LUCANT™
— Overview —

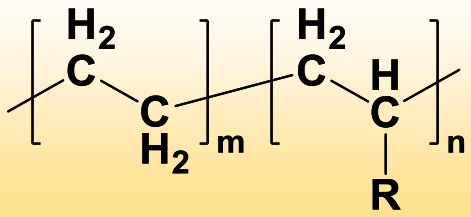
Mitsui Chemicals

注意: 本資料内の全てのデータは代表値であり、性能を保証するものではありません。

What is LUCANT™?

- LUCANT™ is an ethylene/α-olefin based synthetic oil.
- LUCANT™ is mainly used in the applications written below.

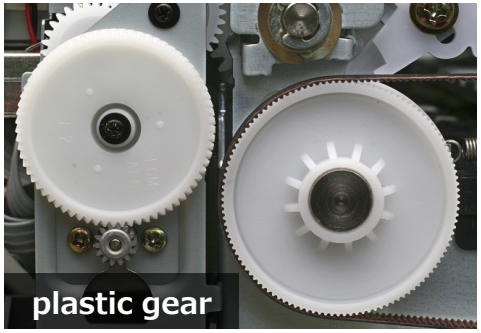
Chemical structure



Appearance

Sliding agent

Its poor compatibility gives sliding and anti-abrasion properties to plastics, e.g. POM, ABS and PA.

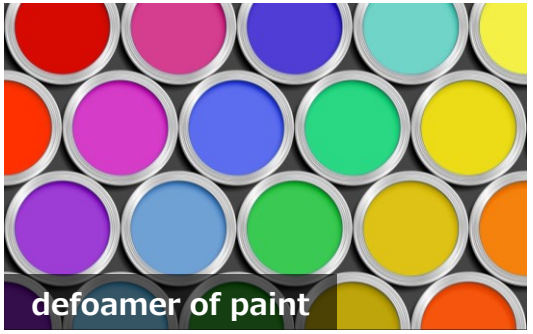


Flexibilizer of elastomers

It has good compatibility with low-polar elastomers such as EPDM or SEBS. It can improve softness and heat resistance.

Coating system

It brings various effects according to base resins such as PU, epoxy and POE; defoaming or adhesive effects.

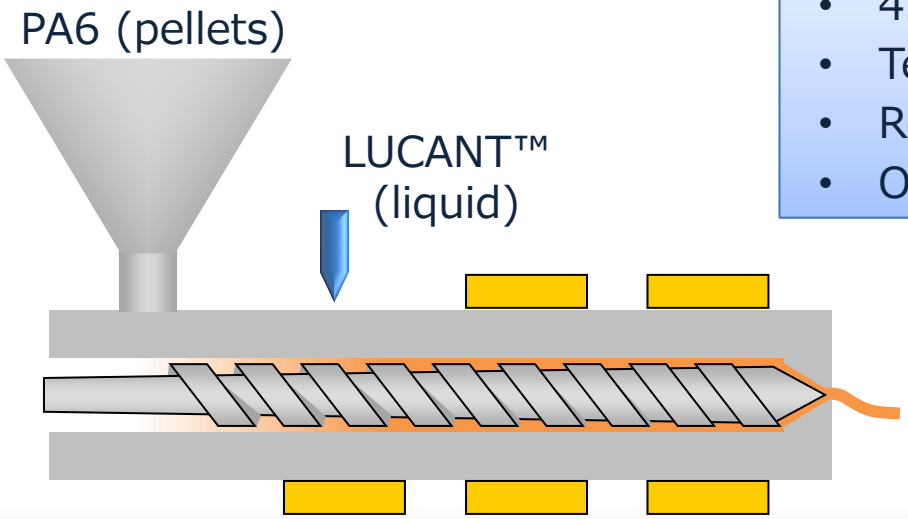


Sliding agent: Effect of LUCANT™

- With small amount of LUCANT™, tribological and mechanical properties of polyamide can be improved.

✓ **Lower friction coefficient**
✓ **Improve abrasion resistance**
✓ **Improve durability**

【Extrusion conditions】

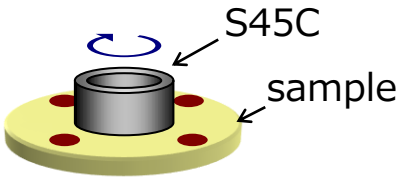


- 43 mmφ twin screw extruder (L/D=30)
- Temp. of cylinder: 240°C
- Rotation speed: 150 rpm
- Output: 20 kg/h

LUCANT™ was directly added into vent of extruder by oil feed pump with heater.

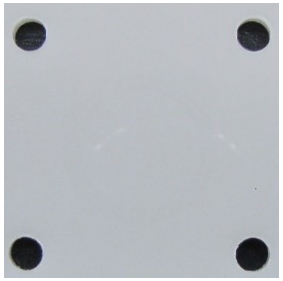
Sliding agent: Effect of LUCANT™

【Test conditions】
Temp: 23°C, counter material: S45C, load: 0.75MPa, velocity: 30m/min, worked distance: 3km

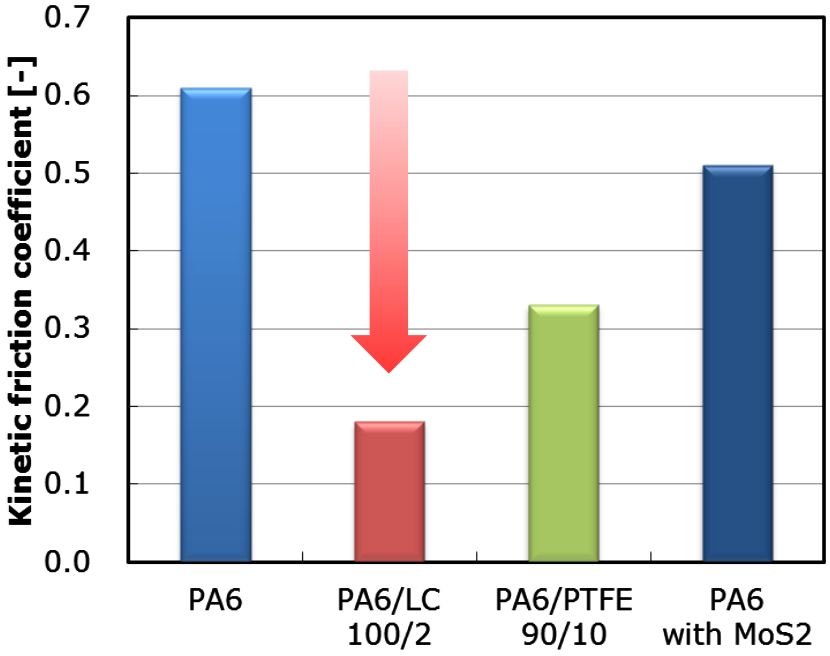


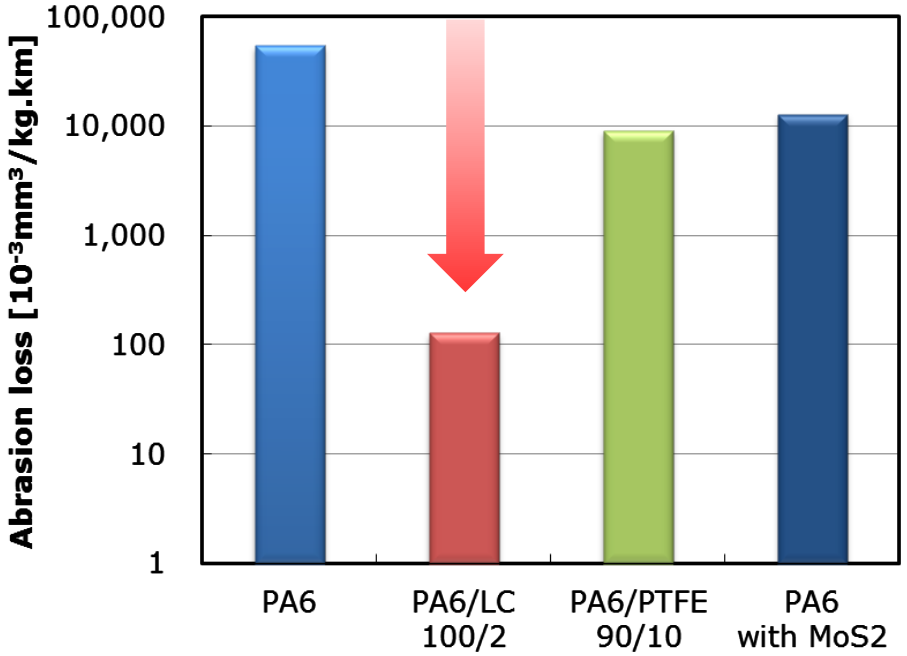
Appearance of test pieces after abrasion tests

PA6



PA6 with LUCANT™





- With small amount of LUCANT™, tribological and mechanical properties of polyamide can be improved.

Sliding agent: Physical properties of PA6 compounds

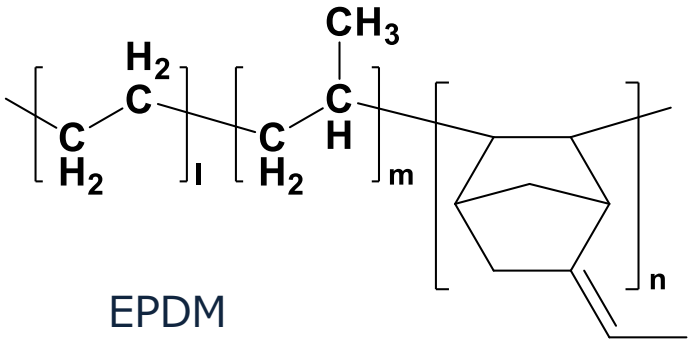
	Method	Unit	PA6	PA6/LX100 = 100/2
MFR (230°C, 2.16kgf)	MCI Method	g/10min	62	70
Density	MCI Method	kg/m^3	1,144	1,126
Tensile strength at yield point	ISO527-1,2	MPa	85	76
Tensile strength at break	ISO527-1,2	MPa	50	70
Tensile elongation at break	ISO527-1,2	%	35	12
Flexural strength	ISO178	MPa	120	113
Flexural modulus	ISO178	MPa	2,600	2,600
Charpy impact strength (V/notched)	ISO179	kJ/m^2	4.0	4.8
HDT (0.45MPa)	ISO75-1,2	°C	160	122
Kinetic coefficient of friction	MCI Method[1)]	–	**0.61**	**0.18**
Abrasion loss	MCI Method[1)]	10^{-3}mm^3 /kg·km	**55,000**	**129**
Limit PV	MCI Method[2)]	MPa·m/min	**10**	**>30**

1) Counter material: S45C, load: 15kg, velocity: 30m/min, worked distance: 3km
2) Counter material: SUS, velocity: 12m/min, load stage interval: 30min

- With small amount of LUCANT™, tribological and mechanical properties of polyamide can be improved.

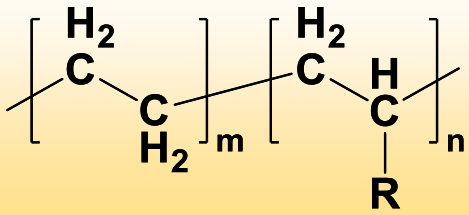
Flexibilizer of EPDM: Effect of LUCANT™

- LUCANT™ is an ethylene/α-olefin based synthetic oil.
- Due to the similar chemical structure, LUCANT™ has good compatibility with EPDM.



EPDM

LUCANT™



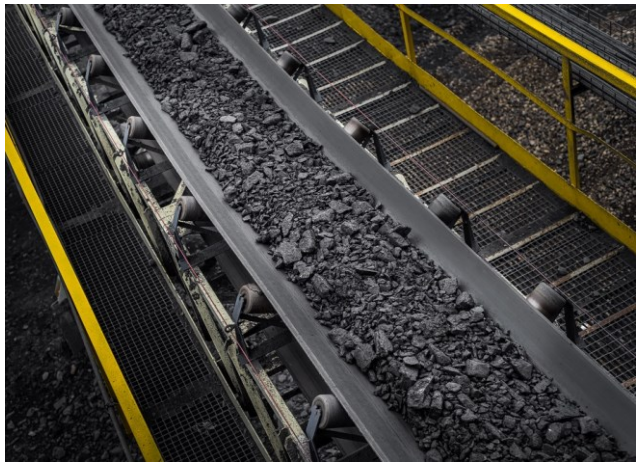
- LUCANT™ improves

- **Roller and extrusion processability**
- **Elasticity at high temperature**
- **Softness at low temperature**
- **Damping properties**

of EPDM compounds, compared with mineral oil.

Flexibilizer of EPDM: Application examples

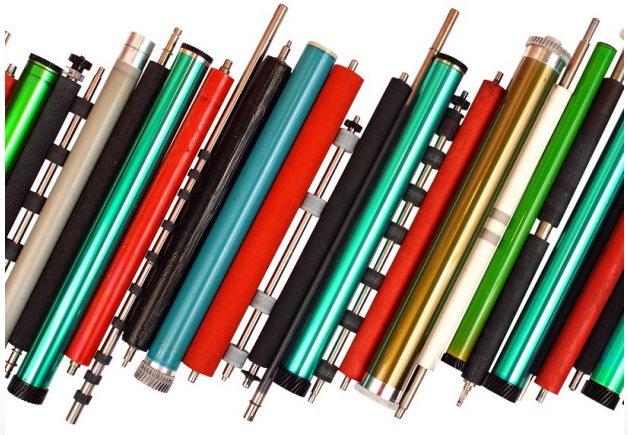
- Conveyor belts



- Sealings (o-rings, gaskets)

- Timing/V belts

- Rollers



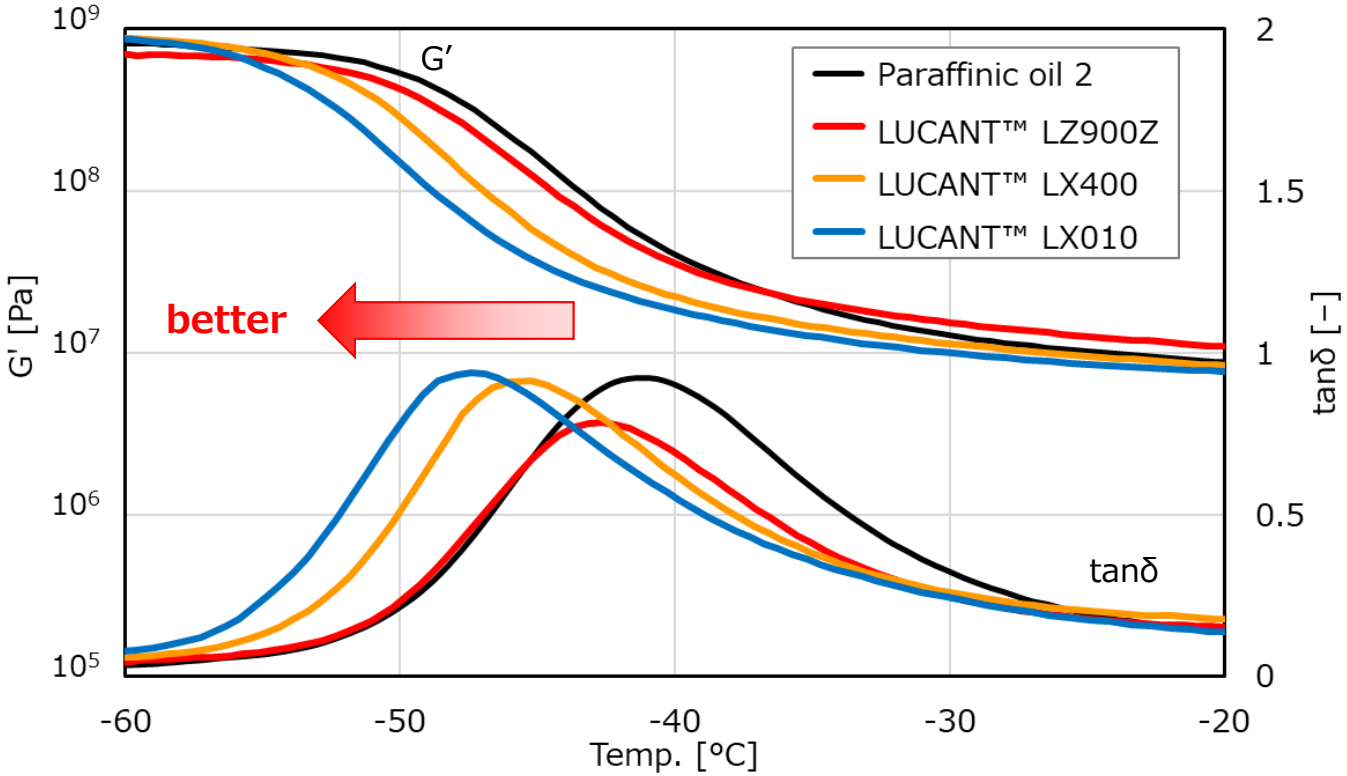
- Hoses

- Dampers

Flexibilizer of EPDM: Flexibility of low temperature

Viscoelasticity (storage modulus G’ and tanδ)

【Formulation】 Mitsui EPT™4045M(100) / Flexibilizer(40) / Asahi#70(50) / ZnO(5) / St.A.(1) / Sanceler M(1) / Sanceler TT-G(1) / Sanceler TRA(1) / sulfur(1) (phr) 【vulcanization】 170°C 10 min



- LUCANT™ can **reduce storage modulus G’ at low temperature and lower Tg** since LUCANT™ has no crystallinity.

【Test conditions】 viscoelasticity, torsion mode, frequency=1Hz, heat rate=3 °C/min
Temperature at the top of tanδ peak was regarded as Tg, glass transition point.

Flexibilizer of EPDM: Extrusion processability

Appearance of extruded samples (Garvey-type die)

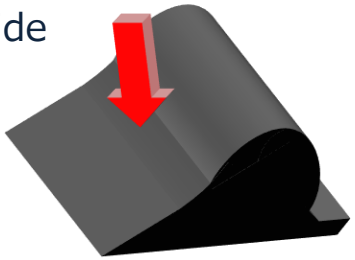
【Formulation】Mitsui EPT™4045M(100) / Flexibilizer(40) / Asahi#70(50) / ZnO(5) / St.A.(1) / Sanceler M(1) / Sanceler TT-G(1) / Sanceler TRA(1) / sulfur(1) (phr)

Paraffinic oil 2 | **LUCANT™ LX400** | **LUCANT™ LX900Z**

Shape of extrusion samples

Side view

Photo taken from upper side



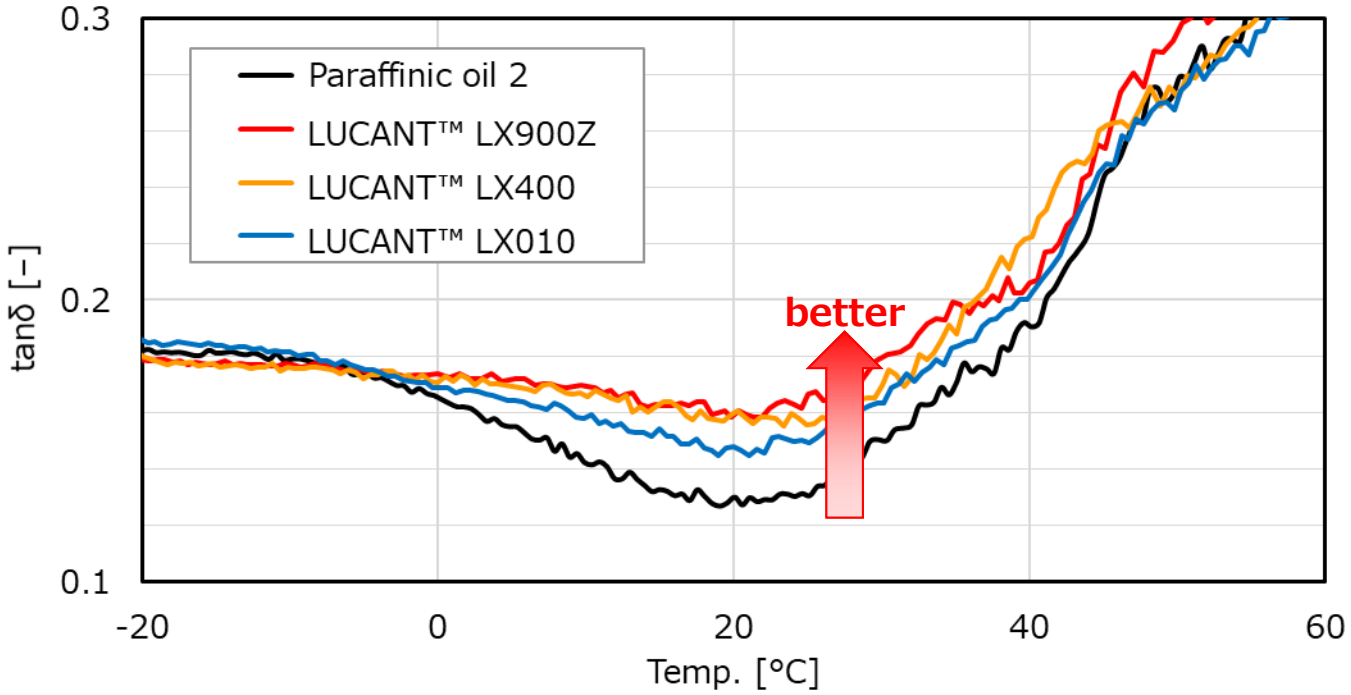
- LUCANT™ can **improve the surface smoothness of extruded products**. Entangled LUCANT™ molecules with EPDM contribute to well-mixing in extrusion process.

【Test method】50mmΦ extruder, temp.: HD/C2/C1/SE=80/70/60/50 °C, extrusion speed=5 m/min

Flexibilizer of EPDM: Damping properties

Viscoelasticity (tanδ)

【Formulation】Mitsui EPT™3072EM(140: Polymer 100 + extender oil 40) / flexibilizer(40) / Asahi#60G(100) / ZnO(5) / St.A.(1) / Sandunt MB(2) / D-40C(8) (phr) 【vulcanization】170°C 10 min



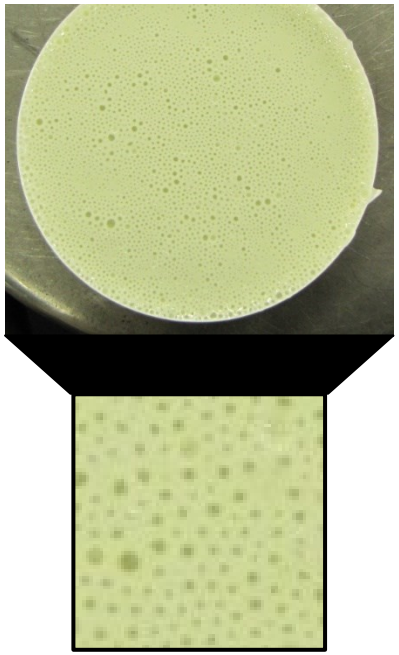
- LUCANT™ shows **better damping properties (greater tanδ value)** than paraffinic oil at room temperature. LUCANT™ could be entangled with EPDM due to its higher molecular weight. This entanglement enhances intermolecular friction between LUCANT™ and EPDM, which could improve transformation of vibration into heat.

【Test conditions】viscoelasticity, torsion mode, frequency=1Hz, heat rate=3 °C/min

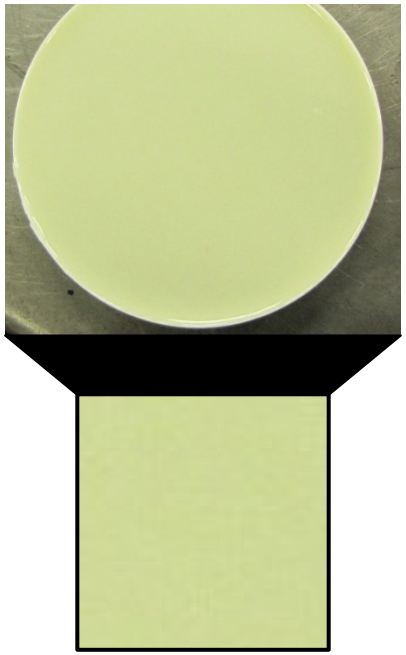
Coating: Defoamer of paints

Urethane-based

blank



LX010 / 0.3wt%



Epoxy-based

blank

LX010 / 0.5wt%

- LUCANT™ gives good defoamability to urethane- and epoxy-based paints with a small dosage.

Special website of LUCANT™

English

Japanese

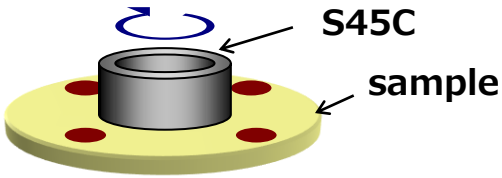
English : https://jp.mitsuichemicals.com/en/special/lucant/
Japanese : https://jp.mitsuichemicals.com/jp/special/lucant/

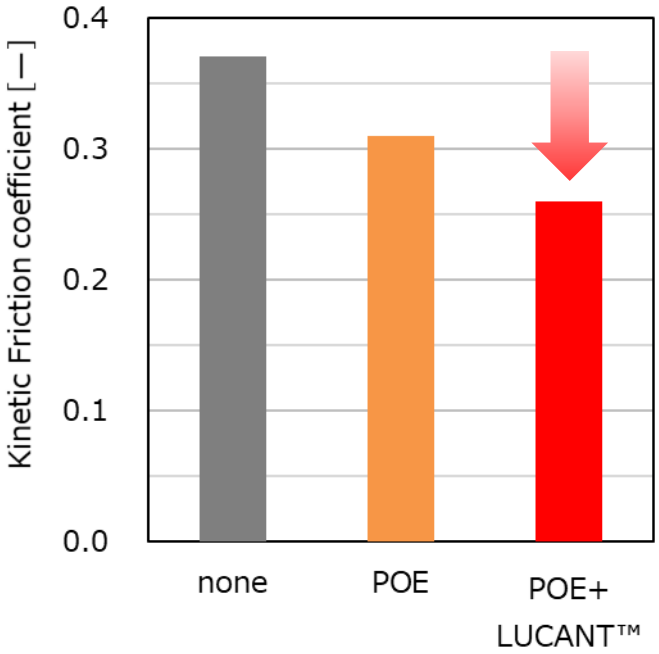
- Special website of LUCANT™ was launched. Various useful data about LUCANT™ are posted there. Please take a look.

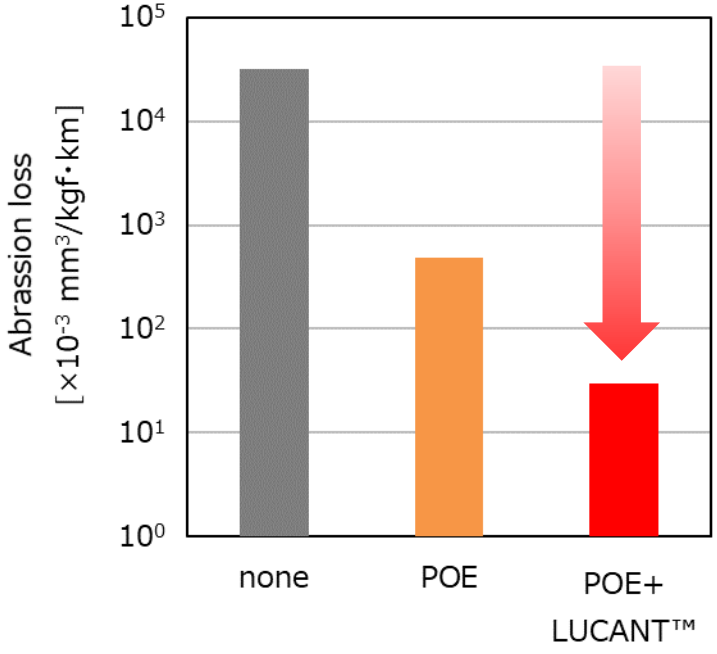
Appendix

Sliding agent: Combination of LUCANT™ and POE

Appearance after test







- LUCANT™ improves sliding properties of PA6/polyolefin elastomer compound.

*1 Counter material: S45C, temp.: 23°C, load: 15.3 kgf, velocity: 30 m/min, worked distance: 3 km.
*2 Kinetic friction coefficient. *3 Test stopped by limitation.

Sliding agent: Physical properties of PA6/POE

		Reference standard	Units	With LUCANT™	Without LUCANT™	
					PA6/POE	PA6
Formulation						
PA6		—	wt%	85	85	100
Acid-modified POE (TAFMER™ MH5040)		—	wt%	10	15	
LUCANT™ LX020		—	wt%	**5**		
Results						
Tensile properties	TY	ISO 527-1,2:2012	MPa	53	49	82
	TB		MPa	40	40	51
	EB		%	30	116	45
	modulus		MPa	1950	1830	2650
Flexural test	modulus	ISO 178:2010	MPa	2100	1980	2920
Izod impact strength (notched)	23°C	ISO 180:1993	kJ/m^2	**36**	**78**	5.9
	0°C		kJ/m^2	**43**	**75**	6.2
	–40°C		kJ/m^2	**15**	**17**	4.8
HDT[*1]	0.45 MPa	ISO75-1,2:2013	°C	158	150	162
Ring abrasion test[*2]	KFC[*3]	JIS K 7218:1986 method A	—	**0.26**	0.31	0.37
	Abrasion loss		10^{-3}mm^3/kgf·km	**30**	480	32,000[*4]

- LUCANT™ can reduce kinetic friction coefficient and abrasion loss.

[*1] Heat deflection/distortion temperature. [*2] Counter material: S45C, temp.: 23°C, load: 15.3 kgf, velocity: 30 m/min, worked distance: 3 km. [*3] Kinetic friction coefficient. [*4] Test stopped by limitation.

Flexibilizer of EPDM: Comparison with mineral oil

			Paraffinic oil 1	Paraffinic oil 2	LUCANT™ LX010	LUCANT™ LX400	LUCANT™ LX900Z
Chemical structure	—	—	Mixture of hydrocarbon (paraffin and naphthene)		Ethylene α-olefin copolymer		
Appearance	—	—	Yellow	C&B*1	C&B*1	C&B*1	Pale white
Molecular weight (GPC, PSt. Std.)	Mw Mn Mw/Mn	—	1,300 1,200 1.1	1,300 1,200 1.1	4,200 2,500 1.6	12,500 6,600 1.9	15,600 7,400 2.1
Viscosity	25°C	mPa·s	1,100	950	3,000	140,000	190,000
Kinematic viscosity	40°C 100°C	mm^2/s	430 30	390 30	1,300 100	37,500 2,000	>50,000 3,300
Tm*2	DSC	°C	−24	−10	N.D.*3	N.D.*3	−2
Tg*4	DSC	°C	−63	−63	−71	−64	−62

*1 C&B: clear and bright, *2 Tm: melting point, *3 Tg: glass transition point, *4 N.D.: not detected

- Better thermal stability due to simple molecular structure
- Better low temp. fluidity due to non-crystallinity (except for LX900Z)
- Molecular structure of LX900Z is optimized for EPDM.
  (monomer contents and molecular weight)

Grade lineup of LUCANT™

			LX004	LX010	LX020	LX100	LX200	LX400	LX900Z
Appearance	—	—	C&B*1	C&B*1	C&B*1	C&B*1	C&B*1	C&B*1	Pale white
Molecular weight (GPC, PSt. Std.)	Mw	—	2,700	4,200	5,000	8,700	11,000	12,500	15,600
	Mn		1,700	2,500	2,900	4,700	5,500	6,600	7,400
	Mw/Mn		1.5	1.6	1.7	1.8	1.9	1.9	2.1
Viscosity (Bookfield)	25°C	mPa·s	820	3,000	6,100	26,000	52,000	140,000	190,000
Kinematic viscosity	40°C	mm^2/s	400	1,300	2,200	9,800	18,900	37,500	>50,000
	100°C		40	100	150	600	1,100	2,000	3,300
Density	15°C	kg/m^3	838	843	846	850	850	851	853
Tm*2	DSC	°C	N.D.*3	N.D.*3	N.D.*3	N.D.*3	N.D.*3	N.D.*3	−2
Tg*4	DSC	°C	−77	−71	−69	−66	−65	−64	−62
Acid Value	—	mgKOH/g	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Flash point	COC	°C	250	280	300	>300	>300	>300	>300

*1 C&B: clear and bright, *2 Tm: melting point, *3 N.D.: not detected, *4 Tg: glass transition point

Grade lineup of acid-modified LUCANT™

			A-5515	A-5260
Base LUCANT™			LX020	LX100
Appearance			yellow	pale yellow
Molecular weight (GPC, PSt Std.)	Mw Mn Mw/Mn	—	7,200 3,900 1.8	10,000 5,400 1.9
Density	15°C	kg/m^3	878	860
Brookfield viscosity	25°C	mPa·s	53,000	61,000
	150°C	mPa·s	70	160
Tm*1	DSC	°C	N.D.*2	N.D.*2
Tg*3	DSC	°C	−65	−64
Total acid number	—	mg-KOH/g	60	25
Flash point	COC	°C	280	290

*1 Tm: melting point, *2 N.D.: not detected, *3 Tg: glass transition point

June, 2024

MITSUI CHEMICALS, Inc.