



TOSOH COATINGS PRODUCTS

DIFFERENTIATE YOUR PRODUCTS
WITH TOSOH TECHNOLOGY



TOSOH CORPORATION

The Chemistry of Innovation

Tosoh Corporation is the parent company of a Japanese chemical and specialty products and materials group that comprises over 100 companies worldwide and a multiethnic workforce of more than 12,000 people.

Tosoh was established in 1935 and is listed on the First Section of the Tokyo Stock Exchange. In the 80 years that we have been in business, we have built balanced product lines of commodity chemicals for industry and of specialty products and materials for high technology and niche markets.

Tosoh's principal markets include the chemical and petrochemical, construction, automotive, consumer electronics, information technology, bioscience, and environmental markets.

With over 1,500 products, Tosoh, in short, is a global chemical company that supplies manufacturers with the materials they need to produce the things that make modern life all that it is and everything it can be.

Expertise in Coatings

Almost since its inception, Tosoh has been involved in the coatings market in Asia, primarily Japan and China.

Many of the products have been developed by Tosoh researchers to fulfill a specific functional or property not available commercially.

In the pages that follow, you will find information on a wide variety of products from specialty matting agents and unique monomers to specialty polymers that can add value by enhancing a wide variety of coatings.

Matting Agents

Nipsil® Ordinary Silica

Rubber applications

Precipitated silica provides powerful reinforcement properties and can be blended for transparency or bright colors, and is widely used in various rubber fields. It has properties that are different from carbon black, and is also used in combination with carbon black in order to improve adhesiveness, tear resistance, heat resistance, and other characteristics. Nipsil is used in the manufacture of such rubber products as belts, hoses, rolls, footwear, industrial supplies, sponges, tapes, pastes, other products.

Grade	Characteristics
VN3	This is a typical highly active grade providing excellent reinforcement properties and transparency.
AQ	Semi-granular grade of VN3 with excellent workability. This variety is well suited for Bunbury mixing.
LP	This highly active grade features excellent reinforcement properties and transparency, and is well suited for use in low-viscosity blends, silicon rubber, special rubbers, and adhesives.
NA	This grade features fast vulcanizing speed and reinforcement properties on the same level as VN3.
ER	This is a moderately grade variety that provides good workability, with excellent low compression strain and other properties.
ER-R	This ER high bulk density grade offers good workability.
RS-150	This grade features excellent elasticity and compression strain.

Tire applications

Blending with precipitated silica has the effect of reducing rolling resistance. It also provides excellent handling properties on wet roads, and is used as a tire reinforcement filler.

Grade	Characteristics
AQ	This variety is a highly active micro-granular type with superior reinforcement properties, and features excellent tear strength (cracking prevention) and rebound resilience (lower rolling resistance).

Matting Agents

Nipsil® Ordinary Silica

Agricultural applications

Utilizing the high oil absorption capability resulting from its large pore volume, precipitated silica is used as a carrier for chemicals. It is also used in grinding aids, anticaking agents, modifiers and other products. For the agricultural industry, Nipsil is used in the manufacture of powders, granules and wettable powders.

Grade	Characteristics
NS NS-T NS-K NS-KR	These grades have higher oil absorption capability than conventional silica.
NA	This is an alkali grade with high oil absorption capability.

Other applications

Precipitated silica is an agglomerate, and by controlling the balance of cohesive forces and the aggregated structure, it can be used as an impregnant, thickener, flow modifier, anti-caking agent, or other modifier.

Grade	Characteristics
KP	This is a high oil-absorption grade with improved oil retention force.
L-300	This is a highly active grade with small grain sizes, providing excellent reinforcement properties and transparency.
KQ	This granular grade offers superior flow characteristics after being impregnated with a fluid.
NS-P	High oil-absorption capability (used in paper applications)

Matting Agents

Nipsil® Special Grade Silica

These are ultrafine particles created by controlling the cohesiveness of the precipitated silica particles. The particle size distribution is sharp, and the material demonstrates good dispersibility. It is used as a matting agent in paints, and also as an additive in various other fields.

Grade	Applications
E-200A, E-220A, K-500, E-1009, E-1011, E-1030, E-150J, E-170, E-200, E-220	Paints, matte inks, modifiers, laser surface treatment agents
E-743, E-75, E-220A, HD, HD-2	Thermal paper, other information papers
L-250, G-300, E-220A	Defoaming agents
E-150J, E-220, E-74P, N-300A	Special rubbers (reinforcement agent, other purposes)
E-200A, E-220A, HD-2	Resins (anti-blocking agent)
E-200A, E-220A, N-300A	Adhesives, grinding agents, thickeners, flow modifiers, others

Nipsil Surface Treated Silica

Surface treatment using various treatment agents is performed for the surface of precipitated silica in order to give it properties which ordinary silica does not possess. Surface treated silica has good water-repellent properties, and combines well with resins and similar substances, providing excellent water resistance, moisture barrier properties, and other characteristics.

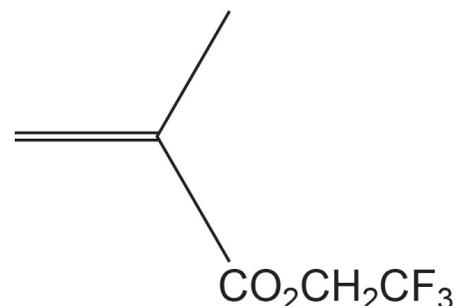
Grade	Applications
SS-10, SS-15, SS-115, SS-50	Defoaming agents (various solutions)
SS-70, SS-72F, SS-50B	Printer inks
SS-50B, SS-170X, SS-178B, SS-50A	Paints, matting agents
SS-30P, SS-50	Anti-caking and flow modification
SS-30P, SS-30V	Special rubber reinforcement fillers
SS-30P, SS-30X, SS-50, SS-70	Silicon rubber
SS-50, SS-70	Electrostatic recording paper

Unique Monomers

Fluorester®

Fluorester® is Tosoh's brand of 2,2,2-trifluoroethylmethacrylate (CAS# 352-87-4). With its relatively high Q and e values it is a versatile monomer and has found its way into a variety of applications.

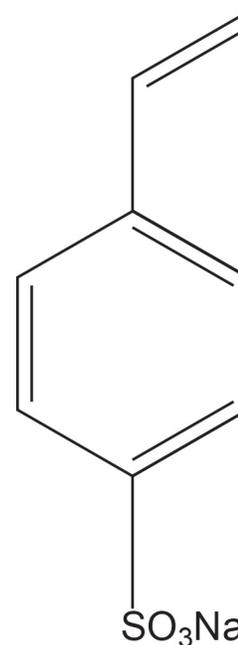
Properties	Lowest cost fluorinated monomer Anti-scuff Anti-graffiti High Q and e values Oil repellence Water repellence Improved optical properties – solar panels
Main applications	Paints and coatings – anti scuff Optical fibers – minimize light loss Contact lenses – oxygen diffusion Optical diffusion panel - minimize light loss/ self-cleaning Toners Photoresists



SPINOMAR® NaSS

SPINOMAR® NaSS is Tosoh's trade name for its sodium styrenesulfonate (CAS# 2695-37-6). With the inductive effect of the sulfo- radical on the para position against the vinyl group, SPINOMAR® NaSS possesses the highest reactivity (polymerization activity) among all sulfonated vinyl monomers.

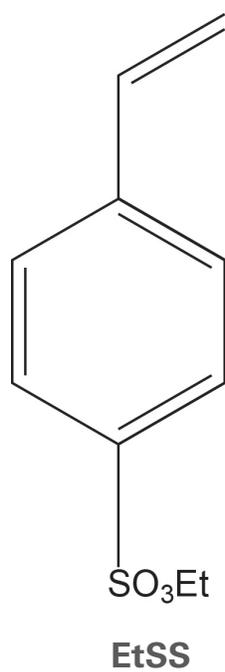
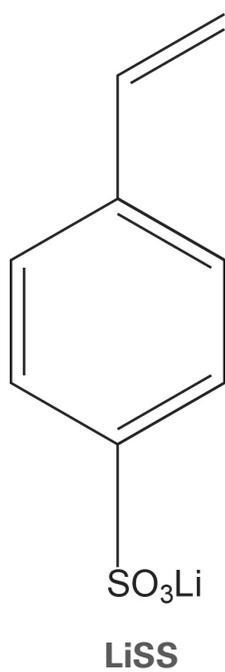
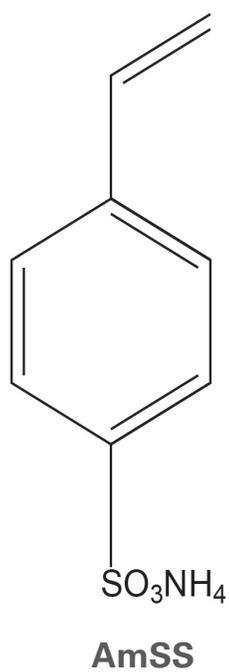
Properties	Reactive emulsifiers Dispersants Scale inhibitor Anti-static Anti-scalant, Sizing agent, Dispersant – surface activity Membrane, Allergen catcher – cation exchange capacity Reactive soap – excellent radical reactivity
Main applications	Dye improving agents for acrylic polyester fibers Anti-static agents for plastic, paper and textiles High temperature resistance - 400° C Emulsion coatings and adhesives – reactive surfactant Membranes Ironing aid – heat resistant (non yellowing) starch



Unique Monomers

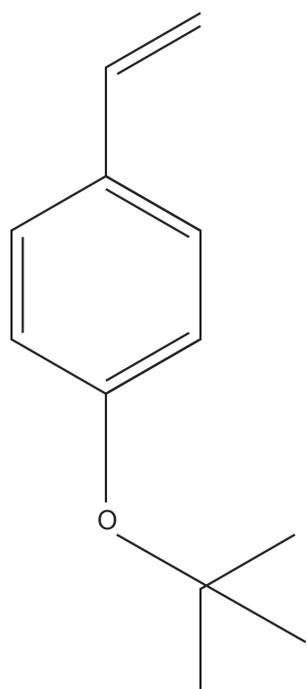
SPINOMAR[®] NaSS Analogues

SPINOMAR[®] AmSS (ammonium styrenesulfonate CAS# 19922-72-6), SPINOMAR[®] LiSS (lithium styrenesulfonate CAS# 4551-88-6) and EtSS (ethyl styrenesulfonate CAS# 16736-98-4) are also available for specialized applications such as ion exchange membranes.

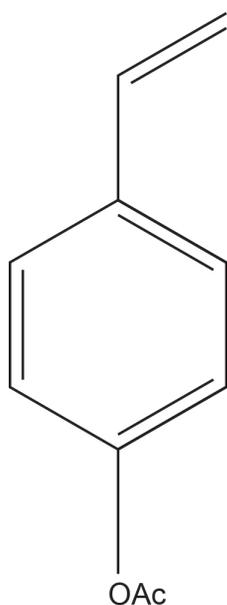


Unique Monomers

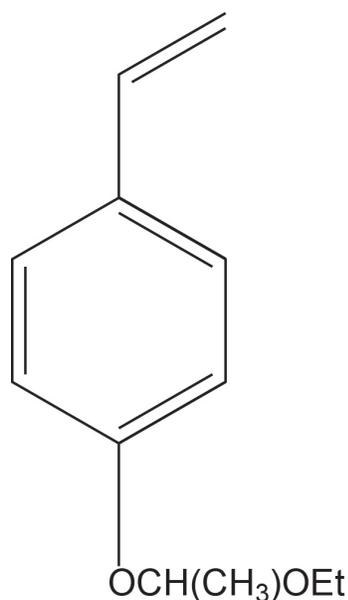
Additional Styrene Monomers



PTBS



PACS



PEES

Polymeric SPINOMAR® NaSS

A polymeric solution of NaSS (Poly-NaSS) and a variety of NaSS co-polymers are available. Poly-NaSS has 4 MW averages and there are three co-polymer (methacrylate, hydroxyethyl-methacrylate and styrene). In addition, ultrahigh molecular weights are available by cross linking with DVBS.

Specification	PS-1	PS-5	PS-50	PS-100	With DVBS
Average MW ($\times 10^4$)	2	5	50	100	> 1,000
Viscosity (mPa.s. 25°C)	5-10	20-50	200-500	800-1600	30,000+
Active solid (%)	~20	~20	~20	~20	~20
pH	7-9	7-9	7-9	8-11	8-11

YTZ[®] Zirconia Grinding and Dispersion Media

Tosoh's **YTZ Series of yttria stabilized zirconia grinding media** is well known for its consistency and high quality.

Advantages	<ul style="list-style-type: none"> • Higher density provides a greater impact force resulting in superior grinding efficiency. • Smooth surface, almost perfect roundness/sphericity and narrow size distribution, resulting in higher productivity grinding and dispersion. • Produced from high purity materials, has a higher wear resistance which results in minimizing product contamination from media wear. • Higher wear resistance results in less frequent media replacement. • Provides optimum results when used in wet grinding and dispersing applications, including the processing of highly viscous materials. • Resistant to rust and corrosion, and thus compatible with water based processing.
Main applications	<ul style="list-style-type: none"> • Dielectric, piezoelectric and magnetic materials • Pigments, inks, dyes, paints & coating materials • Battery and fluorescent materials • High purity advanced ceramic materials, frits, and glazes • Pharmaceutical, dental, cosmetic, and foodstuffs

Typical Properties

Chemical composition	ZrO ₂ : 95%, Y ₂ O: 5%
Specific density	6.0 g/cm ³
Bending strength	1200 MPa
Hardness (HV10)	1250
Modulus of elasticity	210 GPa
Fracture toughness	6.0 Pa m ^{0.5}

Available Sizes

Ball (Ø, mm)	0.03, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.65, 0.8, 1, 1.25, 1.5, 1.75, 2, 2.3, 2.7, 3, 5, 10, 15, 20 and 25
Cylinder (in)	3/8, 1/2

Color Chips

Our color chips dissolve to become highly dispersed and therefore various inks, toners, and others products are manufactured with a favorable gloss and transparency which cannot be achieved with ordinary film coating from milled products. There are two types of chips, NC Chips are dispersed in nitrocellulose and Resin Chips (CAB [cellulose acetate butyrate], vinyl chloride-acetate resin, acrylic resin, polyester resin, polyvinyl butyral resin, epoxy resin, chlorinated polypropylene resin, etc.).

Applications

Cosmetics	Manicures, bath agents
Rubber products	Semiconductive compounds, sporting products
IT industry	Flame retardants, colot toner, inkjet, color filters
Plastic products	Cards, colored materials, conductive materials
Paints	Construction, leather, automobiles, plastics, stationery, construction materials, UV, water based
Inks	Gravure, marker, screen, offset, magnetic tape, conductive

Pigment concentration

NC color chips (pigments dispersed in industrial nitrocellulose)	
Carbon black	10 ~ 40%
Inorganic pigments	60 ~ 80%
Organic pigments	20 ~ 60%
Resin color chips	
Carbon black	20 ~ 70%
Inorganic pigments	60 ~ 85%
Organic pigments	20 ~ 70%

Color Chips

NC Color Chips

Nitrocellulose Series	Color Index	Non Halogen	Formulation (weight %)		
			Pigment	Nitrocellulose	Plasticizer
NC 012 VIOLET	PV-23		26	56 (H1/2)	18 (DBP)
NC 014 VIOLET	PV-23		40	45 (H1/8)	15 (ATBC)
NC 088 VIOLET	PV-23		50	35 (L1/8)	15 (ATBC)
NC 089 VIOLET	PV-23		40	40 (L1/8)	20 (ATBC)
NC 111 RED	PR-3	•	35	47 (H1/2)	18 (DBP)
NC 112 RED	PR-3	•	35	47 (H1/2)	18 (ATBC)
NC 120 RED	PR-48:4		35	47 (H1/2)	18 (DBP)
NC 134 RED	PR-19	•	40	44 (H1/8)	18 (ATBC)
NC 135 RED	PR-177	•	40	45 (L1/4)	15 (ATBC)
NC 139 RED	PR-254		40	45 (L1/4)	15 (ATBC)
NC 141 RED	PR-5		35	55 (H1/2)	10 (DBP)
NC 150 RED	PR-18	•	25	55 (H1/2)	20 (DBP)
NC 154 RED	PR-63:2	•	50	56 (H1/2)	18 (DBP)
NC 164 RED	PR-58:4		35	35 (H1/4)	15 (DBP)
NC 165 RED	PR-58:4		35	50 (H1/4)	15 (ATBC)
NC 180 RED	PR-170	•	45	45 (L1/8)	10 (ATBC)
NC 181 RED	PR-48:2		45	45 (L1/8)	10 (ATBC)
NC 183 RED	PR-211		45	45 (L1/8)	10 (ATBC)
NC 189 RED	PR-170	•	45	45 (L1/8)	10 (ATBC)
NC 192 RED	PR-9		50	35 (L1/8)	15 (ATBC)
NC 196 RED	PR-146		50	35 (L1/8)	15 (ATBC)
NC 198 RED	PR-222		45	45 (L1/8)	10 (ATBC)
NC 230 ORANGE	Mixture		60	30 (H1/2)	10 (DBP)
NC 231 ORANGE	PO-13	•	60	30 (H1/2)	10 (ATBC)
NC 285 ORANGE	Mixture		45	45 (L1/8)	10 (ATBC)
NC 351 YELLOW	Mixture		75	17 (H1/2)	8 (DBP)
NC 355 YELLOW	Mixture		75	17 (H1/2)	8 (DBP)
NC 356 YELLOW	Mixture		60	30 (H1/2)	10 (ATBC)
NC 358 YELLOW	Mixture		75	17 (H1/2)	8 (ATBC)
NC 362 YELLOW	PY-139	•	35	47 (H1/2)	18 (ATBC)
NC 367 YELLOW	PY-110		35	47 (H1/2)	18 (ATBC)
NC 372 YELLOW	PY-128		35	47 (H1/4)	18 (ATBC)
NC 376 YELLOW	PY-81		30	47 (H1/2)	18 (DBP)
NC 379 YELLOW	PY-83		35	60 (H1/4)	10 (ATBC)
NC 381 YELLOW	PY-154	•	40	42 (L1/8)	18 (ATBC)
NC 383 YELLOW	PY-83		45	45 (L1/8)	10 (ATBC)
NC 395 YELLOW	PY-74	•	50	35 (L1/8)	15 (ATBC)
NC 451 GREEN	PG-7		26	56 (H1/2)	18 (DBP)
NC 452 GREEN	PG-7		35	47 (H1/2)	18 (DBP)
NC 466 GREEN	PG-36		35	47 (H1/2)	18 (DBP)
NC 481 GREEN	PG-7		45	45 (L1/8)	10 (ATBC)
NC 495 GREEN	PG-7		50	35 (L1/8)	15 (ATBC)
NC 501 BLUE	PB-27	•	30	52 (H1/2)	18 (DBP)
NC 502 BLUE	PB-27	•	30	52 (H1/4)	18 (DBP)
NC 503 BLUE	PB-27	•	30	52 (H1/4)	18 (ATBC)

Color Chips

NC 534 BLUE	PB-15:2	•	26	56 (H1/4)	18 (DBP)
NC 535 BLUE	PB-15:4	•	30	54.5 (L1/4)	15.5 (DBP)
NC 537 BLUE	PB-15:4	•	35	47 (H1/2)	18 (DBP)
NC 538 BLUE	PB-15:4	•	40	45 (H1)	15 (ATBC)
NC 539 BLUE	PB-15:2	•	26	56 (H1/2)	18 (DBP)
NC 552 BLUE	PB-15:3	•	26	56 (H1/2)	18 (DBP)
NC 558 BLUE	PB-15:6	•	40	45 (L1/4)	15 (ATBC)
NC 559 BLUE	PB-15:2	•	35	50 (H1/2)	15 (ATBC)
NC 563 BLUE	PB-60	•	40	45 (L1/4)	15 (W-2600)
NC 585 BLUE	PB-15:3	•	45	45 (L1/8)	10 (ATBC)
NC 595 BLUE	PB-15:3	•	50	45 (L1/8)	15 (ATBC)
NC 617 BROWN	PR-101	•	75	15 (H1/4)	10 (DBP)
NC 617 BROWN	PR-101	•	75	15 (H1/2)	10 (DBP)
NC 620 BROWN	PR-42	•	60	30 (H1/2)	10 (DBP)
NC 623 BROWN	PR-42	•	60	30 (H1/4)	10 (ATBC)
NC 671 BROWN	PBr-25		35	47 (H1/2)	18 (DBP)
NC 675 BROWN	PBr-23		35	55 (H1/4)	10 (DBP)
NC 683 BROWN	PR-101	•	70	23 (L1/8)	7 (ATBC)
NC 9667 BROWN	PR-101	•	40	20 (H1/4)	30 (AC) 10 (ATBC)
NC 710 WHITE	PW-6	•	75	15 (H1/2)	10 (ATBC)
NC 711 WHITE	PW-6	•	75	15 (H1/2)	10 (DBP)
NC 762 WHITE	PW-6	•	60	30 (H7)	10 (DBP)
NC 769 WHITE	PW-6	•	75	15 (H1)	10 (ATBC)
NC 780 WHITE	PW-6	•	75	15 H(1/2)	10 (ATBC)
NC 781 WHITE	PW-6	•	75	17 (L1/8)	8 (DBP)
NC 782 WHITE	PW-6	•	70	23 (L1/4)	7 (ATBC)
NC 790 WHITE	PW-6	•	75	10 (L1/8)	10 (DBP)
NC 798 WHITE	PW-21	•	75	15	10 (DBP)
NC 802 BLACK	PBk-7	•	13.3	66.7 (H1/2)	20 (DBP)
NC 804 BLACK	PBk-7	•	15	60 (H1/2)	25 (DBP)
NC 805 BLACK	PBk-7	•	15	60 (H7)	25 (DBP)
NC 809 BLACK	PBk-7	•	20	60 (H1/2)	20 (ATBC)
NC 810 BLACK	PBk-7	•	25	57 (L1/8)	18 (ATBC)
NC 840 BLACK	PBk-7	•	25	55 (H1/2)	20 (DBP)
NC 857 BLACK	PBk-7	•	23	57 (H1/2)	20 (ATBC)
NC 858 BLACK	PBk-7	•	23	57 (H1/2)	20 (DBP)
NC 865 BLACK	PBk-7	•	40	45 (L1/4)	15 (ATBC)
NC 869 BLACK	PBk-7	•	25	55 H(1/2)	20 (DBP)
NC 872 BLACK	PBk-7	•	40	45 (L1/4)	15 (ATBC)
NC 873 BLACK	PBk-7	•	36	30 (H1/4)	20 (AC) 10 (ATBC)
NC 877 BLACK	PBk-7	•	40	40 (L1/8)	20 (DBP)
NC 878 BLACK	PBk-7	•	40	45 (H1)	15 (ATBC)
NC 881 BLACK	PBk-7	•	35	49 (L1/8)	16 (ATBC)
NC 882 BLACK	PBk-7	•	45	45 (L1/4)	10 (ATBC)
NC 895 BLACK	PBk-7	•	50	35 (L1/8)	15 (ATBC)
NC 896 BLACK	PBk-7	•	45	45 (L1/8)	10 (ATBC)
NC 899 BLACK	PBk-7	•	25	55 (H1/4)	20 (ATBC)

Color Chips

CAB Color Chips

Nitrocellulose Series	Color Index	Non Halogen	Formulation (weight %)		
			Pigment	Nitrocellulose	Plasticizer
CB 4019 VIOLET	PV-19	•	40	55 (381-0.5)	5 (ATBC)
CB 4023 VIOLET	PV-23		50	45 (381-0.5)	5 (ATBC)
CB 4029 VIOLET	PV-29	•	40	55 (381-0.5)	5 (ATBC)
CB 4031 VIOLET	PV-19	•	40	55 (381-0.5)	5 (ATBC)
CB 4033 VIOLET	PV-32	•	40	55 (381-0.5)	5 (ATBC)
CB 4132 RED	PR-177	•	35	57 (381-0.5)	8 (ATBC)
CB 4138 RED	PR-179	•	40	55 (381-0.5)	5 (ATBC)
CB 4144 RED	PR-185	•	40	55 (381-0.5)	5 (ATBC)
CB 4146 RED	PR-149	•	40	55 (381-0.5)	5 (ATBC)
CB 4190 RED	PR-254		35	55 (381-0.5)	10 (ATBC/other)
CB 4193 RED	PR/-202		40	54 (381-0.5)	6 (ATBC/other)
CB 4198 RED	PR-122		40	50 (381-0.5)	10 (ATBC)
CB 4271 ORANGE	PO-71	•	35	60 (381-0.5)	5 (ATBC)
CB 4350 YELLOW	PY-184	•	60	30 (381-0.5)	10 (ATBC)
CB 4369 YELLOW	PY-139	•	40	52 (381-0.5)	8 (ATBC)
CB 4370 YELLOW	PY-110	•	35	60 (381-0.5)	5 (DOS)
CB 4372 YELLOW	PY-128		35	55 (381-0.5)	10 (ATBC)
CB 4374 YELLOW	PY-180		35	55 (381-0.5)	10 (ATBC)
CB 4499 GREEN	PR-139 PB-15:4	•	40	55 (381-0.5)	5 (ATBC)
CB 4536 BLUE	PB 15:2	•	40	55 (381-0.2)	5 (ATBC)
CB 4537 BLUE	PB-15:4	•	50	45 (381-0.5)	5 (ATBC)
CN 4540 BLUE	PB-15:3	•	40	55 (381-0.5)	5 (ATBC)
CB 4559 BLUE	PB-15:6	•	40	55 (381-0.5)	5 (ATBC)
CB 4563 BLUE	PB-60	•	40	55 (381-0.5)	5 (ATBC)
CB 4620 BROWN	PY-42	•	75	20 (381-0.5)	5 (ATBC)
CB 4667 BROWN	PR-101	•	35	60 (381-0.5)	5 (ATBC)
CB 4732 WHITE	PW-6	•	80	10 (381-0.5)	10 (ATBC)
CB 4750 WHITE	PW-6	•	50	40 (381-0.5)	10 (ATBC/other)
CB 4803 BLACK	PBk-7	•	35	60 (381-0.5)	5 (ATBC)
CB 4804 BLACK	PBk-7	•	30	65 (381-0.2)	5 (DOP)
CB 4859 BLACK	PBk-7	•	30	65 (381-0.5)	5 (ATBC)
CB 4873 BLACK	PBk-7	•	40	45 (381-0.5)	15 (ATBC)
CB 4893 BLACK	PBk-26	•	50	45 (381-0.5)	10 (ATBC/other)

Color Chips

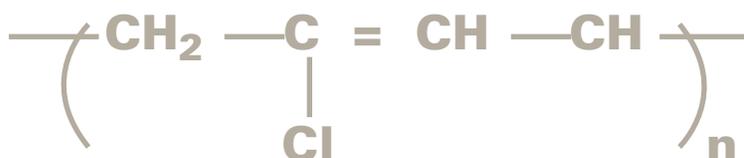
VC Color Chips

Nitrocellulose Series	Color Index	Non Halogen	Formulation (weight %)		
			Pigment	Nitrocellulose	Plasticizer
VC 5013 VIOLET	PV-23		43	52 (SOLBIN)	5 (W-100EL)
VC 15031 VIOLET	PV-19		50	47 (SOLBIN)	3 (W-100EL)
VC 5101 RED	PV-354		40	60 (SOLBIN)	-
VC 5109 RED	PV-149		50	50 (SOLBIN)	-
VC 5116 RED	PR-146		47.6	47.6 (SOLBIN)	4.8 (W-100EL)
VC 5144 RED	PR-185		50	50 (SOLBIN)	-
VC 5181 RED	PR-48:2		58	38 (SOLBIN)	4 (W-100EL)
VC 15110 RED	PR-168		50	47 (SOLBIN)	3 (W-100EL)
VC 15115 RED	PO-38		50	47 (SOLBIN)	3 (W-100EL)
VC 15136 RED	PV-19		50	47 (SOLBIN)	3 (W-100EL)
VC 15138 RED	PR-179		50	47 (SOLBIN)	3 (W-100EL)
VC 15141 RED	PR-185		50	47 (SOLBIN)	3 (W-100EL)
VC 15144 RED	PR-185		50	47 (SOLBIN)	3 (W-100EL)
VC 15145 RED	PR-149		50	47 (SOLBIN)	3 (W-100EL)
VC 15149 RED	PR-176		50	47 (SOLBIN)	3 (W-100EL)
VC 15167 RED	PR-224		50	47 (SOLBIN)	3 (W-100EL)
VC 25137 RED	PV-19		50	45 (VYHH)	5 (W-100EL)
VC85134 RED	PR-144		50	25 (VAGH) 20 (ROSIN)	5 (W-100EL)
VC 5285 ORANGE	PO-13		58	38 (SOLBIN)	4 (W-100EL)
VC 15273 ORANGE	PO-43		55	42 (SOLBIN)	3 (W-100EL)
VC 5388 YELLOW	PY-83		40	60 (SOLBIN)	-
VC 5391 YELLOW	PY-53		73	24 (SOLBIN)	3 (W-100EL)
VC 15360 YELLOW	PY-139		50	47 (SOLBIN)	3 (W-100EL)
VC 15367 YELLOW	PY-110		40	50 (SOLBIN) 10 (CAB)	-
VC 15379 YELLOW	PY-110		40	35 (SOLBIN) 25 (CAB)	-
VC 85366 YELLOW	PY-100		50	25 (SOLBIN) 20 (ROSIN)	5 (W-100EL)
VC 5482 GREEN	PG-7		58	38 (SOLBIN)	4 (W-100EL)
VC 15481 GREEN	PG-7		60	37 (SOLBIN)	3 (W-100EL)
VC 15484 GREEN	PG-7		60	37 (SOLBIN)	3 (W-100EL)
VC 5534 BLUE	PB-15:3		75	25 (SOLBIN)	-
VC 15556 BLUE	PB-15:6		60	37 (SOLBIN)	3 (W-100EL)
VC 15594 BLUE	PB-15:3		60	37 (SOLBIN)	3 (W-100EL)
VC 15589 BLUE	PB-15:3		55	42 (SOLBIN)	3 (W-100EL)
VC 5611 BROWN	PR-101		73	24 (SOLBIN)	3 (W-100EL)
VC 15671 BROWN	PBr-25		50	47 (SOLBIN)	3 (W-100EL)
VC 5711 WHITE	PW-6		75	25 (SOLBIN)	-
VC 5725 WHITE	PW-6		75	23 (SOLBIN)	2 (W-100EL)
VC 5999 WHITE	PW-21		75	25 (SOLBIN)	-
VC 15718 WHITE	PW-6		75	25 (SOLBIN)	-
VC 5879 BLACK	PBk-7		45	50 (SOLBIN)	5 (W-100EL)
VC 5892 BLACK	PBk-7		40	60 (SOLBIN)	-
VC 5895 BLACK	PBk-7		55	40 (SOLBIN)	5 (W-100EL)
VC 25810 BLACK	PBk-7		25	70 (SOLBIN)	5 (DOS)
VC 85890 BLACK	PBk-7		33	47 (SOLBIN) 10 (QUIN-TONE)	5 (DOS + W-100EL)

Specialty Polymers Line-up

SKYPRENE®—Tosoh’s branded polychloroprene rubber (CR)

SKYPRENE polychloroprene rubbers are often specified by design engineers because of their superior properties, such as their resistance to cold, heat, abrasion, ozone, oil and chemicals.



Grade	Type	Mooney viscosity (ML1+4 at 100° C)	Crystallization rate	Main applications
B-5	Mercaptan modified	43~53	Very slow	-Wire and cable jackets
B-10		47~55		-Automotive parts
B-30		43~53	Medium	-General industrial parts
B-31		36~44		-Sponge -Construction materials for buildings and public works
E-20	43	43~53	Very slow	-Extruded products (various hoses, window frames, etc.)
E-33		43~53		-Calendered products
Y-20E		43~53	Medium	-General industrial parts for high loading
Y-30*		111~35		-Adhesives
Y-31		90~110		-Adhesives for high viscosity
Y-30H*		1,460~2,500cps***		-Belts -Rolls
R-10		40~60 (at the time of production)	Very slow	-Wet suits -Thread rubber -Linings
R-22		35~55 (at the time of production)	Medium	
G-40S*		81~95**	Rapid	-MMA graft application
G-40S-1*		81~95**		-Various adhesives for construction, automobiles, shoe-making, carpentry, tiles, etc.
G-40T*		96~113**		
G-41H*				

* Chips are thinner than other grades for easy solution

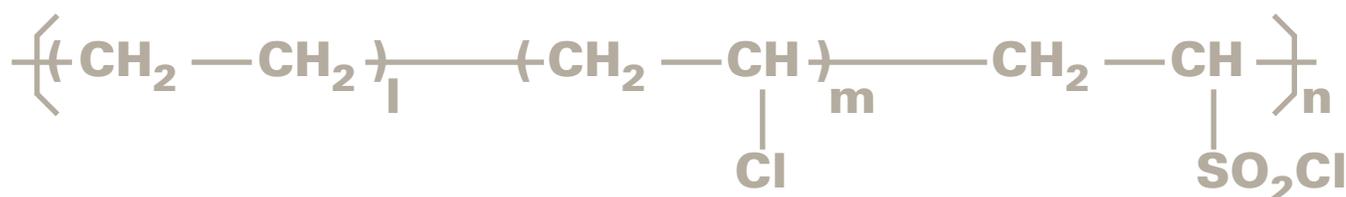
** ML1+2.5 (100°C)

*** 10% toluene solution viscosity (Brookfield’s viscometer, 23°C)

Specialty Polymers Line-up

TOSO-CSM®—Tosoh’s branded chlorosulphonated polyethylene (CSM)

TOSO-CSM is produced from polyethylene by chlorination and chlorosulfonation with chlorine and sulfur dioxide gas. Various types of TOSO-CSM are obtained according to degree of chlorination and chlorosulfonation as well as sort of polyethylene polymer. TOSO-CSM has excellent resistance against ozone, weather, oil and chemicals. And it can be colored in brilliant shades. TOSO-CSM is used for hoses of automobiles, gas and other industrial use, electric cable, rubber coatings, packings, gasket, rolls and lining, adhesives and bounding systems, etc. For goods of daily use, TOSO-CSM is used for life boats, life-jackets, windbreakers, raincoats, handrails of escalator and municipal gas hoses, etc.

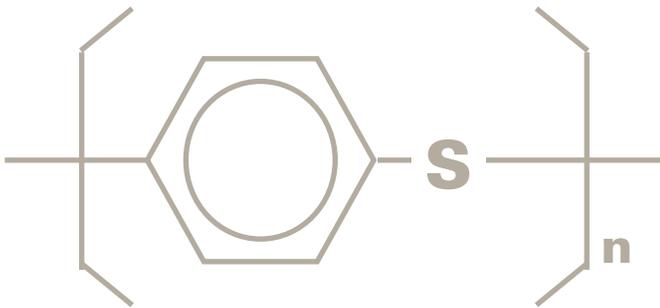


Grade	Chlorine content (%)	Sulfur content (%)	Mooney viscosity (ML1+4 at 100° C)	Features	Main applications
TS-530	35	1.0	56	Well balanced physical and processing properties	-Moldings -Electric cables -Rubber coated cloth -Hoses -Rolls -Machine parts
TS-430	35	1.0	46	Low Mooney viscosity, variation of TS-530	
TS-830	36	1.0	90	High Mooney viscosity, variation of TS-530	
TS-320	23	1.0	37	Thermoplastic (applicable without vulcanization)	-Waterproof cloth -Floor tiles -Magnetic rubber
TS-340	43	1.1	300-500cps*	-Good solubility -Low viscosity of solution -Oil resistance	-Paints for solid surfaces -Oil resistant moldings

* 25% toluene solution viscosity (Brookfield’s viscometer, 23°C)

Specialty Polymers Line-up

Polyphenylene Sulfide (PPS) Resins



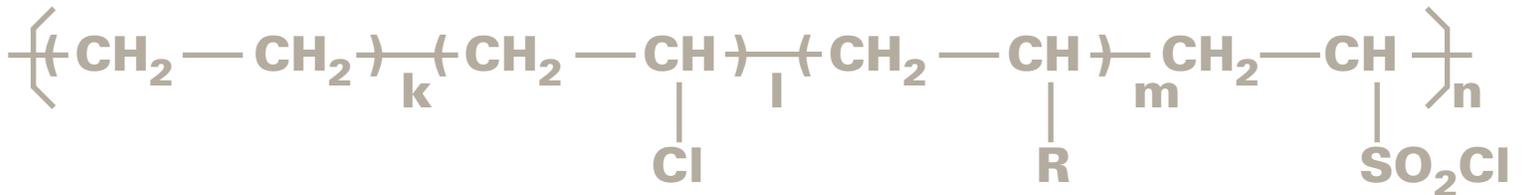
Overview	PPS is a unique engineering plastic material that combines many of the best properties of plastics and metals. It has high temperature resistance, exceptional chemical resistance, inherent flame resistance UL 94V-0, superior electrical properties, and outstanding precision moldability and dimensional stability.
Main applications	<ul style="list-style-type: none"> • Electrical and electronic parts - Switch bases, relay components, connectors, coil bobbins, etc. • Electrical and electronic appliance components • Automotive applications - Emission control components, lighting components, fuel system parts

Typical Properties and Grades

Property	ASTM	GS-40-11
Tensile strength	D-638 10 ³ PSI (MPa)	26.1 (181)
Flexural strength	D-790 10 ³ PSI (MPa)	39 (265)
Flexural modulus	D-790 10 ⁶ PSI (GPa)	2.2 (15)
Izot impact strength (notched)	D-256 FT 16F/M (J/M)	1.5 (80)
Heat deflection temperature	D-648° F (°C)	> 500 (>260)
Coefficient of linear thermal expansion	D-696 10 ⁻⁵ IN/IN °F (10 ⁻⁵ CM/CM °C)	1.2 (2.2)
Flammability	UL-94-	V-0
Volume resistivity	D-257 (OHMS X CM)	4X10 ¹⁶
Dielectric constant	D-150	3.9

Specialty Polymers Line-up

extos®—Tosoh’s branded alkylated chlorosulphonated polyethylene (CSM)



Overview	Extos, which has excellent dynamic and low temperature properties besides the features of conventional TOSO-CSM®, is suited for dynamic applications such as automotive belts and boots.				
Typical Properties					
Grade	Chlorine content (%)	Sulfur content (%)	Mooney viscosity (ML1+4 at 100°C)	Features	Main applications
ET-8010	2630	3.70.9	4040	Excellent low temperature and dynamic properties	Dynamic uses such as automotive belts

Nipolon® Hard—Tosoh’s branded high-density polyethylene (HDPE)

Overview	Nipolon Hard is often selected for its high tensile strength, hardness and excellent processing characteristics.
Applications	<ul style="list-style-type: none"> • Blow molding - Milk bottles, detergent bottles, chemical drums, fuel tanks • Blown film - Shopping bags, food packages • Extrusion pipe - Water, oil and gas pipes, irrigation pipes • Injection molding - Industrial containers, crates, houseware, toys • Filaments - Fishing nets

Nipolon—Tosoh’s branded low-density polyethylene (LDPE)

Overview	Tosoh LDPE resins, sold under the brand names Nipolon and Lumitac are noted for their superior elasticity, transparency, shock resistance, and processing characteristics.
Applications	<ul style="list-style-type: none"> • Blown film - General-purpose packaging, heavy-duty bags, agricultural film, diaper backings, stretch film, shrink film • Extrusion coating and laminating - Milk carton stocks, polymeric film, box liners • Blow molding - Box liners, etc. • Injection molding - Houseware, artificial flowers

Specialty Polymers Line-up

Nipolon®-Z—Tosoh’s branded linear low-density polyethylene (LLDPE)

Overview	Nipolon-Z is an LLDPE made with the comonomer hexene (C6) in the solution phase and offers higher strength than its butene comonomer LLDPE counterpart Nipolon-L.
Applications	<ul style="list-style-type: none"> • Blown film - General-purpose packaging, heavy-duty bags, agricultural film, diaper backings, stretch film, shrink film • Extrusion coating and laminating - Milk carton stocks, polymeric film, box liners • Blow molding - Box liners, etc. • Injection molding - Houseware, artificial flowers

Lumitac®—Tosoh’s branded very low-density polyethylene (VLDPE)

Overview	Lumitac, is an essential material with a variety of applications, and can be seen in action in the frozen foods section of grocery stores. Frozen food packaging, hoses and myriad other end-products are enhanced by VLDPE’s elasticity, quality, strength, and versatility.
Applications	<ul style="list-style-type: none"> • Ice bags • Food packages • Tubes and hoses • Blown films • Stretch wrap

Nipoflex®—Tosoh’s branded ethylene vinyl acetate (EVA) copolymer

Overview	Having outstanding clarity, gloss and weather resistance, our Nipoflex resins offer flexibility over wide temperature ranges, as well as high impact strength, elasticity and resistance to flex and environmental stress cracking.
Applications	<ul style="list-style-type: none"> • Foaming • Blown film and sheet extrusion • Hot melt adhesive • Injection molding

For a full list of grades, please see Appendix A

Specialty Polymers Line-up

Melthene®-G—Tosoh’s branded adhesive polymer for lamination

Overview	Melthene-G is a modified EVA for use as an adhesive for lamination. It excels in its adhesive properties to a wide variety of materials and easy processing ability.
Applications	Laminating - Textile, lumber, plastic, rubber, metal, formed products, paper, packing film, etc.

Typical Properties

	Test method	Unit	Value
Melt flow rate	JIS K-6730	g/10 min	9.0
Density	ASTM D1505	g/cm ³	0.962
Tensile strength	JIS K-7113	kg/cm ²	190
Elongation at break	JIS K-7113	%	850
Flexible modulus	JIS K-6730	kg/cm ²	85
Durometer A hardness	JIS K-7215	HAD	89
Durometer D hardness	JIS K-7215	HDD	36
Vicat softening point	JIS K-6730	°C	48
Melting point	DSC method	°C	72
Dielectric constant			
50 Hz	JIS K-6911	-	3.46
1 KHz	JIS K-6911	-	3.41
1 Mhz	JIS K-6911	-	2.98
Dielectric dissipation factor			
50 Hz	JIS K-6911	-	4.1 × 10 ⁻³
1 KHz	JIS K-6911	-	9.3 × 10 ⁻³
1 MHz	JIS K-6911	-	5.9 × 10 ⁻²

Specialty Polymers Line-up

Melthene®-H—Tosoh’s weather-resistant adhesive polymer

Overview	Melthene-H is a saponified ethylene vinyl acetate copolymer, having weather resistance, solvent resistance and excellent adhesion to various substrates.
Applications	Extrusion coating - Textile, lumber, plastic, rubber, metal, formed products, paper, packing film, etc.

Typical Grades and Their Properties

	Test method	Unit	H6410M	H6051	K502C	S102C	900B (Black)	900W (White)
Melt flow rate	JIS K-6730	g/10 min	16	5	115	220	30	28
Density	ASTM D1505	g/cm ³	0.95	0.97	0.96	0.96	1.07	1.10
Tensile strength	JIS K-6730	kgf/cm ²	123	170	110	110	160	180
Elongation at break	JIS K-6730	%	730	500	570	580	410	400
Durometer D hardness	JIS K-6760	HDD	38	70	53	53	66	67
Vicat softening point	JIS K-6730	°C	54	100	73	71	90	90
Melting point	DSC method	°C	87	110	104	100	113	113
Application			Co-extrusion Excellent adhesion to metal Modified Wire & Cable		Fusible interlining for clothes (Powder)		Powder coating	

Melthene®-M—Tosoh’s adhesive polymer for food containers

Overview	Melthene-M offers excellent adhesion with most substrates, without the use of solvents.
Applications	Easy-to-peel seals - Plastic containers for food and other goods.

Typical Grades and Their Properties

	Test method	Unit	H6410M	H6051	K502C	S102C	900B (Black)	900W (White)
Melt flow rate	JIS K-6730	g/10 min	16	5	115	220	30	28
Density	ASTM D1505	g/cm ³	0.95	0.97	0.96	0.96	1.07	1.10
Tensile strength	JIS K-6730	kgf/cm ²	123	170	110	110	160	180
Elongation at break	JIS K-6730	%	730	500	570	580	410	400
Durometer A hardness	JIS K-6760		38	70	53	53	66	67
Vicat softening point	JIS K-6730	°C	54	100	73	71	90	90
Melting point	DSC method	°C	87	110	104	100	113	113
Application(s)			Co-extrusion Excellent adhesion to metal Modified Wire & Cable		Fusible interlining for clothes (Powder)		Powder coating	

Specialty Polymers Line-up

Petcoal®—Tosoh's C₉ hydrocarbon resins



Overview	Petcoal is a family of aromatic hydrocarbon resins which exhibit excellent solvency. Petcoal resins are compatible with a wide range of synthetic resins and rubbers; they have good thermal stability and weathering properties as well.
Applications	<ul style="list-style-type: none"> • Paints • Printing inks (offset, gravure) • Adhesives • Pressure sensitive adhesive tape • Rubber agents

Typical Grades and Their Properties

	Test method	Petcoal LX	Petcoal 120	Petcoal 130	Petcoal 140
Appearance	Visual observation	Pale, yellow color			
Softening point (°C)	JIS K-2207 R&B	98	120	125	135
Color	ASTM D-1544 (Gardner)	7	7	7	7
Bromine number	ASTM D-1159	25	25	25	20
Acid value	JIS K-5902	0.1 max	0.1 max	0.1 max	0.1 max

APPENDIX A: Nipoflex® EVA Copolymer Grades

Data is presented to describe Nipoflex and not intended as specifications

Properties	Test method	Unit	627	628	638	635	640	634	633	680	681	684	685	751	710	720	722	
Melt index	JIS K 6924-1	ISO 4613-1	g/10	0.8	1.3	13	2.4	2.8	4.3	20	160	350	2000	2500	5.7	18	150	400
Vinyl acetate content	JIS K 6924-1	ISO 4613-1	%	20	20	20	25	25	26	20	20	20	20	14	28	28	28	20
Density	JIS K 6924-2	ISO 4613-2	kg/m ³	941	942	940	948	948	949	940	936	934	930	924	952	949	947	944
Tensile strength at break	JIS K 6924-2	ISO 4613-2	MPa	> 15	> 15	> 10	> 13	> 12	11	> 10	> 6	4	2	3	> 9	> 7	> 4	2
				Tosoh	MPa	19	25	11	29	20	14	11	5	3	2	3	3	17
Elongation at Break	JIS K 6924-2	ISO 4613-2	%	> 570	> 580	> 630	> 580	> 580	> 580	> 640	> 770	730	120	80	> 800	> 640	> 760	750
				Tosoh	%	800	800	800	800	800	800	800	700	700	700	200	150	850
Modulus of elongation	JIS K 6924-2	ISO 4813-2	MPa	40	40	40	20	20	30	20	20	20	10	20	20	10	10	10
Flexural modulus	JIS K 6924-2	ISO 4613-2	MPa	40	40	30	20	20	20	30	20	20	10	30	20	10	10	10
Hardness (A)	JIS K 7215	ISO 868		93	92	91	88	85	86	91	85	85	79	85	82	80	73	69
Melting point (DSC)	JIS K 6924-2	ISO 4613-2	°C	83	83	81	77	75	74	81	78	76	70	77	70	69	67	65
Vicat softening point	JIS K 7206	ISO 306	°C	59	63	53	51	49	46	51	< 40	< 40	< 40	< 40	42	40	< 40	< 40
Low temperature brittleness	JIS K 7216		°C	< -70	< -70	< -70	< -70	< -70	< -70	< -70	-50	-30	-30	-24	< -70	< -70	-60	-50
Test piece	JIS K 6924-2	ISO 4813-2	-	Compression														
				•														
Main applications	Injection molding			•														
	Sheet/tube extrusion			•														
	Foaming			•														
	Hot-melt adhesive			•														
Extrusion coating			•															
Ink			•															

Properties	Test method	Unit	725	735	750	752	760	YX11	
			(High VAlow MI type)						
Melt index	JIS K 6924-1	ISO 4613-1	g/10	1000	1000	30	60	70	0.2
Vinyl acetate content	JIS K 6924-1	ISO 4613-1	%	28	28	32	32	42	32
Density	JIS K 6924-2	ISO 4613-2	kg/m ³	942	950	954	955	968	956
Tensile strength at break	JIS K 6924-2	ISO 4613-2	MPa	1	2	>4	>3	>1	>10
				Tosoh					
Elongation at Break	JIS K 6924-2	ISO 4613-2	%	220	310	>680	>700	>750	>570
				Tosoh					
Modulus of elongation	JIS K 6924-2	ISO 4613-2	MPa	5	10	5	5	1	10
				Flexural modulus					
Hardness (A)	JIS K 7215	ISO 868	MPa	5	10	5	5	10	10
				Hardness (A)					
Melting point (DSC)	JIS K 6924-2	ISO 4613-2	°C	60	67	64	59	>50	61
				Vicat softening point					
Low temperature brittleness	JIS K 7216	-	°C	<40	<40	<40	<40	<40	40
				Test piece					
Main applications	JIS K 6924-2	ISO 4813-2	-	Injection molding					
				Sheet/tube extrusion					
				Foaming					
				Hot-melt adhesive					
				Extrusion coating					
				Blown-film extrusion					

Properties	Test method	Unit	514R 515 510, 510F 520F 540, 540F 537, 537L, 541L 539 530 526 630 631 636 625, 625L															
			514R	515	510, 510F	520F	540, 540F	537, 537L, 537S-2	541, 541L	539	530	526	630	631	636	625, 625L		
Melt index	JIS K 6924-1	ISO 4613-1	g/10 min.	0.41	2.5	2.5	2	3	8.5	9	28	75	25	1.5	1.5	2.5	14	3
Vinyl acetate content	JIS K 6924-1	ISO 4613-1	%	5	6	6	8	10	8	10	6	6	7	15	20	19	15	15
Density	JIS K 6924-2	ISO 4613-2	kg/m ³	925	925	928	927	929	925	929	924	923	925	936	941	941	935	936

Tensile strength at break	JIS K 6924-2	ISO 4613-2	MPa	18 15 15 15 14 13 13 10 8 11 15 18 15 12 15															
				18	15	15	15	14	13	13	10	8	11	15	18	15	12	15	
Elongation at Break	JIS K 6924-2	ISO 4613-2	%	> 820	> 660	> 680	> 640	> 630	660	> 670	530	460	620	> 590	> 590	> 590	> 640	> 610	
Modulus of elongation	JIS K 6924-2	ISO 4813-2	MPa	140	130	140	100	80	120	80	110	100	90	60	40	40	50	50	
Flexural modulus	JIS K 6924-2	ISO 4613-2	MPa	150	130	150	100	80	120	80	120	100	90	60	40	40	50	50	
Hardness (A)	JIS K 7215	ISO 868		97	97	97	97	96	96	96	96	97	97	94	92	92	94	94	
Melting point (DSC)	JIS K 6924-2	ISO 4613-2	°C	101	98	101	96	94	98	93	97	96	95	88	82	82	87	88	
Vicat softening point	JIS K 7206	ISO 306	°C	84	80	84	75	72	77	70	73	69	69	67	58	58	59	65	
Low temperature brittleness	JIS K 7216		°C	< -70															
Test piece	JIS K 6924-2	ISO 4813-2	-	Compression															
Main applications	Injection molding			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Sheet/tube extrusion			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Foaming			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	Hot-melt adhesive			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Extrusion coating			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Blown-film extrusion			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

F..Film L...Extrusion Coating and Laminating

(for solar cell encapsulant)

Properties	Test method	Unit	09M51A	751K	710K	750K	15B51A	12B51B	
Melt index	JIS K 6924-1	ISO 4613-1	g/10 min.	4.6	5.7	18	30	25	28
Vinyl acetate content	JIS K 6924-1	ISO 4613-1	%	26	28	28	32	28	28
Density	JIS K 6924-2	ISO 4613-2	kg/m ³	949	952	949	954	948	948

Tensile strength at break	JIS K 6924-2	ISO 4613-2	MPa	> 9	> 9	> 7	> 4	-	-
	Tosoh		MPa	14	17	9	7	-	-
Elongation at Break	JIS K 6924-2	ISO 4613-2	%	> 570	> 800	> 640	> 680	-	-
	Tosoh		%	800	850	800	1000	-	-
Modulus of elongation	JIS K 6924-2	ISO 4813-2	MPa	140	130	140	100	80	120
Flexural modulus	JIS K 6924-2	ISO 4613-2	MPa	20	20	10	5	-	-
Hardness (A)	JIS K 7215	ISO 868		20	20	10	5	-	-
Melting point (DSC)	JIS K 6924-2	ISO 4613-2	°C	86	82	80	71	-	-
Vicat softening point	JIS K 7206	ISO 306	°C	44	42	40	> 40	-	-
Low temperature brittleness	JIS K 7216		°C	< -70					
Test piece	JIS K 6924-2	ISO 4813-2	-	Compression					
Pressing method			Calender	•	•	•	•	•	•
			T-die extrusion	•	•	•	•	•	•

F..Film L...Extrusion Coating and Laminating

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