

## 世界の SBR 評價 DATA

本 DATA는 日本合成고무工業(株)에서 세계 各國의 SBR을 수집하여 品質比較 評價用으로 每年 실시해 오고 있다.

本資料는 1978년 1월에 試驗한 品質評價 DATA로서 各社에서 外國產 SBR의 輸入時 또는 세계 各國 SBR의 品質 比較時 도움이 되코자 소개한다.

(韓國合成고무工業株式會社提供)

Abbreviations Of Producers

Abbreviation	Producer*	Country	Trade Name
KSR	Korea Synthetic Rubber Industry Co., Ltd.	Korea	Kosyn
NZ	Nippon Zeon Company, Ltd.	"	Nipol
SU	Sumitomo Chemical Company, Ltd.	"	Sumitomo SBR
GY	Goodyear Tire Rubber Company	U.S.A.	Plioflex
FRS	Firestone Synthetic Rubber and Latex Company	"	FR-S
TEX	Texas-U.S. Chemical Company	"	Synpol
GT	General Tire and Rubber Company	"	Genpro
P	POLYSAR Limited	Canada	Krylene, Krynol
SH	Shell Nederland Chemie N.V.	Netherland	Cariflex S
ISR	International Synthetic Rubber Company, Ltd.	U.K.	Intol
BW	Burawerke Hüls GmbH	G.F.R.(W-Germany)	Buna Hüls
AN	ANIC S.P.A.	Italy	Europrene
OW	Zakłady Chemiczne Oswiecim	Poland	Ker
VEB	Kombinat VEB Chemische Werke Bura	G.D.R.(E-Germany)	Buna
NEF	NEFTOCHIM	Bulgaria	Bultex
JSR	Japan Synthetic Rubber Company, Ltd.	Japan	JSR

\* By IISRP'S "The Synthetic Rubber Manual '76 Edit."

## §1: EVALUATION OF

Trade Name	Kosyn	JSR	Nipol	Sumitomo	Plioflex	FR-S	Synpol
	1500	1500	1500	1500	1500C	1500	1500
Producer Country	KSR	JSR	NZ	SU	GY	FRS	TEX
	KOREA	JAPAN			USA		
Raw Mooney Vis.							
ML1+4 (100°C)	54.0	51.5	52.0	485	52.0	49.5	52.0
Volatile Matter (%)	0.13	0.08	0.09	0.16	0.22	0.10	0.44
Ash (%)	0.83	0.65	0.18	0.36	0.36	0.16	0.44
Organic Acid (%)	6.64	6.22	6.67	6.71	7.02	6.47	6.50
Soap (%)	0.04	0.01	0.41	0.02	0.05	0.26	0.05
Bound Styrene (%)	23.0	23.1	23.0	23.1	23.0	22.9	23.7
Compound Mooney Vis							
ML1+4 (100°C)	75.0	75.1	76.5	70.0	72.5	70.0	72.5
300% Modulus (kg/cm <sup>2</sup> )							
25' cure at 145°C	117	118	128	141	143	105	138
35' "	160	162	167	171	180	147	170
50' "	178	186	185	190	200	172	185
Tensile Strength (kg/cm <sup>2</sup> )							
35' cure at 145°C	314	318	308	313	317	332	333
Elongation (%)							
35' cure at 145°C	540	530	500	500	490	590	520
Hardness (JIS)							
35' cure at 145°C	68	69	69	68	70	67	70
Monsant O.D.R. Test (at 160°C)							
M <sub>HF</sub> (Lb-In)	41.5	42.4	42.3	41.4	42.8	39.6	41.9
M <sub>L</sub> ( " )	8.8	8.9	9.2	8.6	8.7	8.5	9.2
tsl (Min.)	3.2	3.6	4.0	3.8	3.6	4.5	3.8
t'c(10) ( " )	5.0	5.1	5.4	5.1	5.0	6.2	5.1
t'c(50) ( " )	8.9	8.3	8.4	7.8	7.8	9.4	7.8
t'c(90) ( " )	14.5	14.3	14.3	13.2	13.2	15.3	13.2
Molecular Characteristics							
(GPC- $[\eta]$ Method)							
$[\eta]$	2.22	2.20	2.29	2.16	2.24	2.17	2.17
$\bar{M}_n$ ( $\times 10^4$ )	12.3	12.4	12.8	13.0	13.2	11.7	12.8
$\bar{M}_w$ ( $\times 10^4$ )	37.5	47.7	39.9	46.0	52.0	47.2	42.5
$\bar{M}_w/\bar{M}_n$	3.1	3.8	3.1	3.5	3.9	4.0	3.3

THE WORLD SBR 1500

Gentro	Kryrene	Cariflex	Intol	BunaHuls	Europrene	Ker	Buna	Bultex
1500A	1500	S 1500	1500	1500	1500	1500	SB 150H	1500
GT	P	SH	SR	BW	AN	OW	VEB	NET
	CANADA	FRANCE	UK	W-GERM	ITALY	POLAND	E-GERM	BURG- ARIA
54.5	52.0	50.5	53.5	52.5	58.0	53.0	56.0	50.0
0.09	0.12	0.13	0.36	0.11	0.42	0.10	0.17	—
0.18	0.36	0.32	0.55	0.26	0.18	0.49	0.40	0.28
6.55	6.49	6.51	6.28	6.86	6.35	6.89	6.40	6.80
0.04	0.03	0.03	0.15	0.21	0.05	0.47	0.13	0.03
23.9	23.2	23.1	23.8	22.7	23.5	22.2	22.5	23.9
75.0	74.0	73.0	67.5	76.0	76.0	65.5	72.0	70.0
91	134	121	130	172	120	124	135	98
139	160	158	167	186	162	156	174	139
169	178	183	190	198	180	180	184	156
323	326	332	324	349	349	319	319	318
590	550	560	520	510	570	540	500	600
68	70	69	70	70	71	69	70	66
39.2	42.2	41.4	40.7	45.5	43.5	38.9	48.9	40.7
9.0	8.9	8.5	8.2	9.3	9.1	7.8	8.3	8.8
4.0	4.1	4.0	4.3	3.2	4.0	3.9	3.9	3.7
6.3	5.4	5.6	5.9	4.4	5.6	5.3	5.3	5.8
10.0	8.1	8.8	8.7	6.4	8.2	8.3	7.6	9.3
16.4	13.4	15.1	14.4	10.4	13.5	14.2	12.8	15.8
2.23	2.12	2.12	2.23	2.15	2.30	2.13	2.48	2.13
11.5	12.5	11.3	12.1	12.3	12.2	13.0	13.2	11.9
48.0	41.9	32.4	63.2	40.2	57.3	60.9	58.7	50.9
4.2	3.4	2.9	5.2	3.3	4.7	4.7	4.4	4.3

Trade Name	Kosyn	JSR	Npol	Sumitomo	Plioflex	FR-S
	1502	1502	1502	1502	1502	1502
Producer Country	KSR	JSR	NZ	SU	GY	FRS
	KOREA	JAPAN			USA	
Raw Mooney Vis						
ML 1+4 (100°C)	51.0	53.5	50.0	46.5	54.0	51.0
Volatile Matter (%)	0.17	0.10	0.14	0.11	0.13	0.08
Ash (%)	0.83	0.48	0.22	0.38	0.66	0.11
Organic Acid (%)	5.79	5.91	5.48	6.24	6.28	6.32
Soap (%)	0.02	0.01	0.04	0.04	0.04	0.05
Bound Styrene (%)	23.1	23.8	23.1	22.7	23.9	21.7
Compound Mooney Vis						
ML 1+4 (100°C)	76.5	74.0	78.0	66.0	73.0	71.5
300% Modulus (kg/cm <sup>2</sup> )						
25' cure at 145°C	175	189	164	153	143	131
35' "	193	208	187	181	175	160
50' "	210	223	209	194	198	185
Tensile Strength (kg/cm <sup>2</sup> )						
35' cure at 145°C	313	315	312	303	318	306
Elongation (%)						
35' cure at 145°C	450	430	450	490	480	500
Hardness (JIS)						
35' cure at 145°C	71	70	69	69	70	66
Monsant O.D.R Test (at 160°C)						
M <sub>HF</sub> (Lb-In)	44.9	46.2	47.2	43.8	44.5	42.7
M <sub>L</sub> ( " )	9.3	9.5	10.2	8.3	9.4	9.2
ts1 (Min)	3.2	3.0	2.5	3.5	3.5	2.8
t'c(10) ( " )	4.6	4.3	4.5	4.8	5.1	4.8
t'c(50) ( " )	6.7	6.3	6.9	7.1	7.7	7.2
t'c(90) ( " )	11.9	11.0	12.2	12.3	13.3	14.8
Molecular Characteristics						
(GPC- $[\eta]$ Method)						
$[\eta]$	2.17	2.18	2.30	2.15	2.32	2.24
$\overline{M}_n$ ( $\times 10^4$ )	13.5	13.1	13.0	12.1	14.2	12.8
$\overline{M}_w$ ( $\times 10^4$ )	42.2	49.4	47.2	52.1	61.9	46.5
$\overline{M}_w/\overline{M}_n$	3.1	3.8	3.6	4.3	4.4	3.6

THE WORLD SBR 1502

Synpol	Gentro	Kryrene	Cariflex	Intol	BunaHüls	Europrene	Ker
1502	1502 A	1502	S 1502	1502	1502	1502	1502
TEX	GT	P	SH	ISR	BW	AN	OW
		CANADA	FRANCE	UK	W-GERM	ITALY	POLAND
49.0	51.5	55.5	53.5	50.0	53.5	52.5	51.0
0.18	0.22	0.18	0.14	0.21	0.11	0.15	0.12
0.16	0.07	0.42	0.35	0.65	0.19	0.15	0.22
6.43	5.91	6.16	6.12	6.10	5.35	7.08	6.37
0.06	0.02	0.01	0.03	0.01	0.42	0.07	0.32
23.1	23.3	23.3	23.9	23.8	22.0	21.9	21.9
67.0	71.5	69.0	78.0	67.5	83.5	73.0	73.0
114	129	135	150	170	236	145	120
143	149	171	186	195	251	181	163
168	170	190	205	212	246	198	187
309	319	316	308	317	306	310	321
560	550	500	460	460	360	460	510
65	66	69	70	69	73	70	70
41.7	42.2	42.7	46.7	43.4	50.8	45.5	42.5
8.5	9.1	8.7	10.3	8.7	10.7	9.4	9.3
4.0	5.0	3.5	2.9	2.8	2.1	3.0	3.5
5.4	3.7	4.7	4.8	4.5	3.2	4.5	5.3
8.3	7.4	7.2	7.6	7.1	4.7	7.0	8.8
14.5	13.0	13.7	13.9	12.7	7.0	13.3	15.4
2.19	2.24	2.31	2.19	2.18	2.39	2.30	2.23
11.7	12.8	14.3	14.5	13.2	12.6	13.8	13.0
43.1	46.3	75.6	50.8	72.5	37.9	63.6	59.0
3.7	3.6	5.3	3.5	5.5	3.0	4.6	4.5

## §3. EVALUATION OF

Trade . Name	Kosyn	JSR 1712		Nipol	Sumit- omo	Plioflex	FR-S	Synpol
	1712	Regular	High Mo- oney Vis	1712	1712	1712 C	1712	1712 Z
Producer Country	KSR	JSR		NZ	SU	GY	FRS	TEX
	KOREA	JAPAN				USA		
Raw Mooney Vis ML1+4(100°C)	48.5	47.0	55.5	49.5	47.0	54.0	53.5	47.5
Volatile Matter (%)	0.09	0.07	0.07	0.07	0.10	0.12	0.09	0.18
Ash (%)	0.58	0.67	0.43	0.15	0.47	1.08	0.08	0.30
Organic Acid (%)	4.96	4.82	4.76	4.35	4.96	5.44	4.49	5.41
Soap (%)	0.01	0.03	0.09	0.03	0.07	0.06	0.03	0.06
Bound Styrene (% of RHC)	23.1	23.9	23.9	23.8	23.8	23.8	20.8	23.2
ETA-Extract (%)	32.2	32.8	32.9	32.1	33.8	32.6	32.0	33.1
Compound Mooney Vis ML1+4 (100°C)	57.5	56.5	62.0	58.0	53.5	58.5	57.0	54.0
-300% Modulus (kg/cm <sup>2</sup> )								
25' cure at 145°C	87	92	102	91	84	89	70	85
35'     "     "	95	100	113	106	97	106	87	96
50'     "     "	102	107	116	106	103	111	95	107
Tensile Strength (kg/cm <sup>2</sup> )								
35' cure at 145°C	263	267	273	280	270	262	266	264
Elongation (%)								
35' cure at 145°C	650	660	620	630	660	620	660	650
Hardness (JIS)								
35' cure at 145°C	60	62	62	62	61	62	58	57
Monsant O.D.R. Test (at 160°C)								
M <sub>HF</sub> (Lb-In)	30.0	29.4	30.5	30.9	28.8	30.0	28.0	28.6
M <sub>L</sub> ( " )	6.8	6.7	7.6	7.3	6.2	7.7	7.7	7.0
t <sub>s1</sub> (Min)	4.4	4.8	4.1	4.3	4.9	4.2	5.0	4.3
t' <sub>c</sub> (10) ( " )	5.2	5.6	4.9	5.3	5.8	5.0	6.0	5.0
t' <sub>c</sub> (50) ( " )	7.1	7.6	6.7	7.1	7.8	7.4	8.6	6.9
t' <sub>c</sub> (90) ( " )	11.8	11.9	10.2	10.7	12.2	12.0	13.5	11.2
Molecular Characteristics (GPC-[ $\eta$ ] Method)								
[ $\eta$ ]	2.97	2.85	3.02	2.93	2.95	3.13	3.08	2.99
$\bar{M}_n$ ( $\times 10^4$ )	18.9	19.6	20.0	16.1	20.6	19.5	23.2	17.9
$\bar{M}_w$ ( $\times 10^4$ )	93.4	13.0	13.8	80.3	141	13.0	18.8	92.7
$\bar{M}_w/\bar{M}_n$	5.0	6.6	6.9	5.0	6.8	6.7	8.1	5.2

THE WORLD SBR 1712

Gentro		Krynol	Cariflex	Intol	Buna Hüls	Europr-ene	Ker	Buna	Bultex
1712/48	1712/52	1712	S 1712	1712	1712	1712	1712	SB 170H	1712
GT		P	SH	ISR	BW	AN	OW	VEB	NEF
		CANA-DA	FRANCE	UK	W-GERM	ITALY	POLAND	E-GERM	BURG-ARIA
51.5	54.0	55.0	50.5	49.5	51.0	53.0	48.5	53.5	52.0
0.08	0.11	0.08	0.20	0.07	0.13	0.06	0.12	0.11	—
0.24	0.25	0.48	0.53	0.31	0.23	0.42	0.21	0.46	0.22
5.69	5.27	5.01	5.01	4.7	4.30	4.72	4.35	4.29	4.43
0.08	0.11	0.10	0.12	0.05	0.21	0.11	0.21	0.10	0.03
23.8	24.0	23.4	23.9	24.0	24.0	23.4	21.4	22.8	21.6
32.7	32.7	32.7	32.7	34.4	32.2	32.2	31.8	340	—
58.0	56.5	62.0	61.0	58.5	61.0	57.0	58.5	57.5	59.5
98	91	92	101	87	100	90	91	88	86
100	103	105	110	98	112	104	105	100	99
110	103	111	118	103	118	105	111	107	106
266	272	265	264	263	277	277	259	269	262
650	640	620	600	650	620	640	570	640	620
62	62	62	62	62	62	61	62	59	60
28.2	28.6	30.7	30.5	28.8	31.5	30.2	28.7	30.0	29.6
7.3	7.8	8.0	7.4	7.4	7.5	6.8	7.5	7.5	7.7
4.4	4.2	4.2	4.3	4.7	4.2	4.7	4.5	4.4	4.7
5.1	5.1	5.0	5.2	5.6	4.9	5.7	5.3	5.6	5.7
6.4	7.3	7.0	7.1	7.6	6.6	7.8	7.5	7.7	7.8
11.0	11.6	10.9	11.3	11.6	10.0	12.2	11.6	12.0	12.0
3.04	3.14	2.97	3.04	3.16	3.08	2.94	2.48	3.28	3.15
20.4	19.9	23.3	19.8	22.2	19.8	22.6	147	21.0	20.0
125	141	150	95.8	149	93.0	165	77.8	183	122
6.1	7.1	6.4	4.8	6.7	4.7	7.3	5.3	8.7	6.1

		Easy Processing Type					
Trade Name	Kosyn	JSR		Nipol	Sumitomo	Plioflex	JSR
	1778K	1778 N		1778 J	1778 S	RPF 5258 U	1778
Producer Country	KSR	JSR		NZ	SU	GY	JSR
	KOREA	JAPAN				USA	JAPAN
Raw Mooney Vis		①	②				
ML1+4 (100°C)	46.0	47.0	46.0	41.5	45.0	45.0	57.5
Volatile Matter (%)	0.44	0.14	0.11	0.07	0.30	0.17	0.09
Ash (%)	0.55	0.51	0.34	0.42	0.59	1.03	0.53
Organic Acid (%)	4.84	4.95	4.71	4.46	4.74	5.31	4.99
Soap (%)	0.04	0.04	0.05	0.05	0.06	0.03	0.04
Bound Styrene (% of RHC)	23.1	23.2	22.7	23.4	22.4	19.7	23.1
ETA-Extract (%)	32.6	34.4	33.9	32.5	32.1	33.8	34.3
Compound Mooney Vis							
ML 1+4 (100°C)	52.5	54.0	52.5	51.5	52.0	57.0	61.5
300% Modulus (kg/cm <sup>2</sup> )							
25' cure at 145°C	92	93	98	91	98	90	104
35' "	112	113	115	104	116	109	121
50' "	128	125	129	122	126	122	133
Tensile Strength (kg/cm <sup>2</sup> )							
35' cure at 145°C	238	234	239	242	228	231	242
Elongation (%)							
35' cure at 145°C	540	550	540	560	500	520	500
Hardness (JIS)							
35' cure at 145°C	58	57	58	56	58	57	57
Monsant O.D.R. Test (at 160°C)							
M <sub>HF</sub> (Lb-In)	28.7	27.4	28.2	28.8	28.2	28.5	28.6
M <sub>L</sub> ( " )	6.8	6.7	6.3	6.4	6.4	7.5	7.9
ts1 (Min)	4.3	4.3	4.5	4.4	4.3	4.2	4.1
t'c(10) ( " )	5.2	5.3	5.3	5.3	5.3	5.3	5.1
t'c(50) ( " )	7.5	7.7	7.7	8.5	7.6	7.6	7.5
t'c(90) ( " )	12.7	13.1	12.8	12.8	12.8	14.0	12.2
Molecular Characteristics							
(GPC- $[\eta]$ Method)							
$[\eta]$	3.14	3.16	3.18	2.91	3.07	3.17	3.08
$\overline{M}_n$ ( $\times 10^4$ )	19.4	26.0	18.5	19.1	19.3	18.9	26.2
$\overline{M}_w$ ( $\times 10^4$ )	97.1	181	115	95.8	168	133	192
$\overline{M}_w/\overline{M}_n$	5.0	7.0	6.2	5.0	8.7	7.0	7.3

IISRP-Regular Type								
FR-S	Synpol	Genfro	Krynol	Cariflex	Intol	BunaHüls	Europr-ene	Ker
178	1778	1778/53	1778	S 1778	1778	1778	1778	1778
FRS	TEX	GT	P	SH	ISR	B-W	AN	OW
USA			CANADA	FRANCE	UK	W-GERM	ITALY	POLAND
52.5	52.0	57.0	52.5	58.0	50.0	52.0	51.0	50.0
0.32	0.24	0.07	0.22	0.11	0.22	0.11	0.11	0.32
0.15	0.34	0.15	0.30	0.41	0.48	0.23	0.22	0.26
4.16	5.79	5.23	4.28	4.96	5.46	4.04	4.80	4.34
0.01	0.11	0.42	0.06	0.07	0.05	0.25	0.08	0.40
19.4	23.1	23.1	23.8	23.8	23.7	22.4	23.3	23.8
31.4	33.2	32.5	32.8	32.8	34.4	3.2	34.4	31.7
59.5	58.5	64.0	57.0	60.5	55.5	58.5	58.0	58.5
77	73	94	90	83	91	122	86	83
104	96	109	116	101	112	131	107	107
117	113	119	128	125	128	137	122	118
232	253	250	250	255	249	253	253	266
520	630	570	560	580	550	500	580	600
57	57	58	58	58	57	59	59	58
30.5	29.8	29.5	30.5	30.3	27.6	32.2	30.3	27.7
8.1	7.5	8.1	7.3	8.1	7.0	7.6	7.2	7.5
4.7	4.2	4.2	5.0	4.7	4.4	3.6	4.0	4.5
5.9	5.3	5.4	6.1	5.7	5.4	4.4	5.3	5.7
8.8	8.1	7.9	8.6	8.6	7.9	6.1	7.6	8.7
14.9	15.0	13.3	14.3	14.6	13.9	9.1	13.2	14.0
3.16	3.30	3.23	3.14	3.16	3.37	3.47	3.07	2.94
22.1	20.8	18.5	20.8	27.3	23.1	19.6	19.3	19.1
186	128	159	138	194	201	99.1	168	159
8.4	6.2	8.6	6.6	7.1	8.7	5.1	8.7	8.3