NOXTITE™ ACM

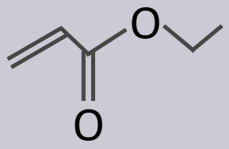
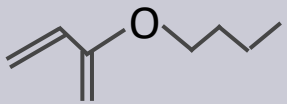
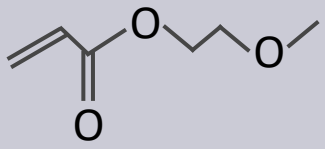


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Feature of acrylate monomer and polymer

Table. Acrylate monomer properties

	Ethyl Acrylate (EA)	Butyl Acrylate (BA)	Methoxyethyl Acrylate(MEA)
Chemical Structure			
Heat Resistance	Excellent	Good	Fair
Oil Resistance	Good	Fair	Excellent
Cold Resistance	Fair	Excellent	Good

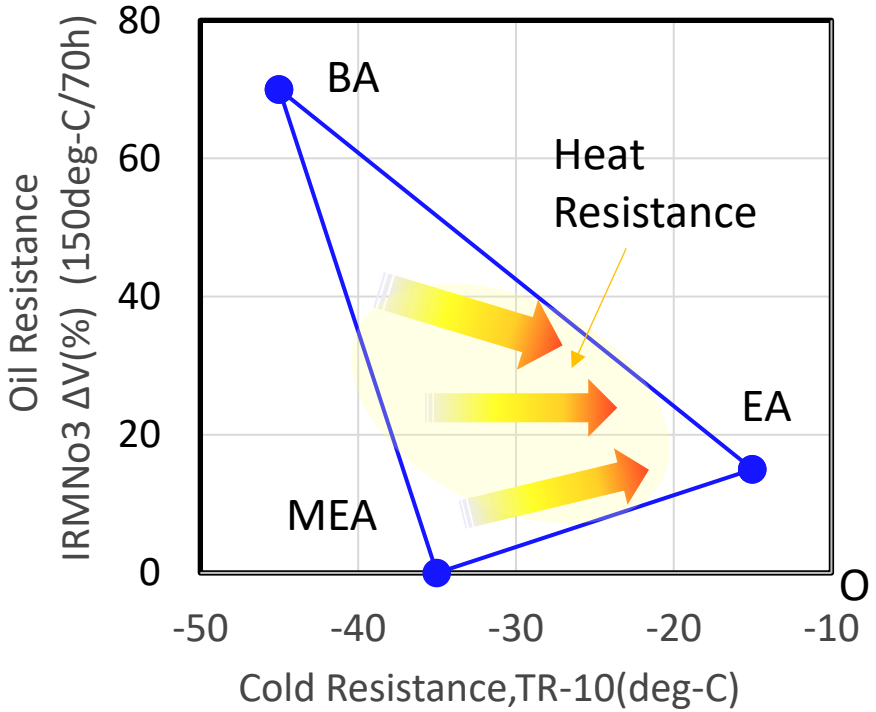


Fig. Relationship between monomer composition and polymer properties.

NOXTITE™ ACM is composed on three primary monomers-Ethyl Acrylate(EA),Butyl Acrylate(BA),and Methoxyethyl Acrylate(MEA)-along with various cross-linking site monomers.

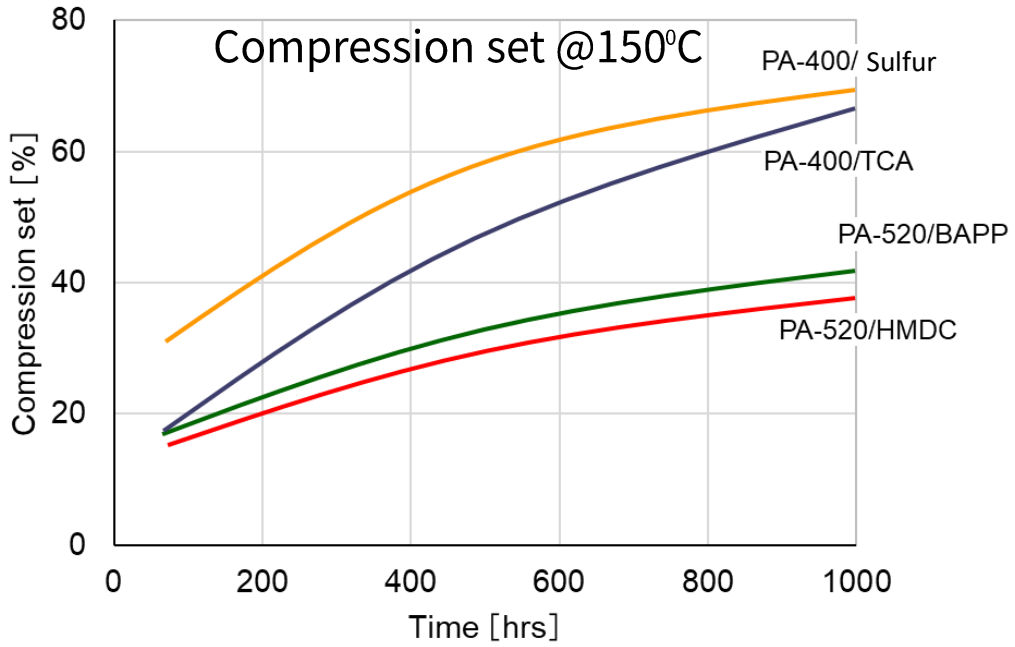
The three key properties of ACM—heat resistance, oil resistance, and low-temperature resistance—are determined by the composition ratio of these three monomers

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High temp resistance ACM; NOXTITE™ HT-ACM

UNIMATEC line up two type of ACM polymer.
PA-4xx series is basic grade. It is good balance between cost and property.
PA-5xx series is high temp. resistance grade named “HT-ACM”. PA-5xx series have adapted special crosslinking type of CSM which is also used in VAMAC

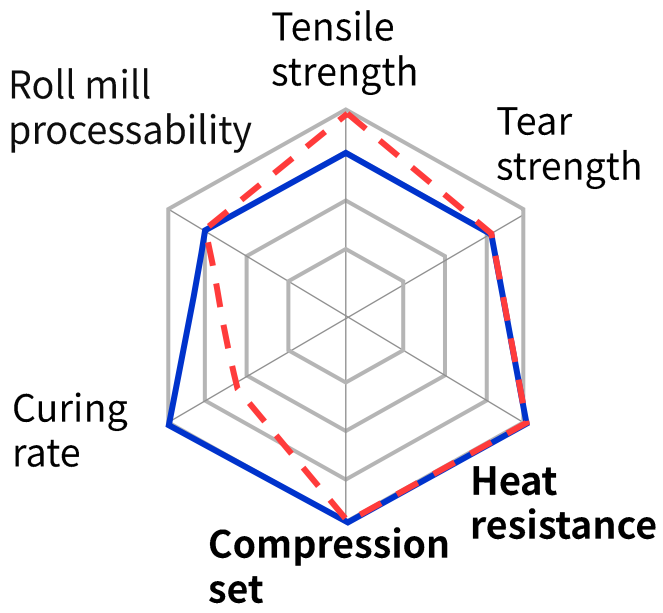
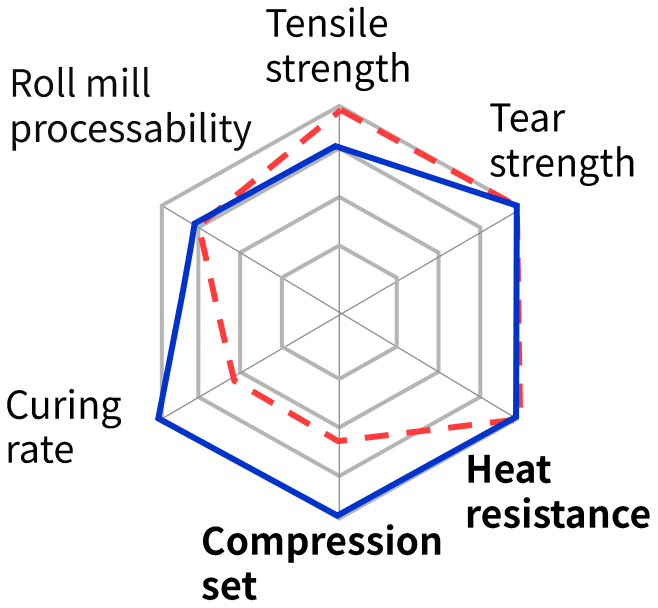
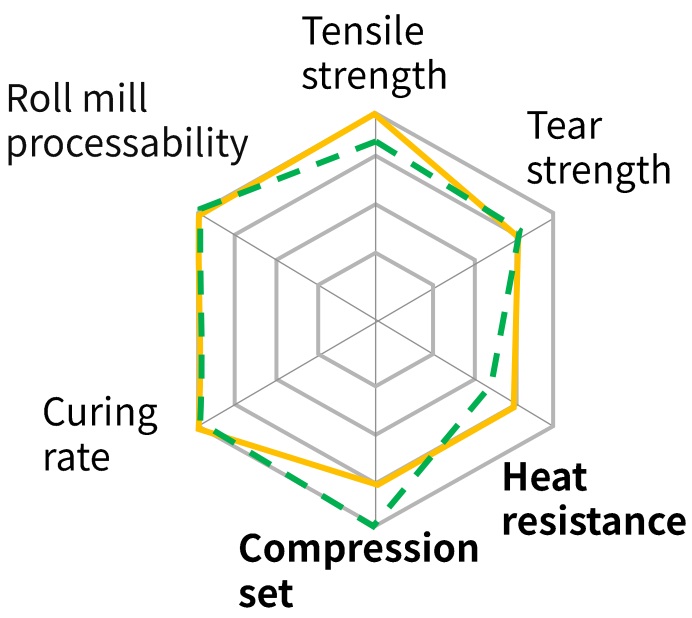
	NOXTIE™ ACM	NOXTIE™ HT-ACM
Grade	PA-400 series	PA-520 series
Cure Site Monomer	Chlorine group	Special crosslinking type
Cross link ingredient	Sulfur/Metal-Soap , TCA	BAPP,HMDC



TCA: 2,4,6-Trimercapto-s-triazine
HMDC: Hexamethylenediamine carbamate
BAPP: 2,2-Bis(3-amino-4-hydroxylphenyl)propane

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Comparison of NOXTITE™ ACM

	NOXTITE™ HT-ACM		NOXTITE™ ACM
Type	PA-520series (Gasket grade)	PA-520series (Hose grade)	PA-400series
Cure agent	HMDC/BAPP	HMDC/BAPP	Sulfur/TCA
Application	Gasket/O-ring	Hose	Gasket/O-ring/Seal
			
Remarks	Heat aging/Compression set ⇒Excellent	Heat aging/Tear strength ⇒Excellent	

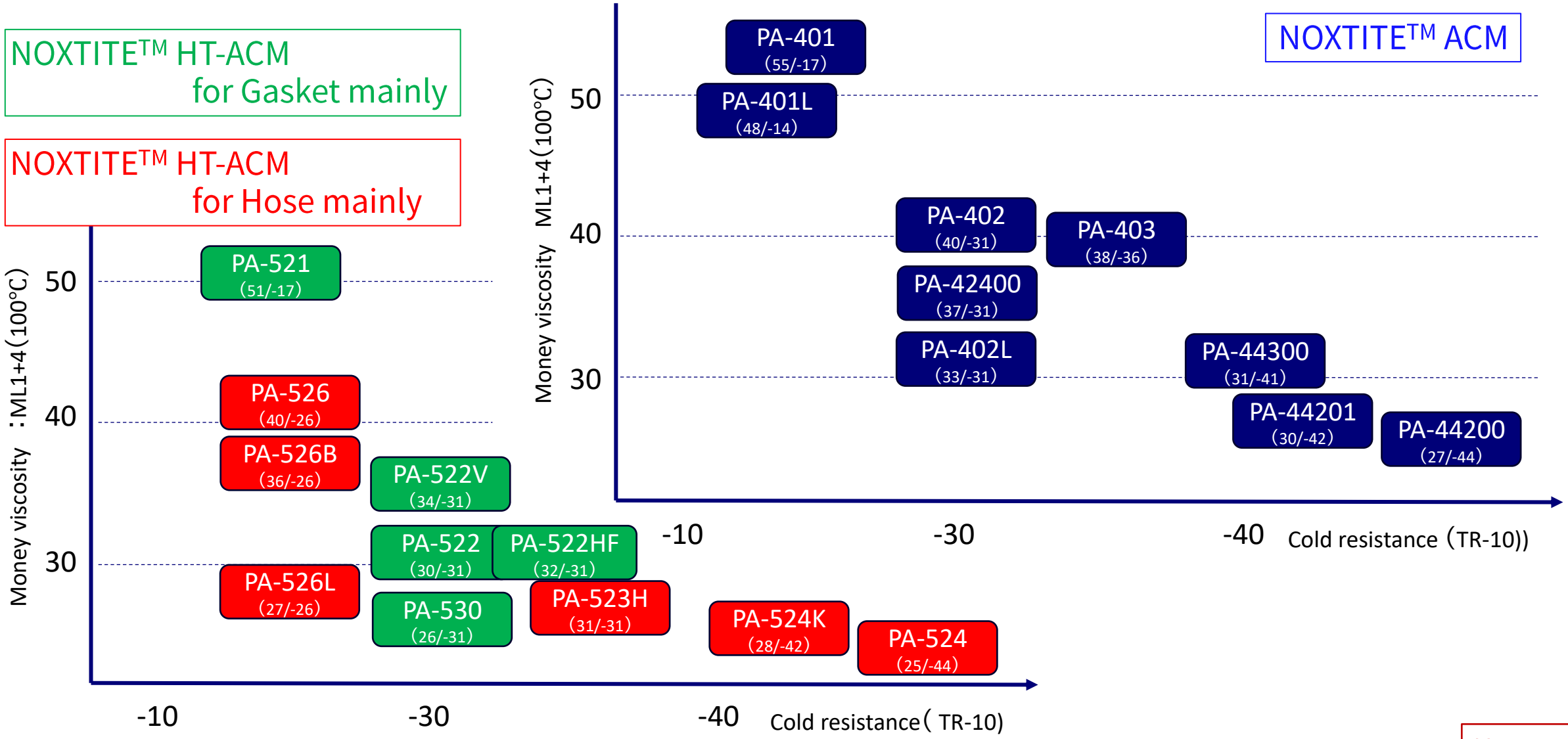
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The position of each type of NOXTITE™ ACM

NOXTITE™ HT-ACM
for Gasket mainly

NOXTITE™ HT-ACM
for Hose mainly



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Formulation is listed in following page, 10

Physical properties NOXTITE™ ACM(vulcanized using Triazine thiol/Dithiocarbamate)

		PA-401	PA-401L	PA-402	PA-42400	PA-402L	PA-403	PA-44300	PA-44201	PA-44200
Compound property										
	ML T5 (min)	50 16.3	48 13.4	42 13.4	43 16.6	37 21.7	45 21.2	43 11.9	42 14.9	43 3.9
Physical Properties										
Original Property	Hs(DuroA,Peak) M100(MPa) TS(MPa) EB(%)	69 5.2 12.0 280	69 5.1 11.6 290	67 6.1 11.7 220	67 6.0 11.3 200	69 6.4 10.6 200	69 6.3 11.2 190	73 8.4 11.3 140	69 7.7 11.3 150	69 7.4 10.8 150
Cold resistance	TR-10 (deg-C)	-11	-11	-25	-26	-25	-29	-38	-39	-40
IRM No3 Immersion 150°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%) ΔV (%)	-11 0 +25 +9	-11 0 +28 +9	-11 -13 +5 +11	-12 -16 +10 +14	-11 -13 +5 +11	-17 -13 +21 +16	-15 -14 +21 +14	-19 -18 +20 +22	-24 -25 +7 +35
Heat Resistance 150°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%)	+3 +2 +4	+3 -3 +7	+3 -1 0	+3 0 +5	+3 -1 0	+5 -1 +5	+2 +1 0	+1 +2 +7	+2 +1 +7
Heat Resistance 175°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%)	+9 +1 -7	+8 -12 +14	+8 -4 -9	+6 -4 +5	+8 -4 -9	+8 -4 -5	+5 -3 -7	+6 -6 0	+5 -4 +7
Compression set	150°Cx72h(%)	18	21	16	12	14	13	13	12	12

Formulation is listed in following page, 10

Physical properties NOXTITE™ HT-ACM(vulcanized using AC-6(HMDC))

Major application		Gasket					Gasket/Hose		Hose			
		PA-521	PA-522	PA-522HF	PA-530	PA-522V	PA-524	PA-524K	PA-526	PA-526L	PA-526B	PA-523H
Compound property												
	ML T5 (min)	57 4.3	49 3.1	45 4.6	43 4.8	46 3.9	48 3.4	51 2.4	51 5.2	44 5.3	46 5.6	42 6.1
Physical Properties												
Original Property	Hs(DuroA,Peak) M100(MPa) TS(MPa) EB(%)	67 4.5 13.8 250	72 6.5 12.0 180	69 5.4 10.7 190	73 5.6 10.8 190	67 5.8 12.1 180	67 5.3 9.8 170	71 7.9 10.8 130	67 4.0 11.3 240	72 4.3 10.7 250	68 4.3 11.3 230	68 4.0 10.2 220
Cold resistance	TR-10 (deg-C)	-16	-28	-27	-27	-28	-39	-38	-22	-20	-24	-28
IRM No3 Immersion 150°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%) ΔV (%)	-7 -6 -4 +10	-13 -8 -11 +14	-17 -13 -11 +25	-18 -11 -11 +24	-17 -10 -6 +25	-21 -18 -12 +31	-16 -17 -8 +20	-7 -3 +8 +12	-9 0 -3 +12	-14 -10 +4 +20	-20 -14 -9 +29
Heat Resistance 150°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%)	+3 -10 +12	+1 -9 +6	+2 -5 +11	+1 -9 +11	+3 -7 +17	+3 -6 +6	+1 -1 +15	+3 -9 +21	+2 -9 +16	+3 -10 +9	+1 -7 +9
Heat Resistance 175°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%)	+3 -20 +24	+1 -21 +6	+1 -15 +21	+1 -20 +21	-1 -15 +22	+3 -14 +18	+2 -13 +15	+3 -19 +25	+4 -17 +17	+3 -19 +13	+2 -16 +14
Compression set	150°Cx72h(%)	13	15	14	15	12	19	15	22	24	20	21

Formulation is listed in following page, 10

Physical properties NOXTITE™ HT-ACM(vulcanized using CLZ77(BAPP))

Major application		Gasket					Gasket/Hose		Hose			
		PA-521	PA-522	PA-522HF	PA-530	PA-522V	PA-524	PA-524K	PA-526	PA-526L	PA-526B	PA-523H
Compound property												
	ML T5 (min)	52 10.8	41 7.6	41 11.8	40 13.0	49 6.8	45 8.7	49 5.4	51 13.1	42 15.9	45 12.9	41 13.8
Physical Properties												
Original Property	Hs(DuroA,Peak) M100(MPa) TS(MPa) EB(%)	70 5.1 13.8 240	73 6.5 11.5 170	74 5.7 11.1 200	74 6.0 11.0 190	70 5.9 12.6 190	70 6.1 9.8 160	73 8.1 9.8 110	71 4.9 12.2 240	73 4.5 10.9 250	72 5.3 11.6 210	72 5.1 11.0 200
Cold resistance	TR-10 (deg-C)	-15	-27	-27	-27	-26	-39	-38	-21	-19	-24	-28
IRM No3 Immersion 150°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%) ΔV (%)	-8 -6 -8 +10	-10 -6 -6 +14	-17 -12 -15 +24	-15 -11 -11 +24	-18 -20 -21 +24	-19 -18 -13 +29	-13 -18 -18 +19	-10 -4 -4 +12	-7 +5 -5 +12	-14 -4 -10 +20	-20 -13 -10 +28
Heat Resistance 150°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%)	0 -12 +8	+2 -7 +12	+1 -9 +5	+4 -9 +11	+2 -12 +5	+4 -3 +6	+2 0 +27	+1 -11 +13	+3 -5 +5	+3 -6 +10	+2 -6 +10
Heat Resistance 175°Cx72h	ΔHs (pts) ΔTs (%) ΔEB (%)	0 -23 +21	+2 -22 +18	+1 -21 +15	+4 -22 +16	+1 -21 +16	+4 -11 +13	+1 -13 +36	+2 -21 +21	+5 -14 +4	+3 -16 +14	+1 -14 +15
Compression set	150°Cx72h(%)	18	20	19	20	18	40	20	45	49	29	30

Introduction to the newly developed grade: PA-44300

PA-44300 is new grade of NOXTITE™ ACM, which improve kneader mixing efficiency, and Its properties is almost same as PA-404N.

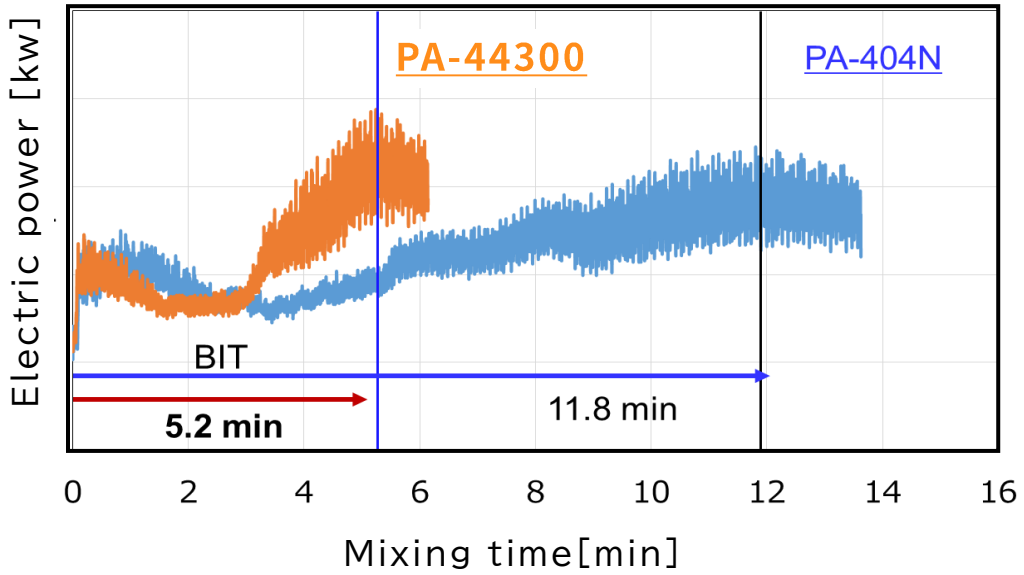
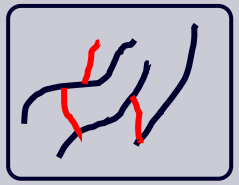
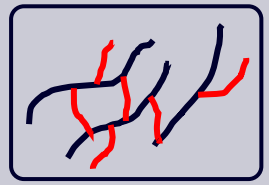


Fig. Mix chart

Black incorporation time(BIT) of PA-44300 is shorter than PA-404N.

	PA-44300	PA-404N
Physical properties[JIS K6253-3,6251]		
Hs(Duro-A Peak) TS(MPa) EB(%)	68 12.1 150	66 12.9 160
Compression set[JIS K6262]		
150°C/ 70h	25	30
Oil immersion[JIS K6258]		
△V(%)	+15	+15
Cool resistance[JIS K6261-4]		
TR-10(°C)	-38	-38
Estimated Polymer structure		
Polymer branch	Low	High

*Same recipe

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Test Compound Formulation

Polymer Grade	PA-400 series			PA-500 series	
Crosslinking Type	S/Soap		CL-T-2R	AC-6	CLZ77
Formulation No.	1	2*	3	4	5
Polymer	100	←	←	100	←
N550 carbon black (FEF)	60	←	←	65	←
Stearic acid	1	←	←	1	←
4,4'-Bis(α,α-dimethylbenzyl)diphenylamine	2	←	←	2	←
Higher fatty acid ester	2	←	←	2	←
Sodium stearate	2.5	3			
Potassium steatate	0.5	0.25			
Sulfur	0.3	0.3			
CHEMINOX CL-T-2R			0.8		
Zinc di-n-butyldithiocarbamate			1.5		
CHEMINOX AC-6				0.6	
CHEMINOX CLZ77					2.4
Tertiary amine complex absorbed on silica carrier				1	1
Stearyl amine				0.5	

*Only PA-401 and PA-401L

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