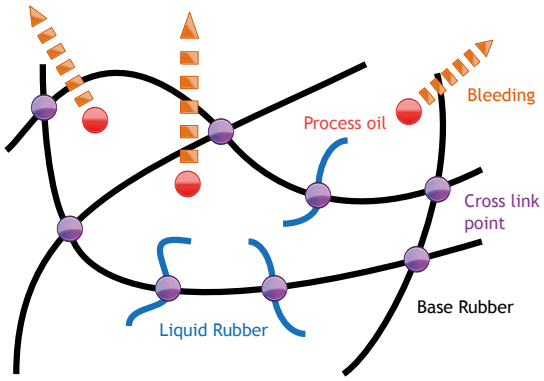
Structural Adhesives

Kuraray Liquid Rubber

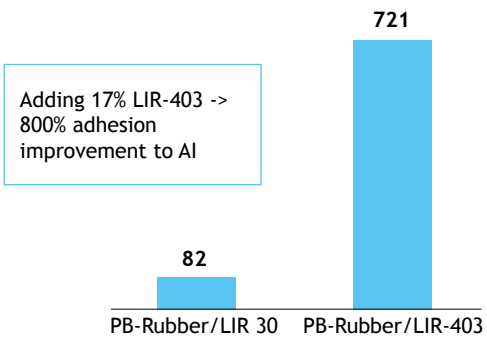
For automotive adhesives we have developed selected copolymers with diverse functionalities. LIR-403 and -410 are carboxylated Liquid Isoprene Rubber (LIR) for improving adhesion to metal surfaces. Other Kuraray Liquid Rubber (K-LR) copolymers contain vinyl-groups for tailored damping performance. Both LIR & LBR (Liquid Butadiene Rubber) can be incorporated into adhesive and sealant formulations for sharp property modifications. In specific cases, LIR & LBR can also be used as primary components. These properties lead to longer product life times with enhanced sound and damping performance.

Key features

- Broad cold temperature performance
- Sound dampening
- Low VOC's
- Adhesion promoter
- Reactive binder



Mechanism scheme of Liquid Rubber versus process oil in vulcanized base rubber.



Max. load (N) (adhesion) to aluminium -> Improved adhesion with functionalized Liquid Rubber

Tested by Kuraray Co. Ltd.

Sealants

SEPTON™ and HYBRAR™

Various grades of SEPTON™ and HYBRAR™ deliver excellent adhesive properties combined with improved temperature and weather resistance for automotive sealants. Certain grades of HYBRAR™ can be foamed and cured during the paint curing process for added damping performance. SEPTON™ 4000-series and SEPTON™ V-series exhibit excellent tensile properties, compression set and oil resistance while maintaining a good surface smoothness.

Formulation example with SEPTON™ 4000-series

Product		S4055	S4077	S4099
SEPTON™ 4055		100		
SEPTON™ 4077			100	
SEPTON™ 4099				100
Paraffin Oil		120	120	120
Homo PP		45	45	45
Properties	**unit**			
Hardness (Initial)	Type A	70	70	70
100% modulus	MPa	1.9	1.8	1.9
Tensile strength	MPa	12.8	13.5	13.2
Elongation	%	820	860	800
Compression set @70C-22h	%	38	36	36
CS @100C-22h	%	50	44	41
CS @120C-22h	%	55	50	45
MFR (230C-5kg)	%	29	28	16

Kuraray Liquid Rubber

The narrow molecular weight distribution of Kuraray Liquid Rubber (K-LR) ensures minmal residuals (low VOC's) for improved quality. With its low glass transition temperature (Tg), K-LR allows formulators to tailor performance over a broad temperature range.

UNDER THE HOOD

Hoses, Gaskets and Cables

Component	Phr.
EPDM	100
Carbon black	50
Paraffinic oil	25
Peroxide	4
PBd Coagent	10

Liquid Butadiene Rubber

Liquid Butadiene Rubber (LBR) is used in high performance crosslinked rubber applications where high operating temperatures are common. Kuraray has a range of Liquid Rubbers with high vinyl contents (e.g. LBR-361). These materials provide two functions. First, as a reactive plasticizer without bleeding. Second, they improve curing kinetics similar to conventional coagents. The crucial advantages of incorporating LBR into EPDM rubber include optimum hardness compression set improvement, high hardness compounds, processability, metal adhesion, low VOC's and no migration with excellent curing kinetics.

	Control-1 No Coagent	LBR-361 High Vinyl Type PBd
MW	-	5500
Mooney Viscosity (100 °C)	58	47
Hardness (Shore A)	51	57
Tensile Strength (MPa)	16.5	11.4
Elongation (%)	760	311
Modulus 100% (MPa)	1.2	2.0
Modulus 300% (MPa)	4.9	11.0
Compression Set** (%)	27.1	9.3

** After 72h at 100°C, 25% deformation

SEPTON™ 4000-series

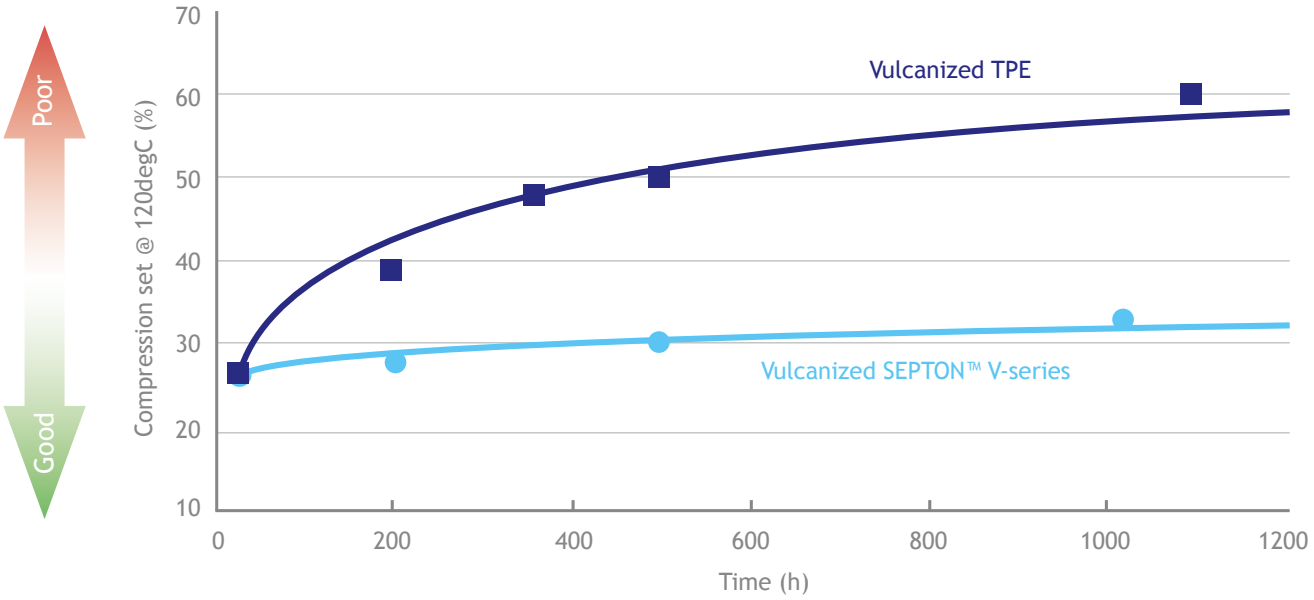
In particular SEPTON™ 4000-series with its high loading capacities is widely used in cable applications.
The main benefit is to combine thermoplastic processing and adequate elasticity over a wide temperature range.

SEPTON™ V-series

SEPTON™ V-series is a block copolymer with reactive and cross-linkable hard and soft blocks. Crosslinked SEPTON™ V-series compounds exhibit excellent heat resistance, long term compression set and oil resistance while maintaining good rubber-like properties even at low temperatures.

Compression Set Over Time

SEPTON™ V-series
Compromise of TPE and Cured Rubber Crosslinkable Hard Block for Durable Performance



Tested by Kuraray Co. Ltd.

Excellent properties for long lasting weather seals

DECORATION AND PROTECTION

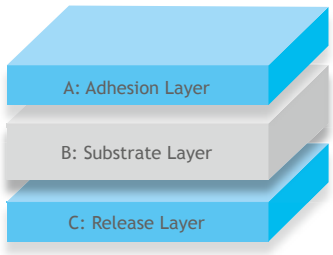
Protective Films

Various grades of SEPTON™ and HYBRAR™ are used in protective films. The core chemistry is based on styrenic-block copolymers and allows design flexibility in customizing tack adhesion, strengthening ultimate tack, and residue-free removal.
Especially in films for transportation protection or in colored films for temporary color changes Kuraray's products SEPTON™ and HYBRAR™ offer solutions for all needs.

Key features

- High clarity films
- Direct processing without previous compounding
- Lower overall structure costs

Film Sample Schemata



Film Receipe Example

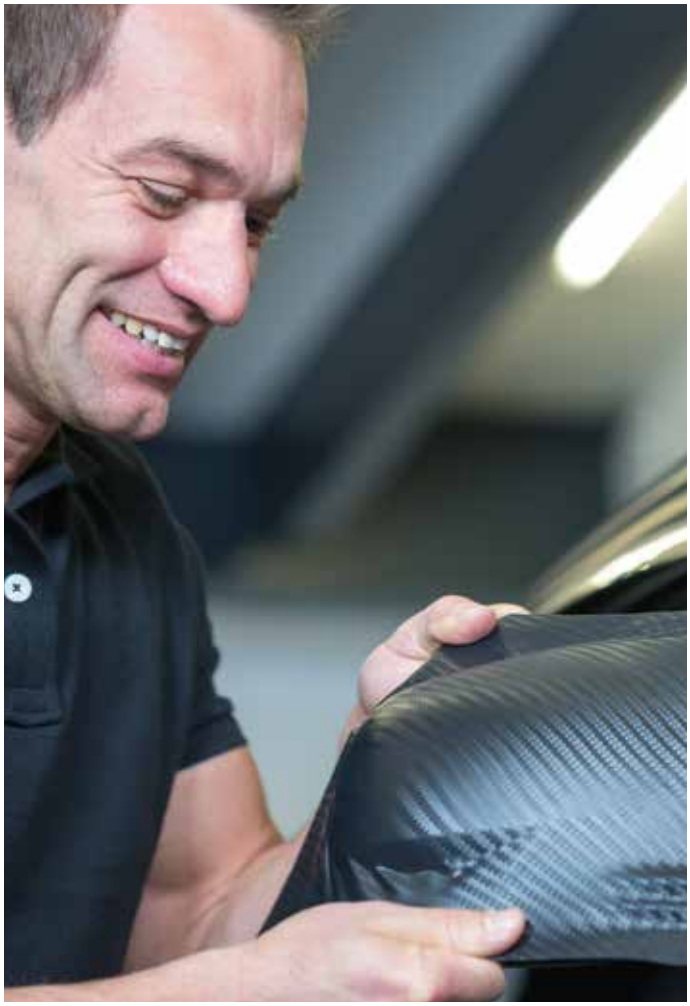
Layer	Excellent Adhesion	High Adhesion
A	100% **SEPTON™ 2063**	100% **HYBRAR™ 7311F**
Adhesive Layer	36 Shore A	41 Shore A
10 µm	MFR 7.0 (230°C/2.16kg)	MFR 2.0 (230°C/2.16kg)
B	100% **Random PP**	100% **Random PP**
Substrate Layer		
30 µm	MFR 4.5 (230°C/2.16kg)	MFR 4.5 (230°C/2.16kg)
C Peel Adhesion (N/25mm)	10.0 (PMMA)	7.0 (PMMA)

Measured by Kuraray
Test method: JIS Z0273

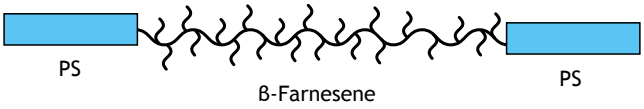
Pure Polymer Recommendations

Protective Films (Newly Developed Bio-based HSFC*)

Hydrogenated Styrene-Farnesene Copolymer



Utilizing a new renewable monomer called ß-farnesene, Kuraray has developed a new hydrogenated styrene-farnesene copolymer (HSFC) with a unique chemical structure and differentiated properties. HSFC exhibits strong and stable adhesion force across a wide temperature range and has excellent removability without leaving residues, making it ideally suited for use in protective film applications.



HFSC is a newly developed styrenic block copolymer having a hydrogenated farnesene soft block.

Key features

- Good temperature stability like other Hydrogenated Styrene Block Copolymers
- Excellent adhesion without the need for tackifier or plasticizer
- Good film processability with SF-904

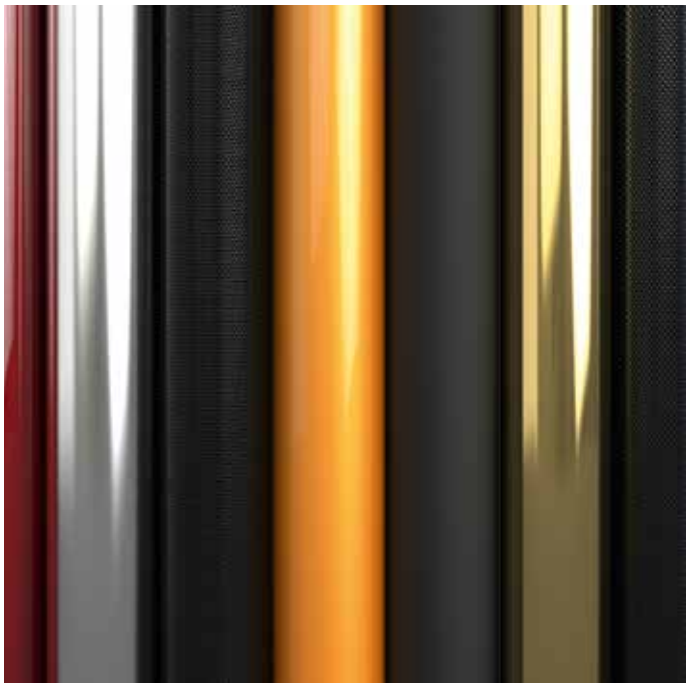
Spray-able Films

Another new application area for SEPTON™ and HYBRAR™ are spray able films. Both SEPTON™ and HYBRAR™ can be easily dissolved in solvent for further processing into a spray-able film formulation. The readymade solution can be bottled in spray cans or multiple use tanks.

Applications

- Temporary protection films
- Spray-cans for car tuning parts
- Stone chipping protection

Decorative Films



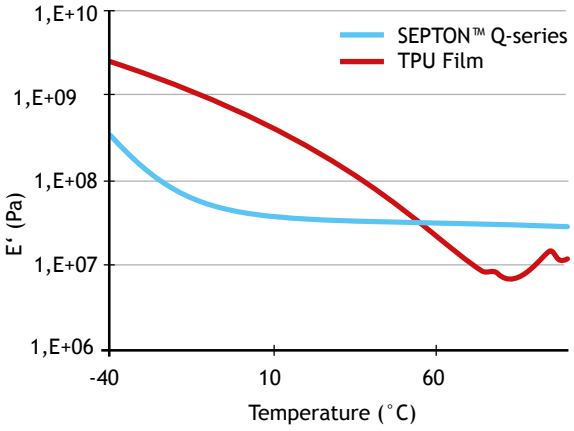
SEPTON™ Q-series is a new HSBC (hydrogenated styrenic block copolymer) with outstanding abrasion resistance, light weight, temperature resistance and weatherability. The product is synthesized with a new polymerization technology and is compatible with Polyolefins and PMMA. This provides the potential for new polymer combinations.

For soft touch applications, SEPTON™ Q-series delivers excellent softness and elasticity. Its enhanced durability shows high UV resistance as well as scratch and abrasion resistance. SEPTON™ Q-series is compatible with polyolefins and suitable for co-extrusion and over molding. The biggest advantage compared to TPU is its non-polarity which makes the material compatible with commodity plastics such as PP.

SEPTON™ Q-series film for co-extrusion with high durability and possibility for co-extrusion with commodity Polyolefin resins

	TPU	SEPTON™ Q-series
Abrasion	Excellent	Excellent
Density	-1,20	-1,04
Polarity	Polar	Not Polar
UV Resistance	-/+	++

Temperature Dependency of Elastic (Storage) Modulus (DMA)



Tested by Kuraray Co. Ltd.

SEPTON™ Q-series film has moderate temperature dependency of elastic modulus.

TIRES

Kuraray Liquid Rubber

Kuraray Liquid Rubber (K-LR) offers various application possibilities for tire manufacturing. Different grades can be processed in certain tire parts to contribute to a long lasting quality product. K-LR is a favored component in the production of high performance tires. It reduces Mooney viscosity which minimizes migration while improving the processability of the rubber compound in tires. K-LR enhances tire performance significantly by simultaneously controlling the balance of grip, fuel efficiency and wear resistance. K-LR is crosslinkable for superior performance and longer shelf life.

1 *Beadfiller/APEX:*

High hardness with excellent processability
Improved dimensional stability
Better filler dispersion
LIR-50, LBR-300*

2 *Side wall / Carcass:*

Improved dimensional stability
Enhanced surface smoothness of calendered sheet
Lower mill shrinkage
Better green tackiness
Higher production rates
LIR-50, LBR-302, LBR-307

3 *Rim cushion:*

Good balance of processability and physical properties
Improved abrasion resistance
LIR-50, LBR-300*

4 *Tread:*

Improved dynamic and physical proterties (tanδ)
Excellent abrasion resistance, wet and ice grip
Excellent extrudability
LIR-50, LBR-302, LBR-307,
L-SBR-820, L-SBR-841

5 *Cushion:*

Enhanced surface smoothness of calendered sheet
Reduced extrusion temperature
Better green tackiness
Improvement of dynamic properties
LIR-50, LBR-302, LBR-307

*Developmental Grade

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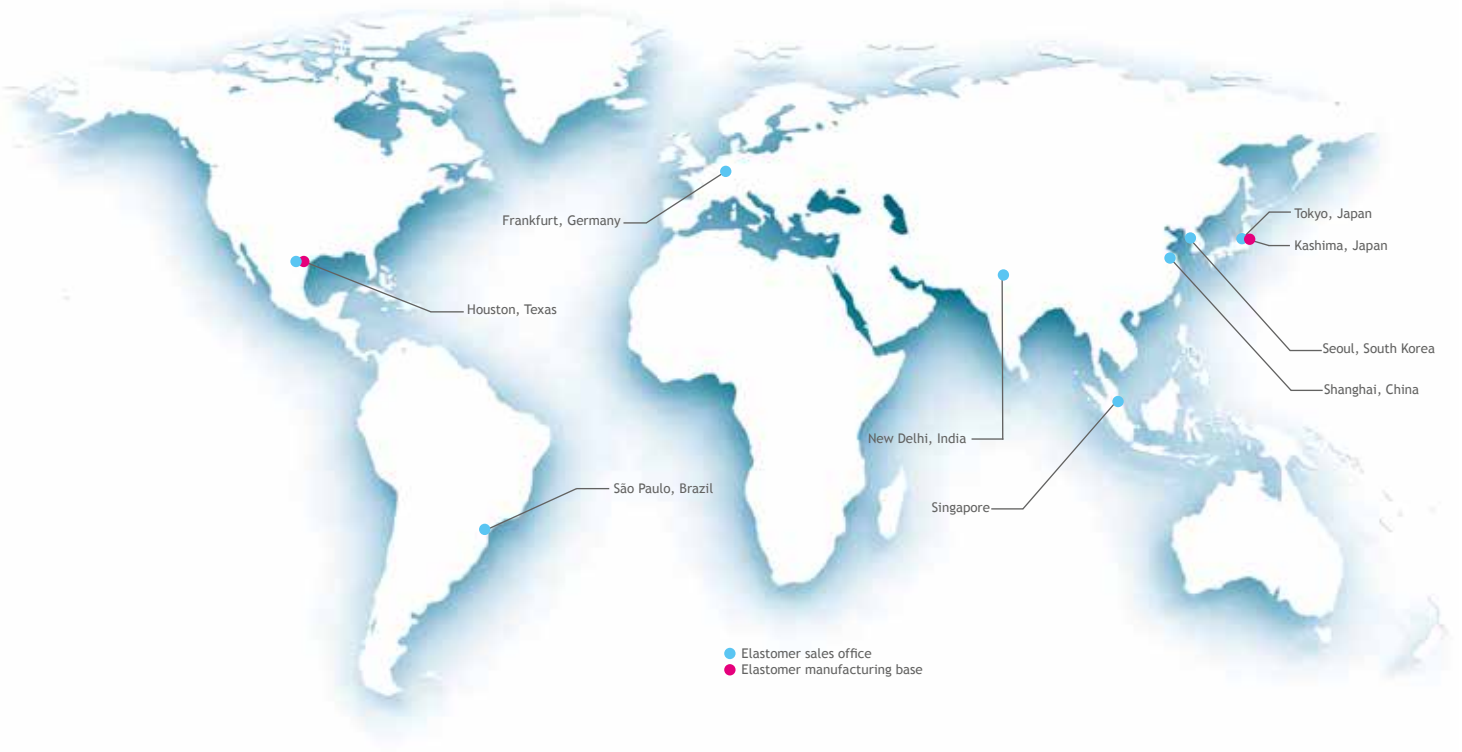
Adding value to your products – worldwide



Kuraray is a world leader in specialty chemicals and functional materials. We are committed to developing products that ensure quality and value while helping our customers differentiate themselves from their competition.

The history of Kuraray's Elastomer division started in 1972 with the production of polyisoprene rubber and the development of new rubber materials based on Isoprene in the Kashima plant. From the first production line, the Elastomer Division continuously grew and invented new products such as Kuraray Liquid Rubber, ISOBAM, SEPTON™, HYBRAR™, and KURARITY™.

Kuraray strives to develop new and innovative high performance products for customers around the globe. If you would like to know more about Kuraray's Elastomer products please also visit our website *www.elastomer.kuraray.com*

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