

UNIVERSITY OF CALGARY

Rheological Properties of Asphalt Binder, Mastic and Hot Mix Asphalt

by

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THESIS APPENDICES

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APPENDIX A

MEASURED RAW DATA

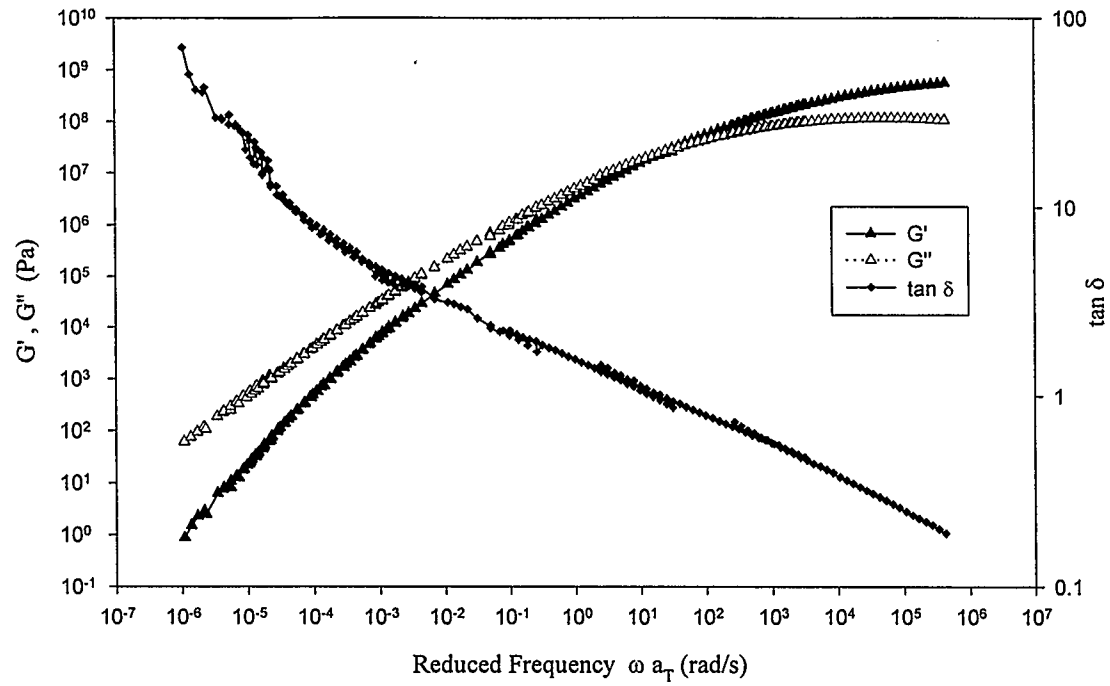


Figure A 1 Master curves at $T_r = 0^\circ\text{C}$ for A150/200 Pen grade

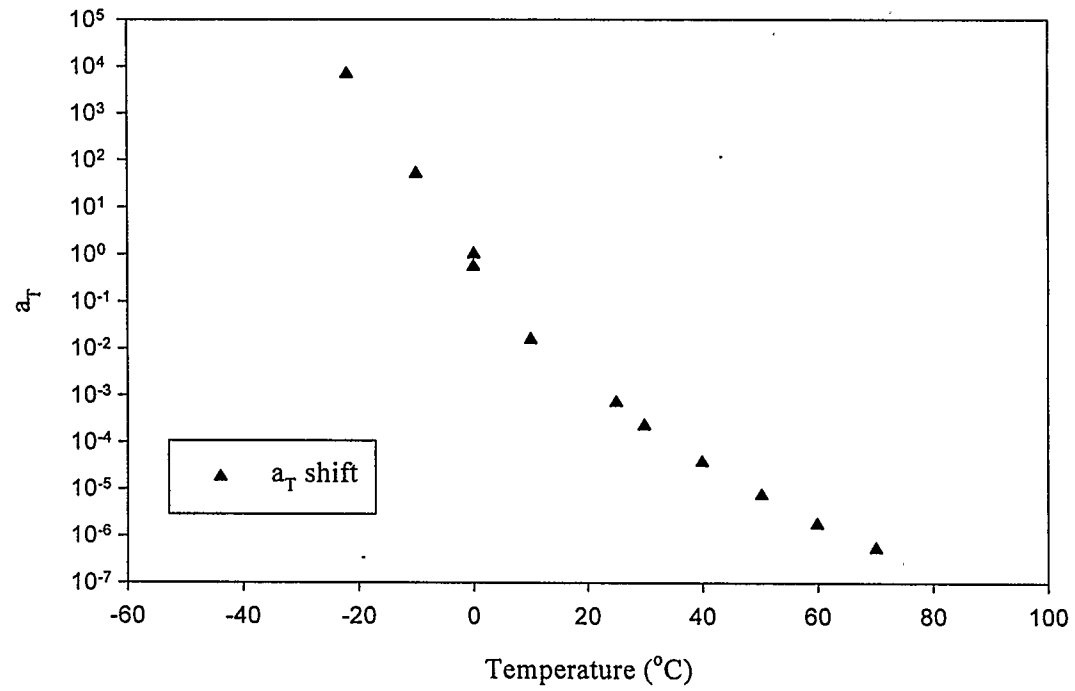


Figure A 2 TTS a_T shift factor for A150/200 Pen grade

A 150/200 Pen grade (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-21.99	6.77E+03	0.92	1	1.63E+08	2.24E-06	1	4.24E-10	2.92E-06
-9.99	5.02E+01	0.96	2	1.30E+08	1.43E-05	2	5.99E-10	1.90E-05
-0.05	5.45E-01	1.00	3	1.23E+08	7.59E-05	3	1.08E-09	1.11E-04
0.01	1.00E+00	1.00	4	1.04E+08	4.04E-04	4	2.13E-09	6.70E-04
9.99	1.54E-02	1.04	5	7.15E+07	2.10E-03	5	4.73E-09	4.04E-03
25.00	7.02E-04	1.09	6	4.12E+07	1.17E-02	6	1.13E-08	2.66E-02
29.89	2.23E-04	1.11	7	1.76E+07	6.51E-02	7	2.26E-08	1.52E-01
39.96	3.66E-05	1.15	8	6.58E+06	2.87E-01	8	5.30E-08	7.10E-01
50.25	7.23E-06	1.18	9	2.46E+06	1.22E+00	9	1.47E-07	3.37E+00
59.92	1.73E-06	1.22	10	9.14E+05	5.63E+00	10	7.34E-07	2.43E+01
70.12	5.28E-07	1.26	11	2.25E+05	4.24E+01	11	3.00E-06	2.47E+02
			12	2.58E+04	3.45E+02	12	1.09E-05	1.71E+03
			13	3.94E+03	2.16E+03	13	4.86E-05	1.43E+04
			14	3.90E+02	1.66E+04	14	2.32E-04	1.98E+05
			15	1.26E+01	2.09E+05			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 1 A 150/200 Pen grade, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	16.94
C ₂	114.94
r ²	0.996
Std. Err.	0.2081

Table A 2 A 150/200 Pen grade , WLF a_T shift constants

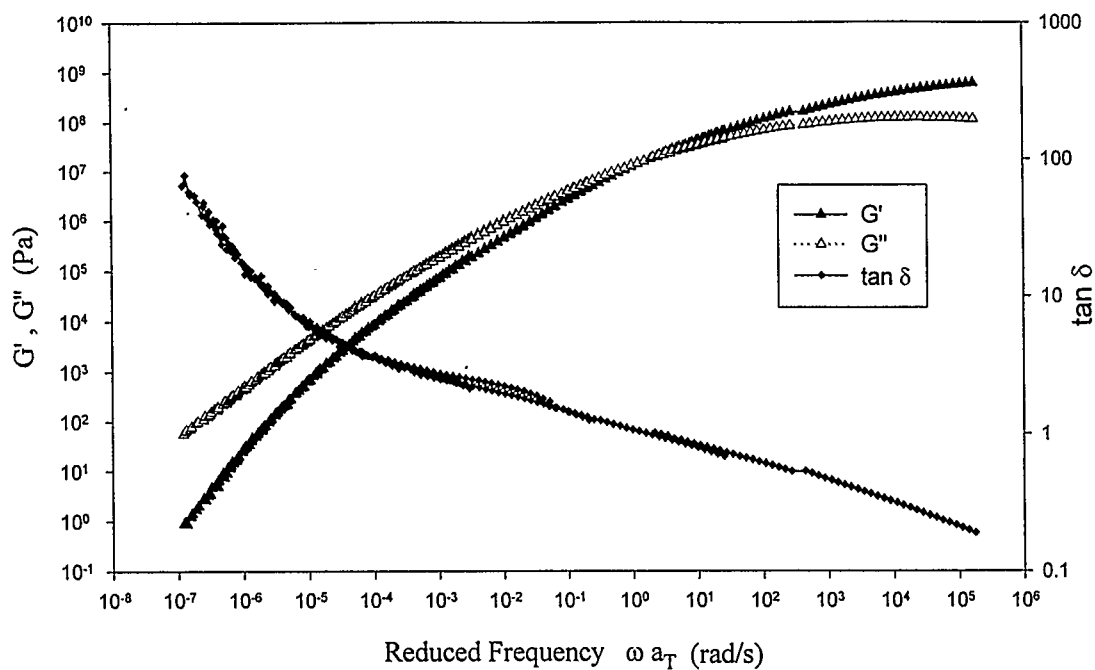


Figure A 3 Master curves at $T_r = 0^\circ\text{C}$ for A150/200 Pen grade RTFO aged

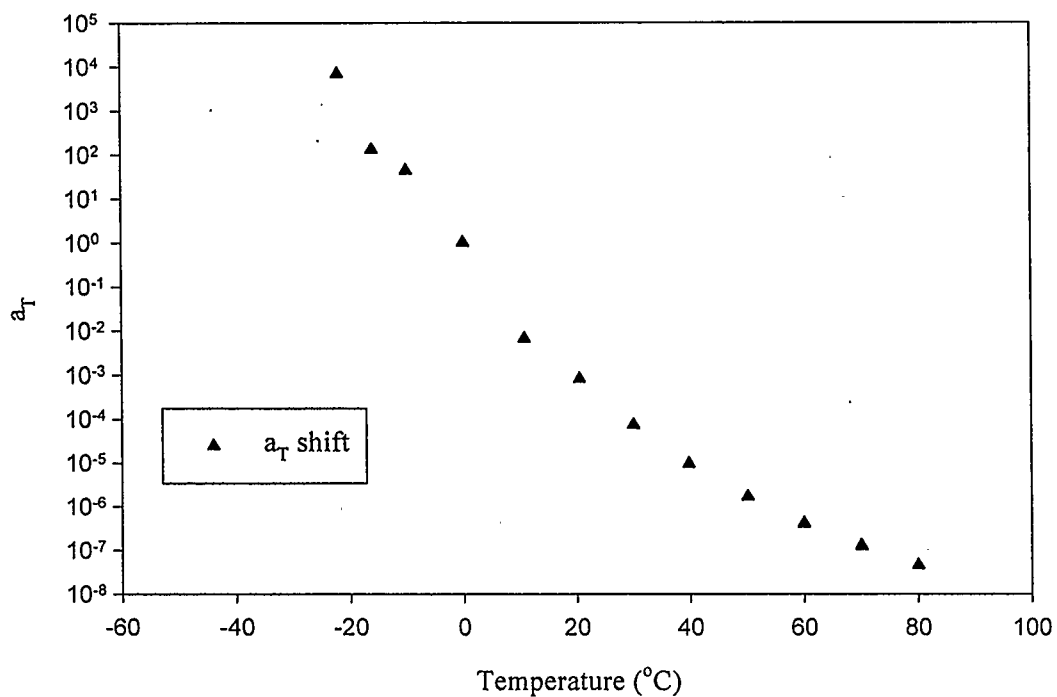


Figure A 4 TTS a_T shift factor for A150/200 Pen grade RTFO aged

A150/200 Pen grade RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-21.99	6.98E+03	0.92	1	1.42E+08	3.55E-05	1	3.84E-10	6.99E-06
-16.00	1.29E+02	0.94	2	1.77E+08	5.38E-06	2	5.46E-10	4.72E-05
-9.99	4.33E+01	0.96	3	1.31E+08	1.96E-04	3	9.50E-10	2.82E-04
0.00	1.00E+00	1.00	4	1.12E+08	1.06E-03	4	2.06E-09	1.76E-03
10.81	6.62E-03	1.04	5	8.90E+07	8.09E-03	5	4.84E-09	1.65E-02
20.61	8.20E-04	1.08	6	4.16E+07	5.35E-02	6	9.37E-09	1.10E-01
30.12	7.39E-05	1.11	7	2.05E+07	2.85E-01	7	2.27E-08	6.65E-01
39.81	9.58E-06	1.15	8	9.22E+06	1.58E+00	8	6.86E-08	4.59E+00
50.11	1.67E-06	1.18	9	3.10E+06	9.86E+00	9	2.07E-07	3.38E+01
59.97	4.03E-07	1.22	10	7.46E+05	5.94E+01	10	7.65E-07	2.20E+02
60.00	4.11E-07	1.22	11	1.98E+05	3.77E+02	11	2.41E-06	1.51E+03
70	1.26E-07	1.2563	12	3.92E+04	2.22E+03	12	8.93E-06	9.31E+03
70.146	1.22E-07	1.2568	13	8.37E+03	1.29E+04	13	2.51E-05	5.96E+04
80.001	4.55E-08	1.2929	14	1.11E+03	7.17E+04	14	5.19E-05	2.99E+05
			15	1.33E+02	3.26E+05	15	1.19E-04	1.99E+06
			16	7.63E+00	2.05E+06			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 3 A150/200 Pen grade RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	20.95
C ₂	138.28
r ²	0.992
Std. Err.	0.3468

Table A 4 A150/200 Pen grade RTFO aged, WLF a_T shift constants

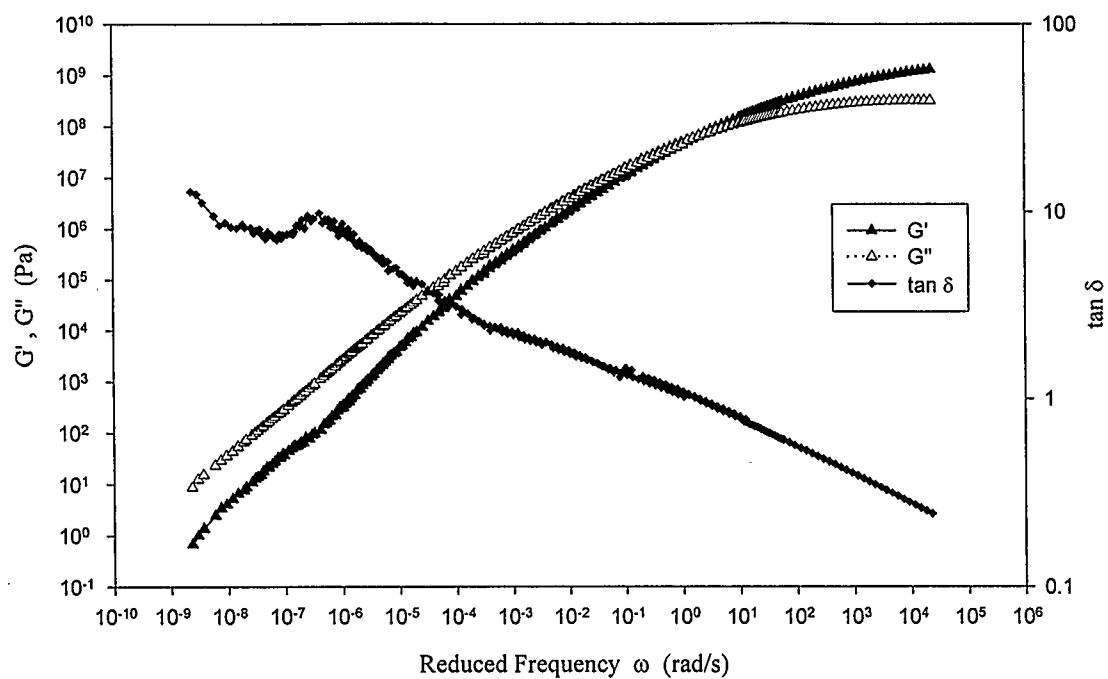


Figure A 5 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A150/200 Pen grade RTFO aged

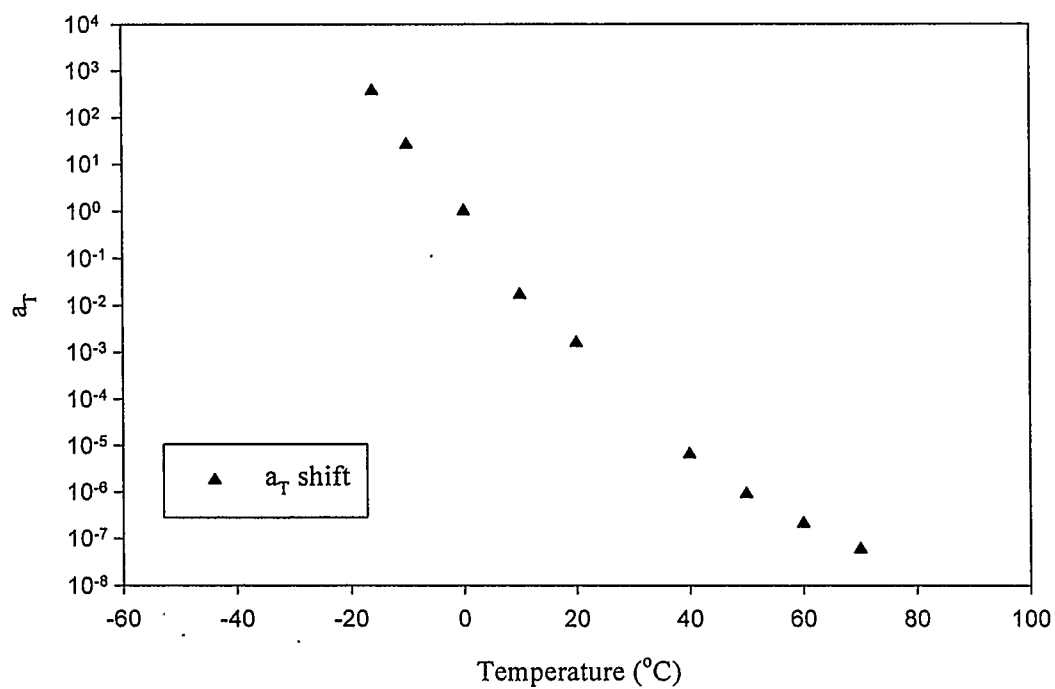


Figure A 6 TTS a_T shift factor for Mastic, A150/200 Pen grade RTFO aged

Mastic, A150/200 Pen grade RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-16.01	3.61E+02	0.94	1	5.18E+08	5.07E-05	1	2.36E-10	7.21E-05
-10.01	2.57E+01	0.96	2	3.47E+08	3.37E-04	2	3.35E-10	4.79E-04
0.02	1.00E+00	1.00	3	3.11E+08	1.92E-03	3	6.97E-10	3.13E-03
10.01	1.66E-02	1.04	4	2.22E+08	1.21E-02	4	1.42E-09	2.22E-02
20.02	1.55E-03	1.07	5	1.34E+08	7.18E-02	5	3.30E-09	1.54E-01
40.00	6.40E-06	1.15	6	6.42E+07	4.23E-01	6	8.45E-09	1.05E+00
50.00	8.92E-07	1.18	7	2.57E+07	2.53E+00	7	2.39E-08	7.23E+00
60.00	2.05E-07	1.22	8	8.36E+06	1.53E+01	8	6.80E-08	4.64E+01
70.00	5.89E-08	1.26	9	2.60E+06	8.83E+01	9	2.08E-07	2.99E+02
			10	6.89E+05	5.07E+02	10	8.58E-07	2.10E+03
			11	1.60E+05	3.44E+03	11	2.35E-06	1.42E+04
			12	2.65E+04	1.91E+04	12	9.81E-06	8.90E+04
			13	4.94E+03	1.15E+05	13	3.11E-05	6.01E+05
			14	5.64E+02	6.93E+05	14	4.73E-04	8.06E+06
			15	5.59E+01	9.63E+06	15	1.24E-03	4.03E+07
			16	8.95E+00	4.51E+07	16	6.20E-03	1.83E+08
			17	2.87E+00	2.12E+08			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 5 Mastic, A150/200 Pen grade RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	24.52
C ₂	159.13
r ²	0.996
Std. Err.	0.2326

Table A 6 Mastic, A150/200 Pen grade RTFO aged , WLF a_T shift constants

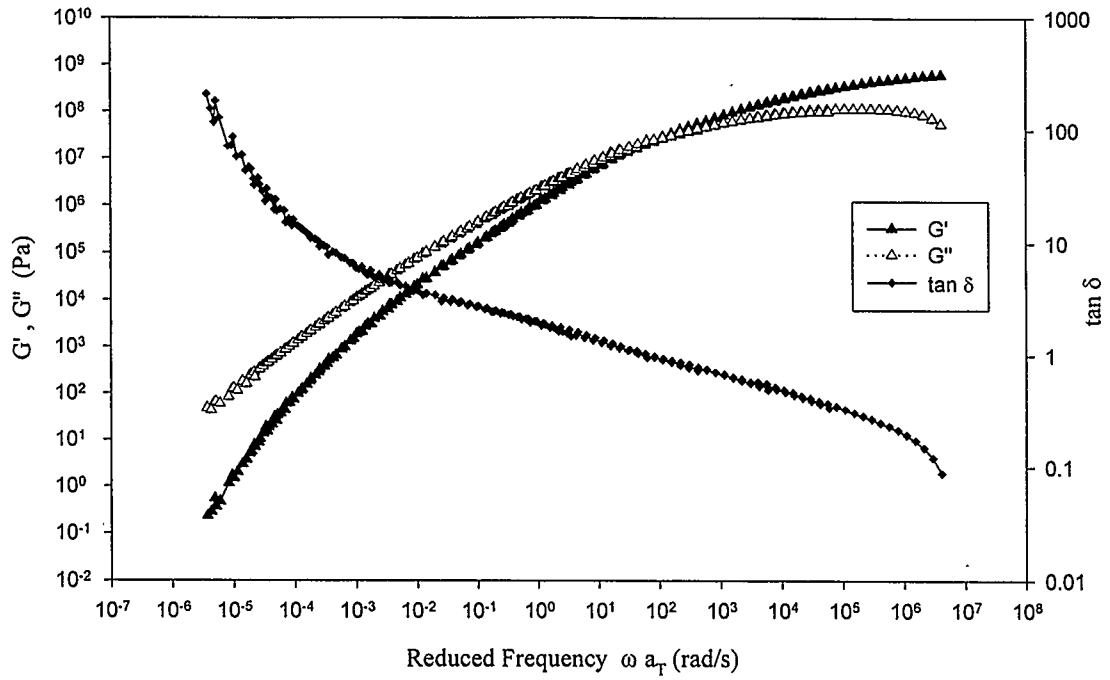


Figure A 7 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade

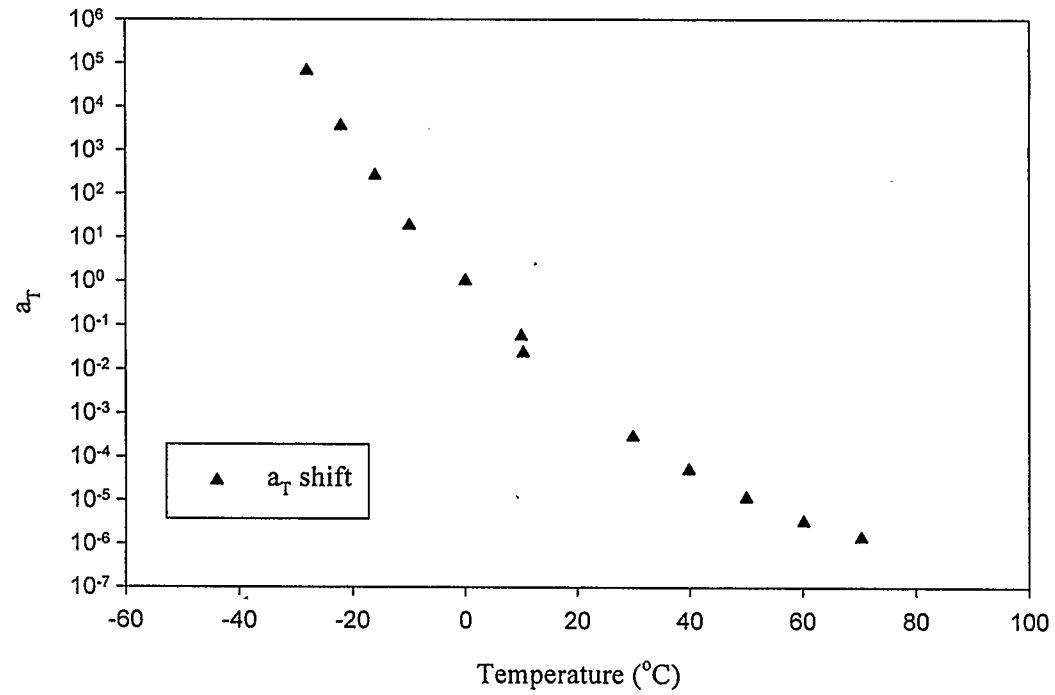


Figure A 8 TTS a_T shift factor for A200/300 Pen grade

A200/300 Pen grade (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-27.98	6.49E+04	0.90	1	1.44E+08	6.84E-07	1	4.19E-10	8.76E-07
-22.01	3.53E+03	0.92	2	1.44E+08	4.45E-06	2	7.63E-10	6.25E-06
-15.98	2.54E+02	0.94	3	1.02E+08	2.31E-05	3	1.06E-09	3.27E-05
-9.92	1.80E+01	0.96	4	9.39E+07	1.04E-04	4	2.32E-09	1.72E-04
0.01	1.00E+00	1.00	5	6.28E+07	5.45E-04	5	4.27E-09	9.77E-04
10.01	5.62E-02	1.04	6	3.57E+07	2.51E-03	6	9.10E-09	4.93E-03
10.36	2.34E-02	1.04	7	1.96E+07	1.23E-02	7	2.00E-08	2.70E-02
29.97	2.87E-04	1.11	8	1.05E+07	6.30E-02	8	7.07E-08	2.14E-01
39.88	4.95E-05	1.15	9	2.52E+06	4.06E-01	9	1.93E-07	1.34E+00
50.05	1.12E-05	1.18	10	6.35E+05	2.15E+00	10	6.49E-07	7.85E+00
60.15	3.17E-06	1.22	11	1.54E+05	1.18E+01	11	2.71E-06	4.88E+01
70.34	1.36E-06	1.26	12	3.77E+04	7.29E+01	12	9.22E-06	3.67E+02
			13	5.08E+03	4.71E+02	13	2.58E-05	2.43E+03
			14	5.28E+02	2.75E+03	14	6.28E-05	1.44E+04
			15	4.56E+01	1.52E+04			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 7 A200/300 Pen grade, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	17.27
C ₂	127.81
r ²	0.998
Std. Err.	0.1856

Table A 8 A200/300 Pen grade , WLF a_T shift constants

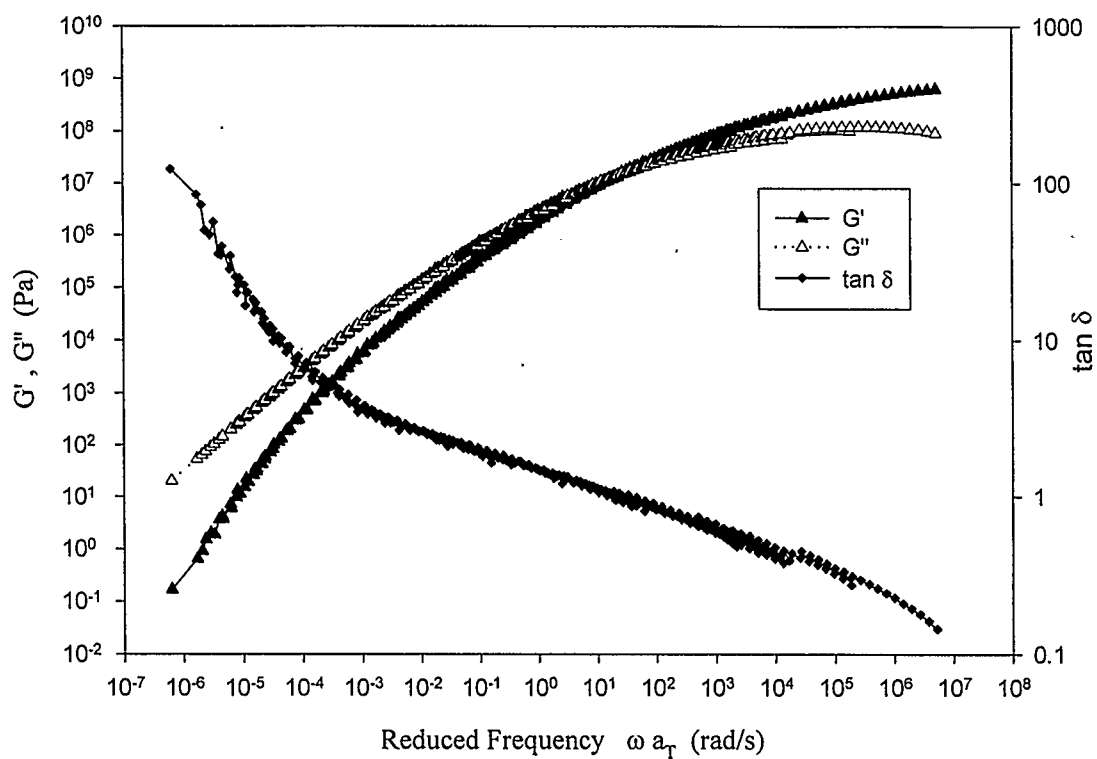


Figure A 9 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade RTFO aged

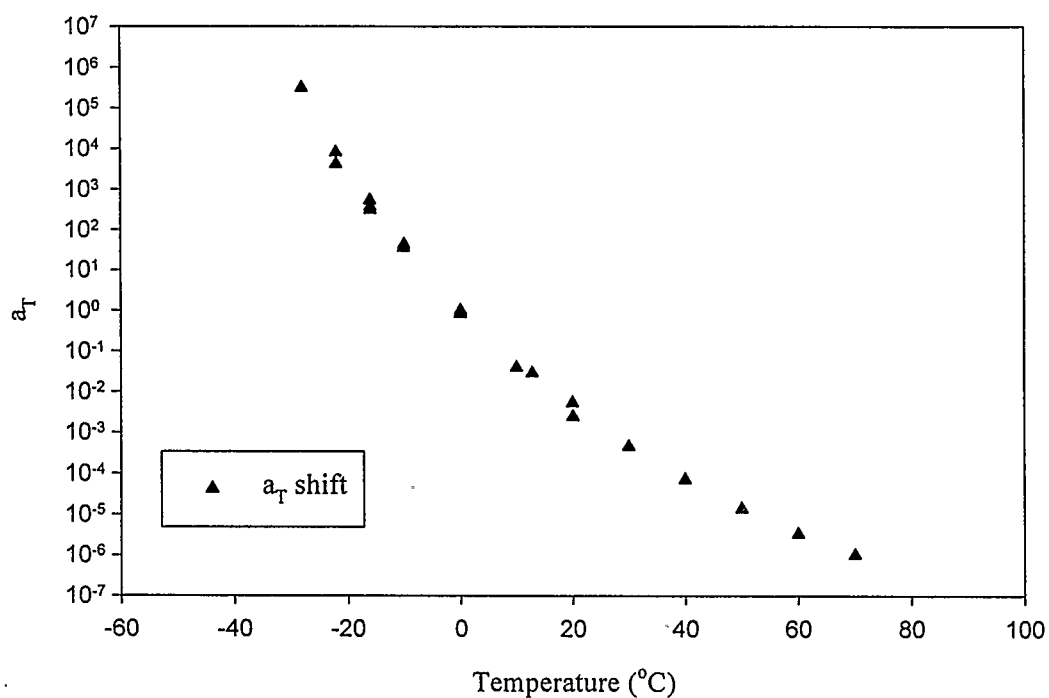


Figure A 10 TTS a_T shift factor for A200/300 Pen grade RTFO aged

A200/300 Pen grade RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-28.02	3.11E+05	0.90	1	1.36E+08	2.22E-07	1	2.96E-10	2.72E-07
-22.01	8.07E+03	0.92	2	1.26E+08	1.20E-06	2	4.34E-10	1.52E-06
-21.99	4.18E+03	0.92	3	1.18E+08	5.54E-06	3	6.85E-10	7.43E-06
-16.02	5.25E+02	0.94	4	1.27E+08	2.61E-05	4	1.66E-09	4.23E-05
-16.00	3.02E+02	0.94	5	8.00E+07	1.53E-04	5	2.87E-09	2.56E-04
-15.98	3.67E+02	0.94	6	5.35E+07	8.72E-04	6	5.39E-09	1.58E-03
-10.06	3.50E+01	0.96	7	3.31E+07	4.65E-03	7	1.26E-08	9.91E-03
-9.99	4.23E+01	0.96	8	1.50E+07	2.50E-02	8	2.62E-08	5.51E-02
0.00	8.34E-01	1.00	9	6.97E+06	1.22E-01	9	7.34E-08	3.21E-01
0.01	1.00E+00	1.00	10	2.69E+06	6.75E-01	10	2.07E-07	2.13E+00
0.01	8.66E-01	1.00	11	6.47E+05	3.63E+00	11	3.69E-07	8.78E+00
10.00	3.97E-02	1.04	12	2.40E+05	1.30E+01	12	1.47E-06	4.27E+01
12.845	0.028596	1.047	13	8.19E+04	6.76E+01	13	7.17E-06	3.30E+02
20.004	0.0053954	1.0732	14	1.58E+04	5.06E+02	14	2.09E-05	2.44E+03
20.068	0.0024601	1.0734	15	2.08E+03	3.10E+03	15	7.17E-05	1.90E+04
30.015	0.0004495	1.1099	16	1.82E+02	2.15E+04	16	1.58E-04	2.00E+05
40.001	6.97E-05	1.1464	17	4.36E+00	2.05E+05			
49.999	1.37E-05	1.183						
60	3.29E-06	1.2196						
70.006	1.01E-06	1.2563						

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 9 A200/300 Pen grade RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	15.47
C ₂	109.66
r ²	0.999
Std. Err.	0.1147

Table A 10 A200/300 Pen grade RTFO aged, WLF a_T shift constants

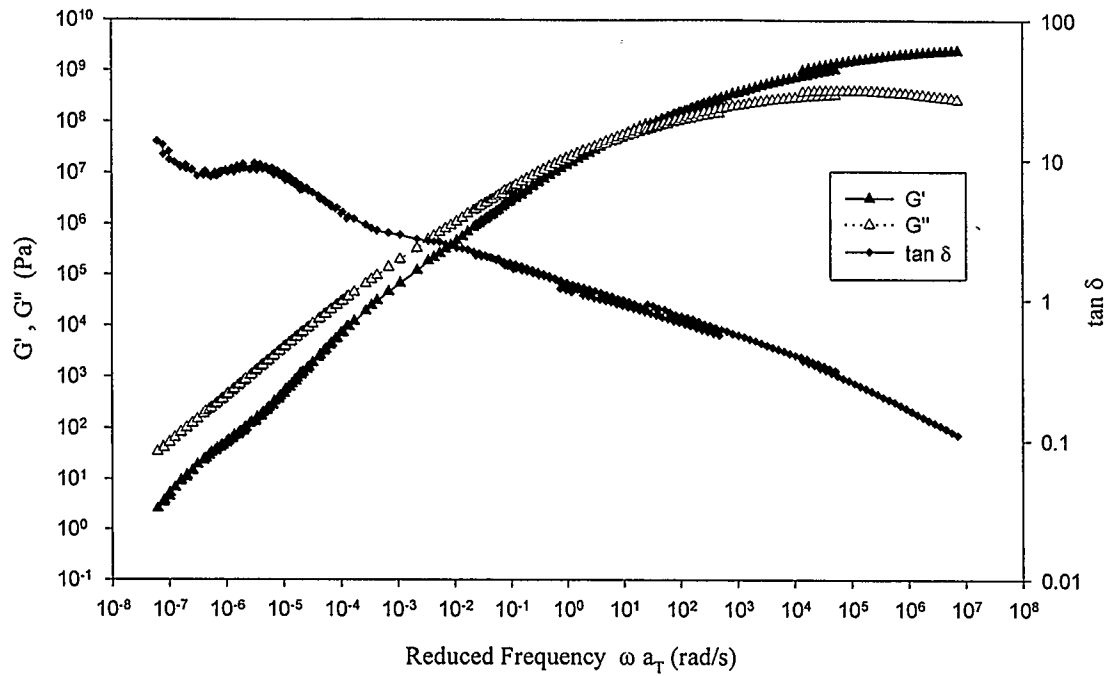


Figure A 11 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A200/300 Pen grade RTFO aged

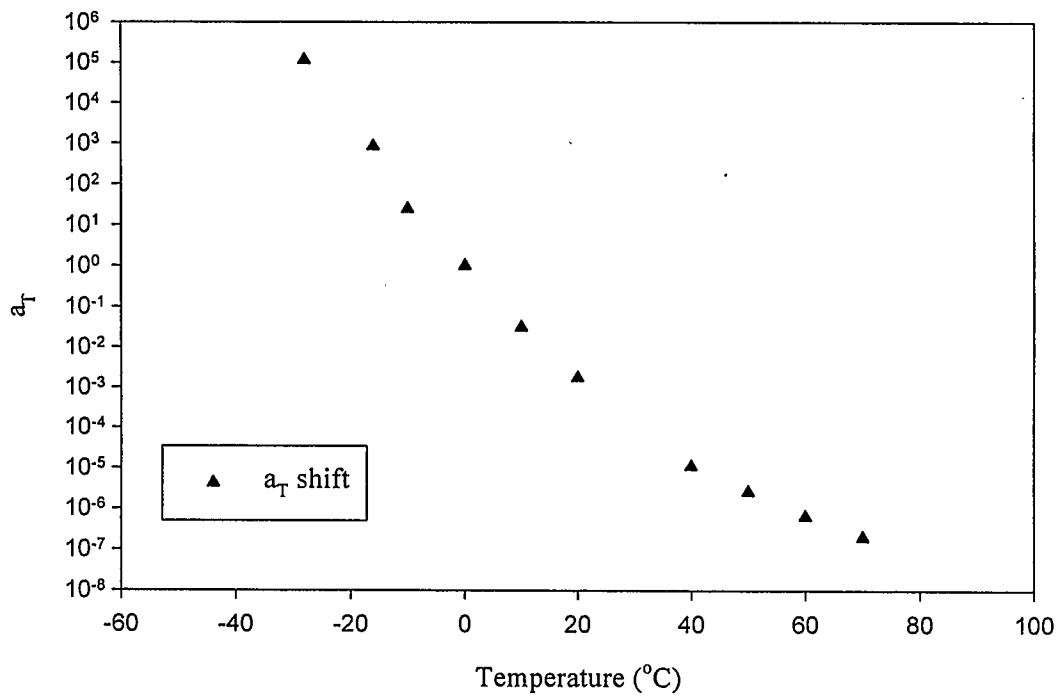


Figure A 12 TTS a_T shift factor for Mastic, A200/300 Pen grade RTFO aged

Mastic, A200/300 Pen grade RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-28.01	1.14E+05	0.90	1	4.27E+08	1.99E-07	1	7.18E-11	2.38E-07
-16.00	8.36E+02	0.94	2	4.18E+08	1.35E-06	2	1.03E-10	1.67E-06
-10.00	2.43E+01	0.96	3	4.84E+08	7.85E-06	3	1.99E-10	1.08E-05
0.04	1.00E+00	1.00	4	5.71E+08	5.41E-05	4	5.65E-10	9.80E-05
10.01	3.08E-02	1.04	5	1.76E+08	3.13E-04	5	3.63E-10	4.12E-04
20.01	1.76E-03	1.07	6	2.31E+08	9.42E-04	6	1.78E-09	1.91E-03
40.00	1.10E-05	1.15	7	1.19E+08	7.65E-03	7	2.97E-09	1.48E-02
50.00	2.59E-06	1.18	8	6.65E+07	4.71E-02	8	4.77E-09	9.37E-02
60.00	6.33E-07	1.22	9	2.83E+07	1.86E-01	9	1.34E-08	4.16E-01
70.00	1.99E-07	1.26	10	1.66E+07	1.00E+00	10	4.65E-08	3.33E+00
70.00	1.99E-07	1.26	11	4.61E+06	6.96E+00	11	1.34E-07	2.53E+01
70.00	1.96E-07	1.26	12	9.84E+05	4.14E+01	12	5.66E-07	1.73E+02
			13	2.24E+05	2.77E+02	13	2.73E-06	1.37E+03
			14	4.43E+04	2.14E+03	14	8.24E-06	1.07E+04
			15	5.54E+03	1.36E+04	15	2.76E-05	7.17E+04
			16	6.46E+02	8.28E+04	16	1.59E-04	5.69E+05
			17	7.12E+01	6.37E+05	17	1.12E-03	3.00E+06
			18	2.40E+01	3.60E+06	18	2.09E-03	1.75E+07
			19	2.01E+00	1.87E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 11 Mastic, A200/300 Pen grade RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	22.00
C ₂	146.17
r ²	0.999
Std. Err.	0.1327

Table A 12 Mastic, A200/300 Pen grade RTFO aged, WLF a_T shift constants

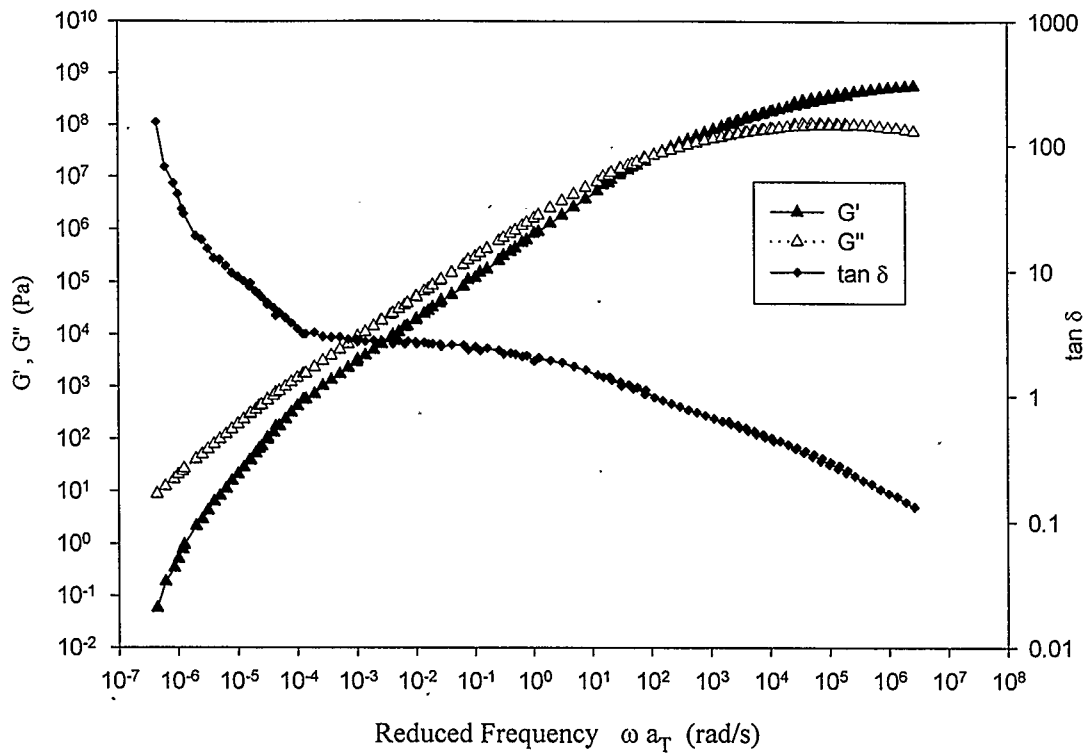


Figure A 13 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+2% SBS

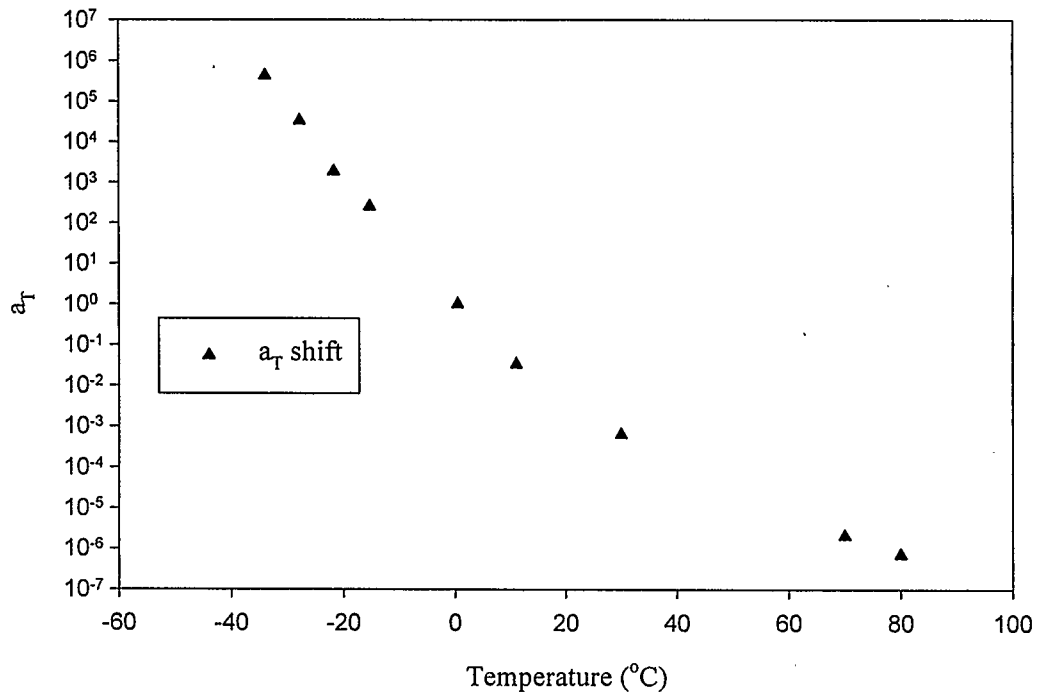


Figure A 14 TTS a_T shift factor for A200/300 Pen grade+2% SBS

A200/300 Pen grade+2% SBS (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-33.91	4.28E+05	0.87	1	1.10E+08	4.34E-07	1	3.45E-10	5.28E-07
-27.74	3.27E+04	0.90	2	1.05E+08	2.51E-06	2	5.02E-10	3.17E-06
-21.67	1.82E+03	0.92	3	8.97E+07	1.09E-05	3	6.64E-10	1.41E-05
-15.26	2.50E+02	0.94	4	1.13E+08	4.42E-05	4	1.88E-09	7.20E-05
0.51	1.00E+00	1.00	5	8.05E+07	2.67E-04	5	3.70E-09	4.85E-04
11.09	3.31E-02	1.04	6	4.97E+07	1.50E-03	6	8.72E-09	3.21E-03
30.00	6.22E-04	1.11	7	2.55E+07	8.79E-03	7	2.21E-08	2.33E-02
70.00	2.03E-06	1.25	8	9.14E+06	4.93E-02	8	7.54E-08	1.79E-01
80.00	7.03E-07	1.29	9	1.92E+06	3.07E-01	9	2.64E-07	1.09E+00
			10	5.43E+05	1.83E+00	10	1.11E-06	7.90E+00
			11	1.16E+05	1.27E+01	11	4.82E-06	5.79E+01
			12	2.36E+04	8.93E+01	12	2.40E-05	4.27E+02
			13	5.16E+03	6.73E+02	13	1.06E-04	3.34E+03
			14	9.12E+02	4.93E+03	14	1.84E-04	1.50E+04
			15	2.21E+02	1.89E+04	15	8.44E-04	1.48E+05
			16	1.38E+01	1.66E+05			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 13 A200/300 Pen grade+2% SBS, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	16.34
C ₂	129.86
r ²	0.999
Std. Err.	0.1433

Table A 14 A200/300 Pen grade+2% SBS, WLF a_T shift constants

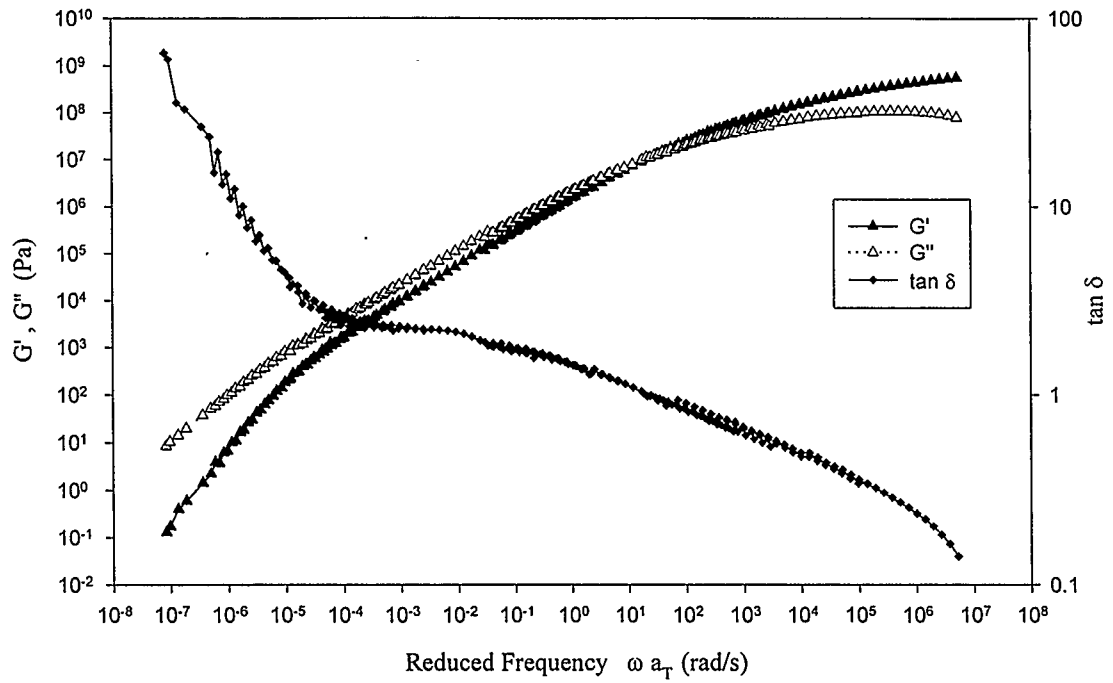


Figure A 15 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+2% SBS RTFO aged

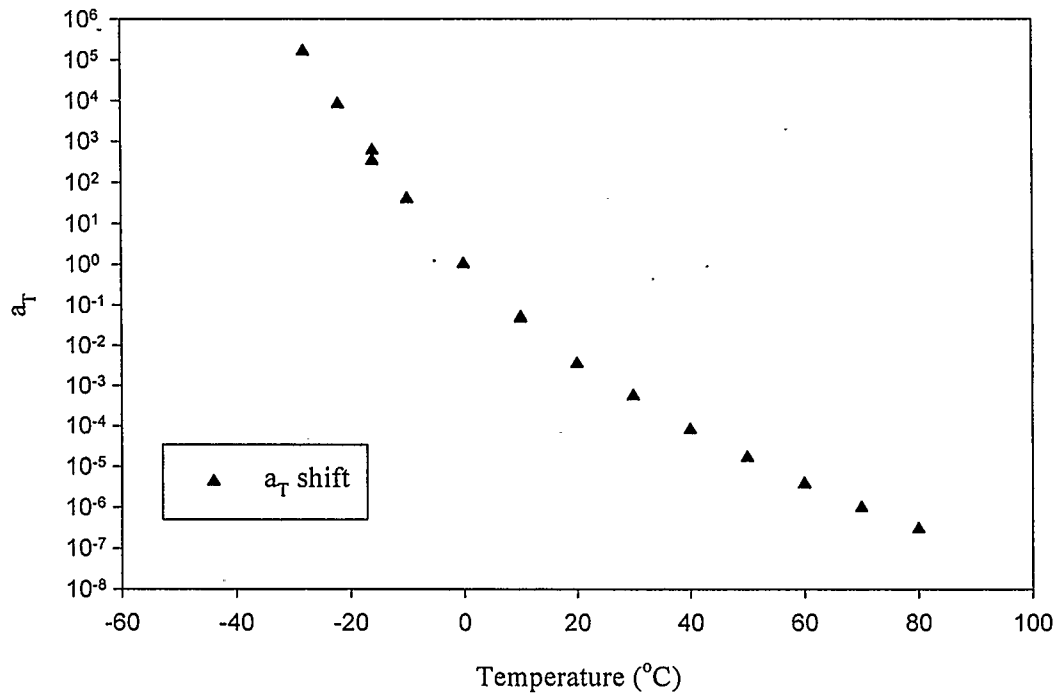


Figure A 16 TTS a_T shift factor for A200/300 Pen grade+2% SBS RTFO aged

A200/300 Pen grade+2%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-28.02	1.60E+05	0.90	1	1.26E+08	2.93E-07	1	3.64E-10	3.64E-07
-21.97	8.07E+03	0.92	2	1.04E+08	1.35E-06	2	4.92E-10	1.71E-06
-16.02	3.36E+02	0.94	3	1.18E+08	5.87E-06	3	1.08E-09	8.50E-06
-15.99	5.96E+02	0.94	4	9.64E+07	3.52E-05	4	1.81E-09	5.47E-05
-9.98	3.96E+01	0.96	5	7.14E+07	1.80E-04	5	3.83E-09	3.18E-04
-0.03	1.00E+00	1.00	6	4.27E+07	9.95E-04	6	7.70E-09	1.90E-03
9.99	4.50E-02	1.04	7	2.64E+07	5.70E-03	7	2.17E-08	1.38E-02
10.05	4.86E-02	1.04	8	1.12E+07	3.94E-02	8	4.87E-08	1.02E-01
20.01	3.44E-03	1.07	9	3.49E+06	2.07E-01	9	1.11E-07	5.07E-01
30.00	5.44E-04	1.11	10	1.42E+06	9.52E-01	10	3.19E-07	2.69E+00
30.00	5.44E-04	1.11	11	4.97E+05	4.88E+00	11	1.62E-06	1.90E+01
40.00	7.87E-05	1.15	12	1.53E+05	4.20E+01	12	4.50E-06	1.68E+02
50.00	1.64E-05	1.18	13	2.50E+04	2.64E+02	13	1.29E-05	8.05E+02
50.00	1.64E-05	1.18	14	7.93E+03	1.23E+03	14	4.25E-05	3.87E+03
60.00	3.73E-06	1.22	15	2.81E+03	6.13E+03	15	1.63E-04	2.42E+04
70.01	9.58E-07	1.26	16	7.16E+02	3.76E+04	16	3.80E-04	1.55E+05
80.00	2.98E-07	1.29	17	1.07E+02	1.95E+05	17	1.40E-03	2.75E+06
			18	1.67E+00	2.89E+06			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 15 A200/300 Pen grade+2% SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	56.39
C ₂	365.52
r ²	0.998
Std. Err.	0.2101

Table A 16 A200/300 Pen grade+2% SBS RTFO aged, WLF a_T shift constants

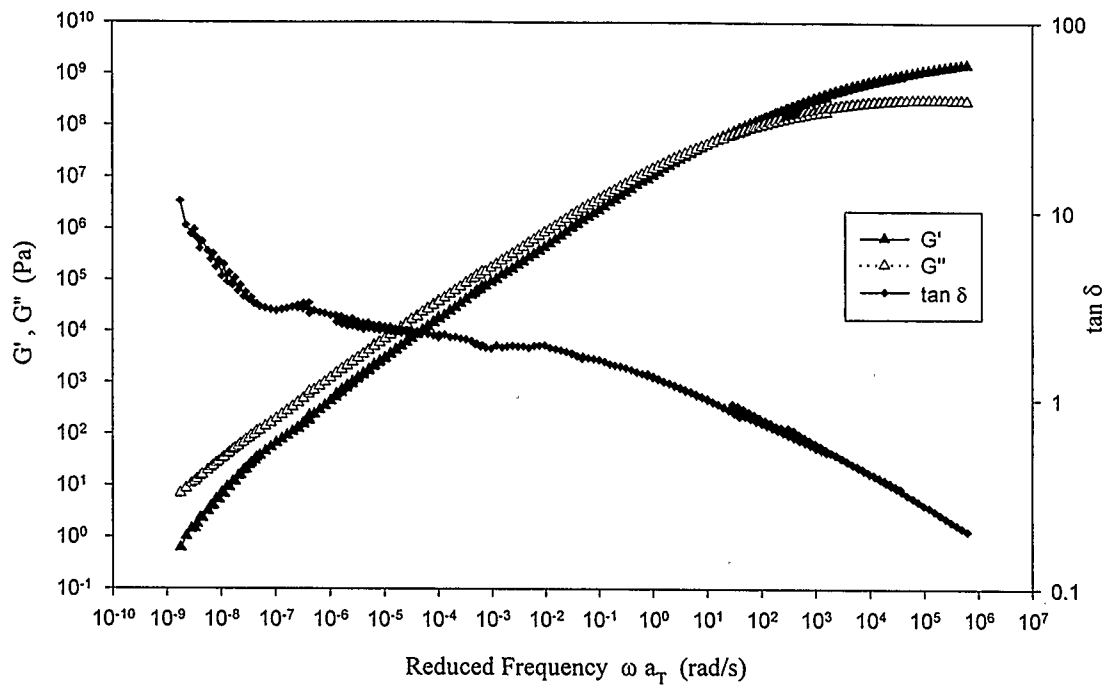


Figure A 17 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A200/300 Pen grade+2% SBS RTFO aged

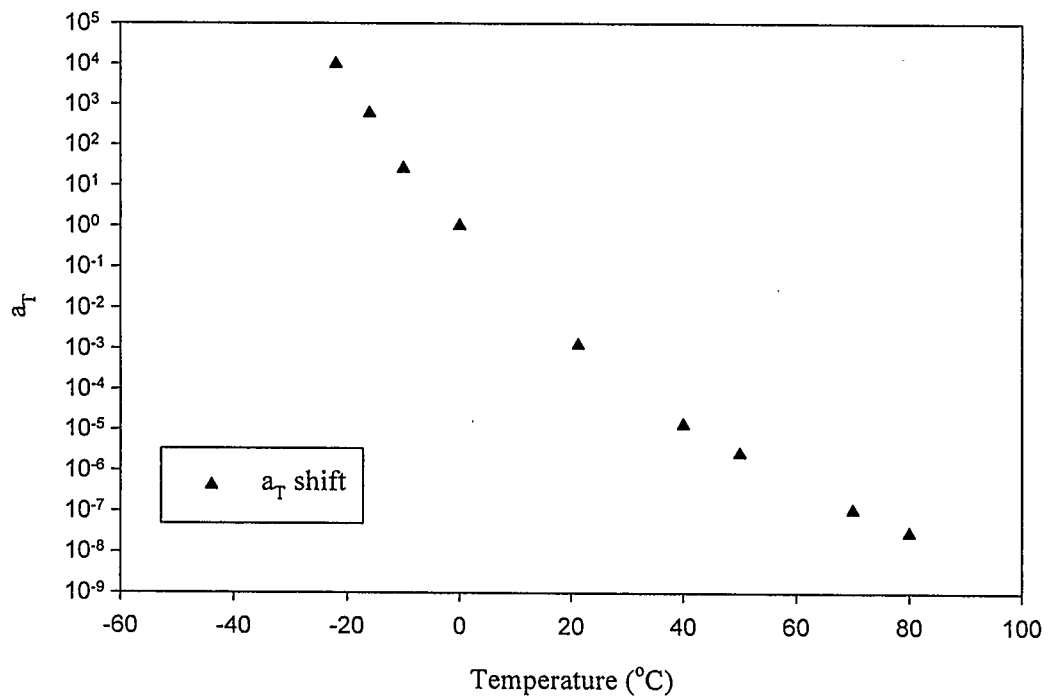


Figure A 18 TTS a_T shift factor for Mastic, A200/300 Pen grade+2% SBS RTFO aged

Mastic, A200/300 Pen grade+2%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-22.01	9.83E+03	0.92	1	4.84E+08	1.66E-06	1	1.79E-10	2.23E-06
-16.01	5.85E+02	0.94	2	3.73E+08	1.15E-05	2	2.60E-10	1.59E-05
-10.00	2.54E+01	0.96	3	3.16E+08	6.33E-05	3	4.35E-10	9.32E-05
0.00	1.00E+00	1.00	4	2.73E+08	3.32E-04	4	9.99E-10	5.81E-04
21.26	1.22E-03	1.08	5	1.75E+08	2.07E-03	5	2.26E-09	4.13E-03
40.00	1.32E-05	1.15	6	9.30E+07	1.39E-02	6	4.48E-09	2.96E-02
50.00	2.57E-06	1.18	7	4.06E+07	7.34E-02	7	9.15E-09	1.58E-01
70.00	1.04E-07	1.26	8	1.93E+07	3.46E-01	8	2.18E-08	8.50E-01
80.00	2.86E-08	1.29	9	6.85E+06	1.59E+00	9	5.66E-08	4.04E+00
			10	2.77E+06	7.49E+00	10	1.67E-07	2.18E+01
			11	9.74E+05	3.96E+01	11	7.02E-07	1.52E+02
			12	2.45E+05	2.78E+02	12	2.71E-06	1.05E+03
			13	6.73E+04	1.96E+03	13	9.37E-06	7.53E+03
			14	1.62E+04	1.30E+04	14	3.05E-05	4.94E+04
			15	3.56E+03	7.59E+04	15	1.27E-04	2.89E+05
			16	1.79E+02	2.91E+06	16	4.24E-04	2.08E+06
			17	1.07E+03	4.72E+05	17	2.88E-03	1.46E+07
			18	5.03E+01	2.39E+07	18	1.20E-02	1.89E+08
			19	3.43E+00	2.38E+08			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 17 Mastic, A200/300 Pen grade+2% SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	20.48
C ₂	134.45
r ²	0.999
Std. Err.	0.1293

Table A 18 Mastic, A200/300 Pen grade+2% SBS RTFO aged, WLF a_T shift constants

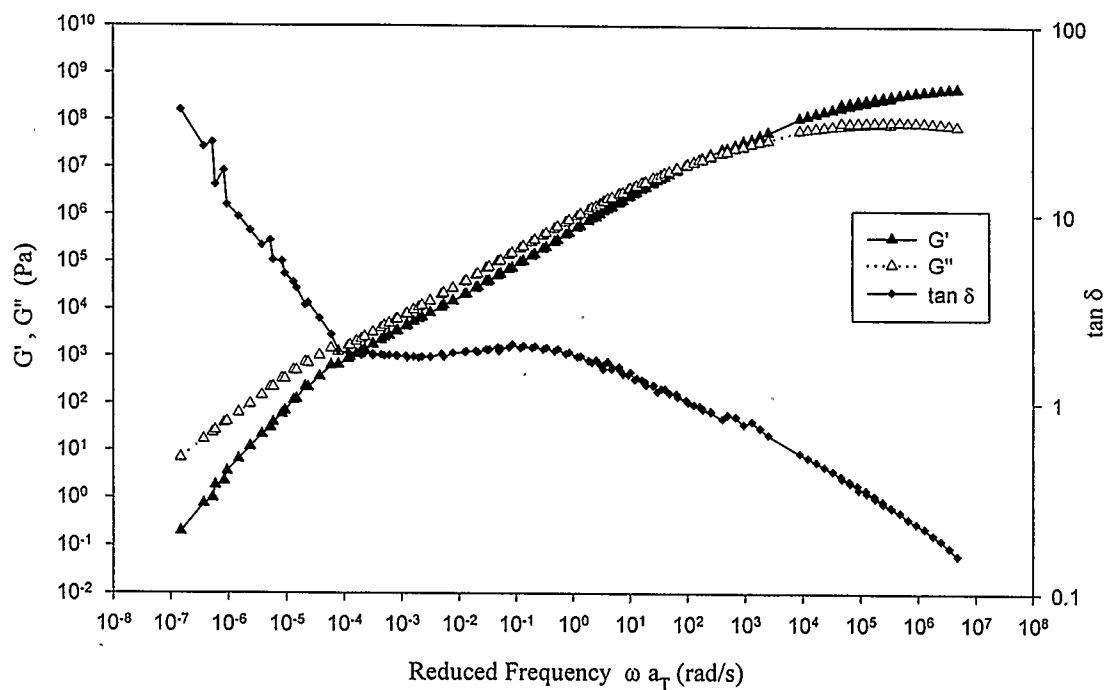


Figure A 19 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+4% SBS

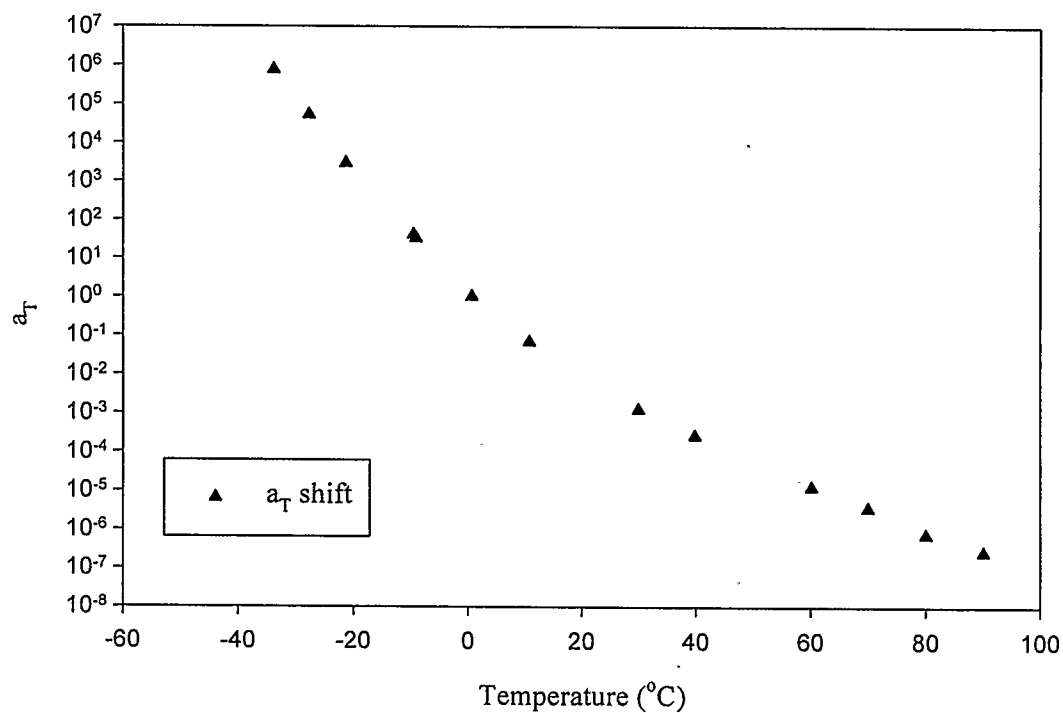


Figure A 20 TTS a_T shift factor for A200/300 Pen grade+4% SBS

A200/300 Pen grade+4%SBS (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-33.86	7.59E+05	1.00	1	4.27E+08	1.99E-07	1	7.18E-11	2.38E-07
-27.75	5.26E+04	0.82	2	4.18E+08	1.35E-06	2	1.03E-10	1.67E-06
-21.40	2.90E+03	0.28	3	4.84E+08	7.85E-06	3	1.99E-10	1.08E-05
-9.58	3.99E+01	0.96	4	5.71E+08	5.41E-05	4	5.65E-10	9.80E-05
-9.11	3.22E+01	0.96	5	1.76E+08	3.13E-04	5	3.63E-10	4.12E-04
0.69	1.00E+00	1.00	6	2.31E+08	9.42E-04	6	1.78E-09	1.91E-03
10.80	6.81E-02	1.04	7	1.19E+08	7.65E-03	7	2.97E-09	1.48E-02
30.00	1.25E-03	1.11	8	6.65E+07	4.71E-02	8	4.77E-09	9.37E-02
39.85	2.58E-04	1.14	9	2.83E+07	1.86E-01	9	1.34E-08	4.16E-01
60.17	1.24E-05	1.22	10	1.66E+07	1.00E+00	10	4.65E-08	3.33E+00
70.00	3.62E-06	1.25	11	4.61E+06	6.96E+00	11	1.34E-07	2.53E+01
80.00	7.47E-07	1.29	12	9.84E+05	4.14E+01	12	5.66E-07	1.73E+02
			13	2.24E+05	2.77E+02	13	2.73E-06	1.37E+03
			14	4.43E+04	2.14E+03	14	8.24E-06	1.07E+04
			15	5.54E+03	1.36E+04	15	2.76E-05	7.17E+04
			16	6.46E+02	8.28E+04	16	1.59E-04	5.69E+05
			17	7.12E+01	6.37E+05	17	1.12E-03	3.00E+06
			18	2.40E+01	3.60E+06	18	2.09E-03	1.75E+07
			19	2.01E+00	1.87E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 19 A200/300 Pen grade+4%SBS, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	14.82
C ₂	117.07
r ²	0.999
Std. Err.	0.1705

Table A 20 A200/300 Pen grade+4% SBS, WLF a_T shift constants

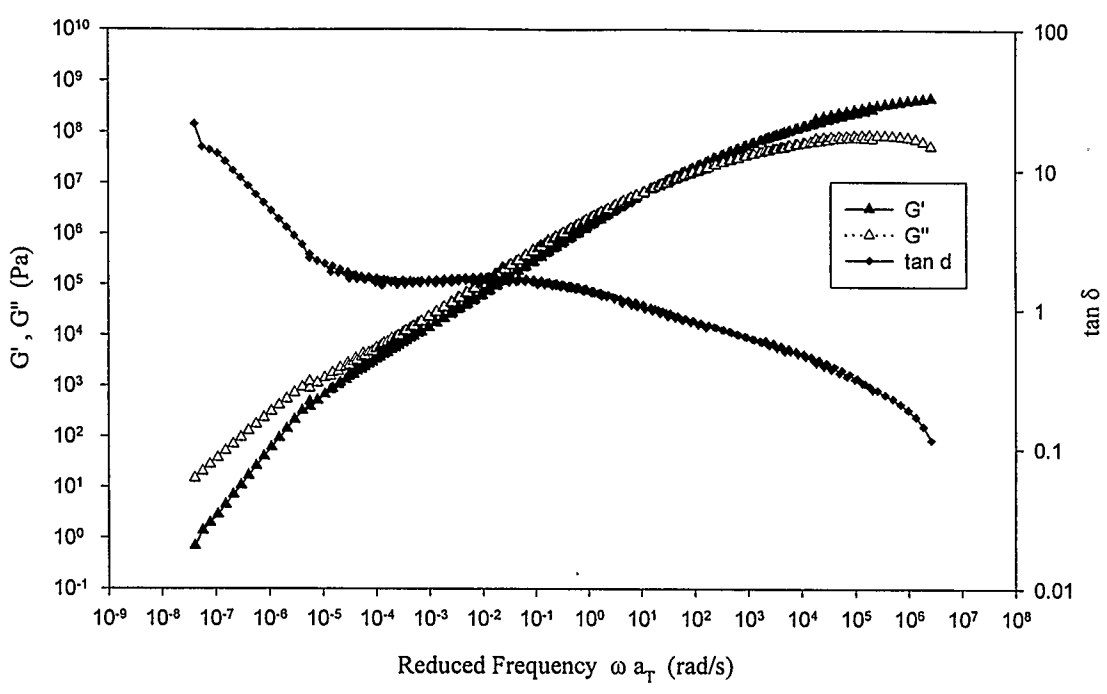


Figure A 21 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+4% SBS RTFO aged

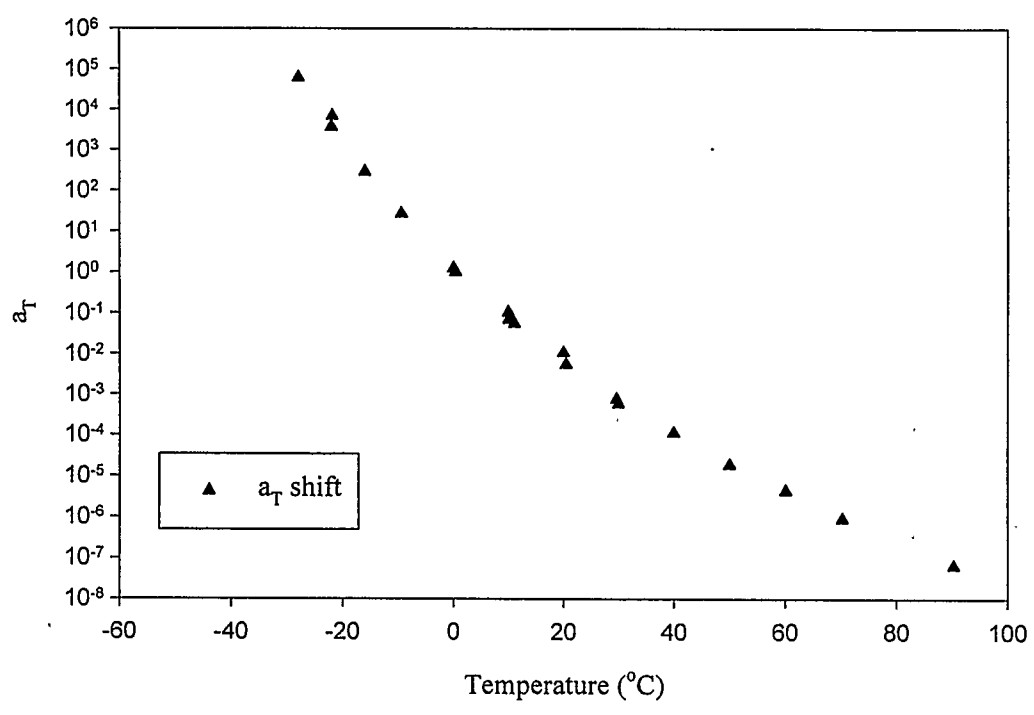


Figure A 22 TTS a_T shift factor for A200/300 Pen grade+4% SBS RTFO aged

A200/300 Pen grade+4%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-27.89	6.01E+04	0.90	1	9.89E+07	7.36E-07	1	4.87E-10	9.18E-07
-21.99	3.66E+03	0.92	2	8.78E+07	3.28E-06	2	7.60E-10	4.28E-06
-21.84	6.74E+03	0.92	3	1.04E+08	1.65E-05	3	1.82E-09	2.61E-05
-16.00	2.86E+02	0.94	4	7.30E+07	9.37E-05	4	3.56E-09	1.63E-04
-9.40	2.67E+01	0.96	5	3.98E+07	4.98E-04	5	5.47E-09	8.41E-04
-0.01	1.24E+00	1.00	6	2.51E+07	2.15E-03	6	1.09E-08	3.97E-03
0.39	1.00E+00	1.00	7	1.41E+07	9.52E-03	7	2.22E-08	1.89E-02
9.98	1.03E-01	1.04	8	7.11E+06	4.18E-02	8	4.73E-08	8.88E-02
10.03	6.92E-02	1.04	9	3.60E+06	1.87E-01	9	1.37E-07	4.94E-01
11.07	5.53E-02	1.04	10	1.33E+06	1.00E+00	10	4.12E-07	2.94E+00
20.03	1.06E-02	1.07	11	4.61E+05	5.86E+00	11	1.40E-06	2.00E+01
20.49	5.49E-03	1.07	12	1.23E+05	3.73E+01	12	4.71E-06	1.24E+02
29.66	7.59E-04	1.11	13	3.66E+04	2.32E+02	13	1.53E-05	7.54E+02
30.01	5.89E-04	1.11	14	1.08E+04	1.40E+03	14	4.46E-05	4.12E+03
39.98	1.11E-04	1.14	15	3.81E+03	7.77E+03	15	1.20E-04	2.27E+04
50.02	1.86E-05	1.18	16	1.31E+03	4.08E+04	16	4.35E-04	1.38E+05
60.13	4.30E-06	1.22	17	4.88E+02	2.71E+05	17	7.69E-04	1.59E+06
70.27	9.01E-07	1.26	18	2.32E+01	1.84E+06	18	3.57E-03	1.14E+07
90.25	6.49E-08	1.33	19	2.55E+00	1.26E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 21 A200/300 Pen grade+4%SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	16.65
C ₂	124.66
r ²	0.998
Std. Err.	0.1445

Table A 22 A200/300 Pen grade+4%SBS RTFO aged , WLF a_T shift constants

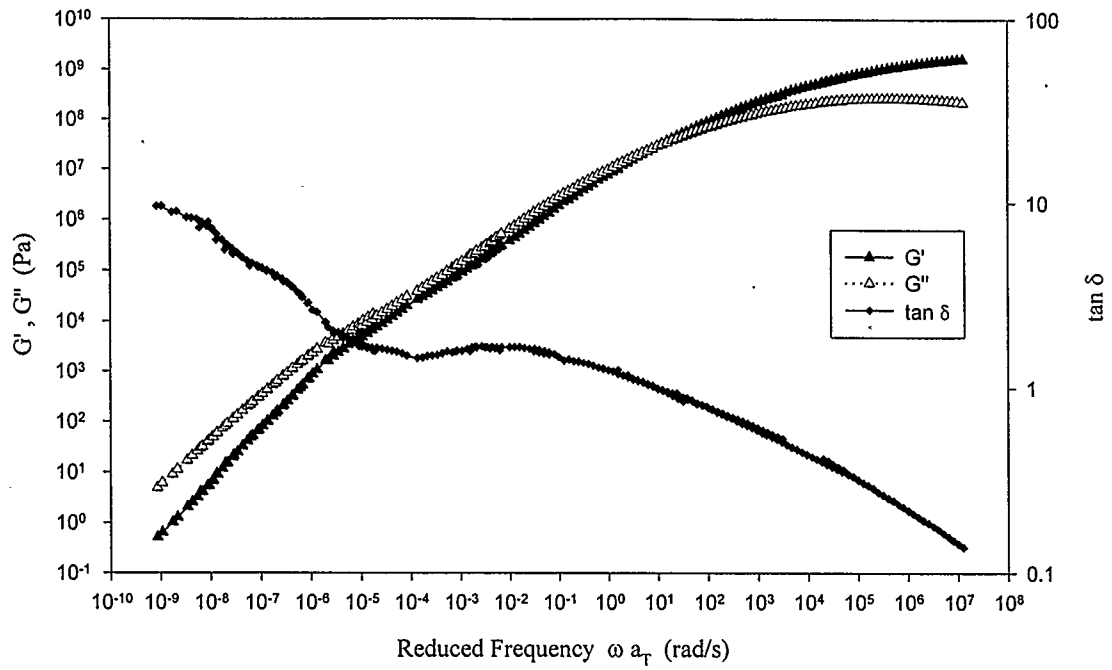


Figure A 23 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A200/300 Pen grade+4% SBS RTFO aged

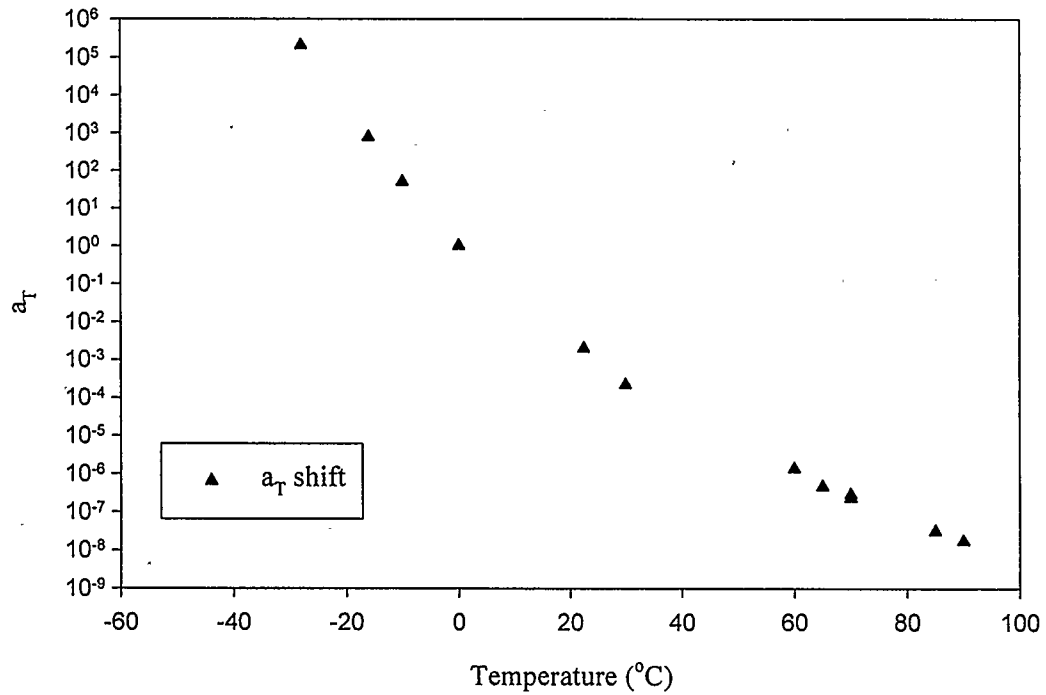


Figure A 24 TTS a_T shift factor for Mastic, A200/300 Pen grade+4% SBS RTFO aged

Mastic, A200/300 Pen grade+4%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-27.99	2.02E+05	0.90	1	3.57E+08	1.08E-07	1	1.28E-10	1.34E-07
-16.01	7.59E+02	0.94	2	3.11E+08	7.61E-07	2	1.78E-10	9.66E-07
-10.02	4.94E+01	0.96	3	3.10E+08	4.57E-06	3	2.98E-10	6.24E-06
0.02	1.00E+00	1.00	4	2.62E+08	2.39E-05	4	5.28E-10	3.52E-05
22.50	2.01E-03	1.08	5	2.24E+08	1.48E-04	5	1.01E-09	2.45E-04
30.00	2.19E-04	1.11	6	1.35E+08	7.96E-04	6	1.76E-09	1.36E-03
60.00	1.35E-06	1.22	7	8.25E+07	3.88E-03	7	3.25E-09	7.01E-03
65.00	4.59E-07	1.24	8	4.97E+07	1.82E-02	8	7.50E-09	3.76E-02
70.00	2.28E-07	1.26	9	2.48E+07	9.39E-02	9	1.49E-08	2.05E-01
70.00	2.83E-07	1.26	10	1.02E+07	4.12E-01	10	3.57E-08	9.40E-01
85.01	3.11E-08	1.31	11	4.54E+06	1.88E+00	11	9.35E-08	4.70E+00
90.00	1.73E-08	1.33	12	1.98E+06	9.60E+00	12	2.01E-07	2.64E+01
			13	5.06E+05	4.13E+01	13	6.77E-07	1.10E+02
			14	2.39E+05	2.03E+02	14	2.38E-06	6.65E+02
			15	7.03E+04	1.24E+03	15	8.94E-06	3.97E+03
			16	2.61E+04	8.98E+03	16	2.40E-05	2.77E+04
			17	8.35E+03	5.67E+04	17	9.34E-05	2.03E+05
			18	2.86E+03	4.63E+05	18	2.46E-04	2.43E+06
			19	2.59E+02	3.28E+06	19	1.23E-03	1.74E+07
			20	4.56E+01	2.28E+07			
			21	4.39E+00	1.49E+08			
			22	8.72E-01	1.09E+09			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 23 Mastic, A200/300 Pen grade+4% SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	18.32
C ₂	123.69
r ²	0.999
Std. Err.	0.089

Table A 24 Mastic, A200/300 Pen grade+4%SBS RTFO aged, WLF a_T shift constants

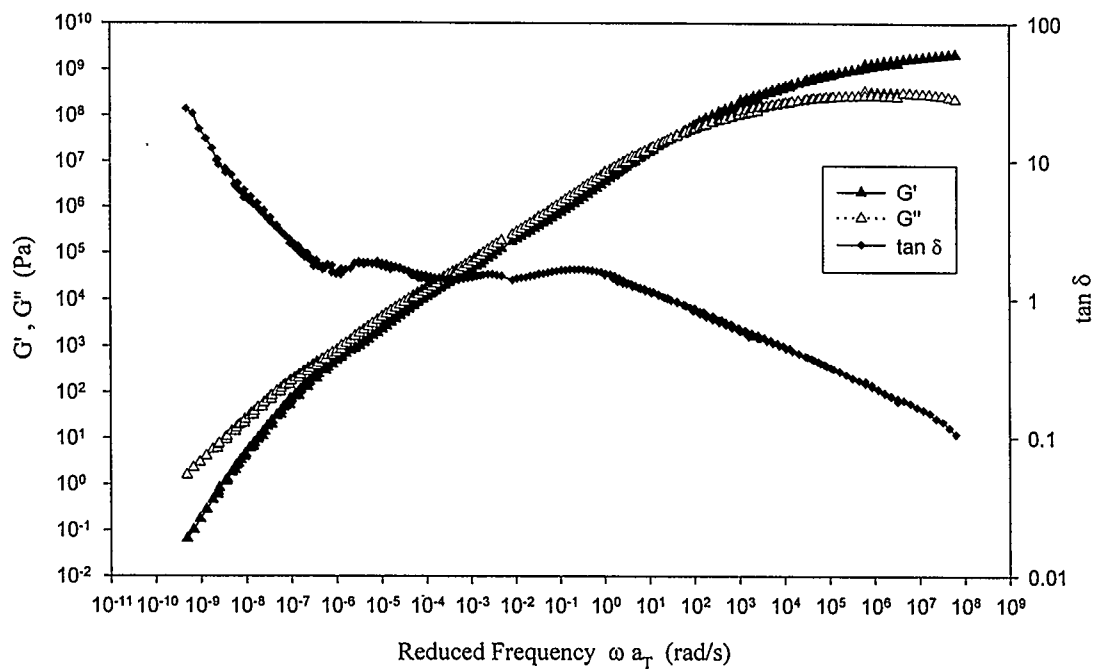


Figure A 25 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+6% SBS

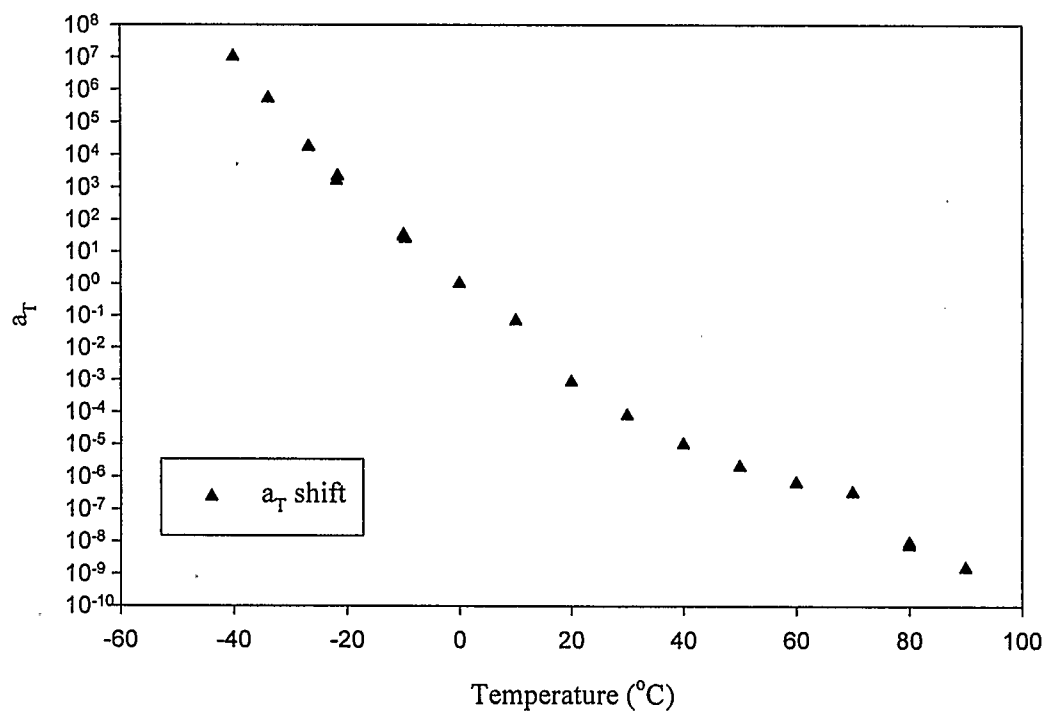


Figure A 26 TTS a_T shift factor for A200/300 Pen grade+6% SBS

A200/300 Pen grade+6%SBS (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-39.98	1.01E+07	3.33	1	3.77E+08	1.34E-07	1	9.40E-11	2.60E-08
-33.85	5.27E+05	2.53	2	3.57E+08	2.16E-08	2	1.62E-10	1.72E-07
-26.75	1.74E+04	2.00	3	2.50E+08	7.39E-07	3	1.68E-10	9.11E-07
-21.79	1.55E+03	1.33	4	3.33E+08	3.88E-06	4	3.82E-10	5.59E-06
-21.62	2.13E+03	1.61	5	2.25E+08	2.11E-05	5	5.33E-10	3.03E-05
-10.01	2.94E+01	0.98	6	2.19E+08	1.09E-04	6	1.22E-09	1.91E-04
-9.96	3.28E+01	1.04	7	1.27E+08	5.77E-04	7	2.50E-09	1.09E-03
-9.60	2.53E+01	1.01	8	6.97E+07	3.13E-03	8	4.73E-09	6.13E-03
-0.03	1.00E+00	1.00	9	4.09E+07	1.58E-02	9	1.33E-08	3.99E-02
10.03	6.83E-02	-0.25	10	1.48E+07	8.99E-02	10	3.27E-08	2.30E-01
20.01	8.52E-04	-0.50	11	6.00E+06	4.87E-01	11	9.51E-08	1.52E+00
30.00	7.75E-05	-0.75	12	1.52E+06	2.68E+00	12	2.31E-07	7.40E+00
40.01	1.00E-05	-1.00	13	3.96E+05	1.13E+01	13	5.73E-07	2.49E+01
50.00	2.07E-06	-1.25	14	2.45E+05	4.45E+01	14	1.89E-06	1.23E+02
60.00	6.41E-07	-1.50	15	1.15E+05	2.64E+02	15	8.08E-06	1.02E+03
70.00	3.19E-07	-1.75	16	2.75E+04	2.22E+03	16	2.35E-05	6.83E+03
80.00	7.50E-09	-0.41	17	1.01E+04	1.55E+04	17	6.92E-05	5.47E+04
80.01	9.12E-09	-0.42	18	2.40E+03	9.90E+04	18	2.56E-04	3.79E+05
90.00	1.49E-09	-0.29	19	5.59E+02	6.42E+05	19	5.17E-04	1.85E+06
			20	1.90E+02	2.76E+06			
			21	8.22E+01	9.84E+06			
			22	1.07E+01	5.60E+07			
			23	8.58E-01	4.78E+08			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 25 A200/300 Pen grade+6%SBS, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	27.81
C ₂	198.97
r ²	0.997
Std. Err.	0.2853

Table A 26 A200/300 Pen grade+6%SBS, WLF a_T shift constants

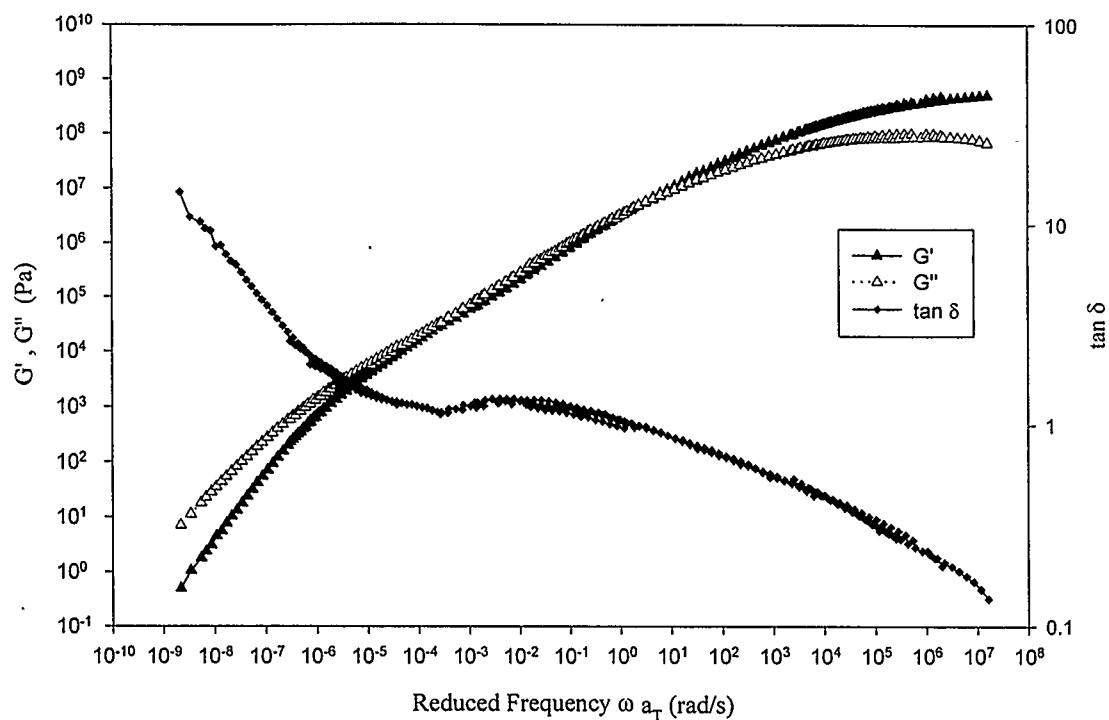


Figure A27 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+6%SBS RTFO aged

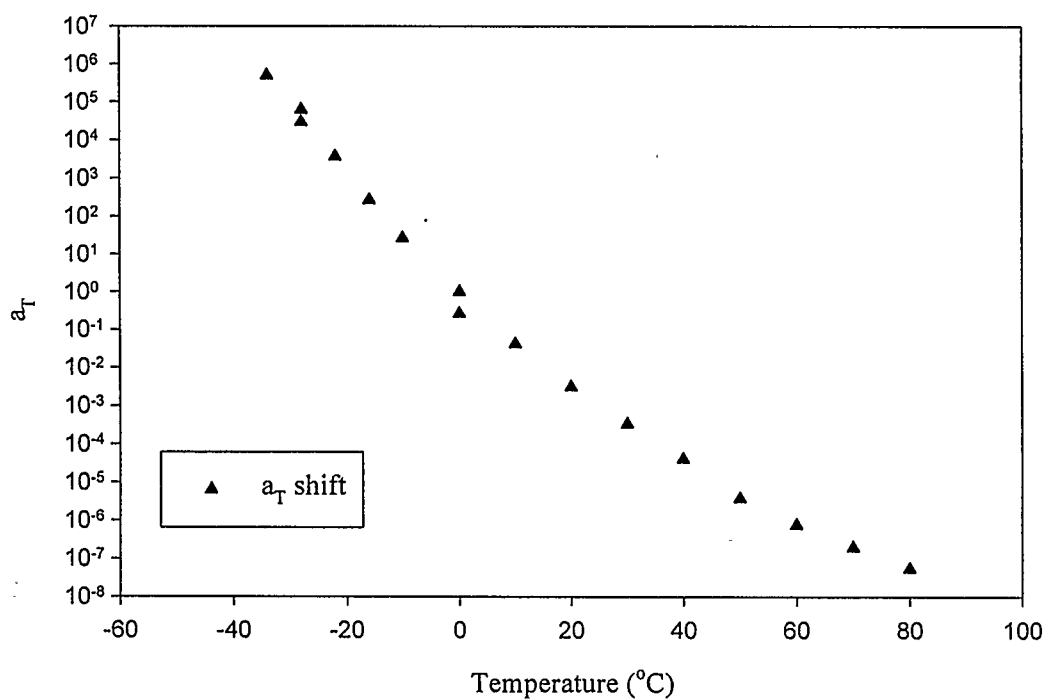


Figure A28 TTS a_T shift factor for A200/300 Pen grade+6%SBS RTFO aged

A200/300 Pen grade+6%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-33.96	4.93E+05	0.88	1	2.59E+08	9.06E-09	1	5.86E-10	1.34E-08
-27.97	2.91E+04	0.90	2	1.22E+08	2.50E-07	2	5.01E-10	3.21E-07
-27.93	6.15E+04	0.90	3	1.29E+08	2.26E-06	3	9.37E-10	3.22E-06
-21.99	3.63E+03	0.92	4	9.80E+07	1.60E-05	4	1.44E-09	2.36E-05
-15.97	2.64E+02	0.94	5	6.47E+07	7.96E-05	5	2.12E-09	1.18E-04
-10.04	2.64E+01	0.96	6	4.93E+07	3.52E-04	6	3.93E-09	5.69E-04
0.04	2.64E-01	1.00	7	3.23E+07	1.64E-03	7	6.88E-09	2.78E-03
0.05	1.00E+00	1.00	8	2.12E+07	7.48E-03	8	1.52E-08	1.44E-02
10.03	4.16E-02	1.04	9	1.15E+07	3.85E-02	9	3.08E-08	7.82E-02
20.02	3.09E-03	1.07	10	5.42E+06	1.87E-01	10	5.12E-08	3.67E-01
30.05	3.28E-04	1.11	11	2.49E+06	7.04E-01	11	1.20E-07	1.47E+00
39.95	4.00E-05	1.15	12	1.25E+06	2.95E+00	12	2.35E-07	6.33E+00
50.00	3.75E-06	1.18	13	5.42E+05	1.14E+01	13	6.96E-07	2.71E+01
60.00	7.60E-07	1.22	14	3.01E+05	6.00E+01	14	2.90E-06	2.10E+02
70.00	1.94E-07	1.26	15	8.39E+04	4.95E+02	15	1.02E-05	1.65E+03
80.00	5.48E-08	1.29	16	2.55E+04	4.27E+03	16	2.00E-05	1.13E+04
			17	8.05E+03	2.19E+04	17	5.30E-05	5.61E+04
			18	3.42E+03	1.13E+05	18	1.19E-04	3.01E+05
			19	1.27E+03	5.35E+05	19	3.68E-04	1.86E+06
			20	3.45E+02	2.96E+06			
			21	3.38E+01	2.14E+07			
			22	2.56E+00	1.98E+08			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 27 A200/300 Pen grade+6%SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	22.88
C ₂	167.21
r ²	0.998
Std. Err.	0.1854

Table A 28 A200/300 Pen grade+6%SBS RTFO aged, WLF a_T shift constants

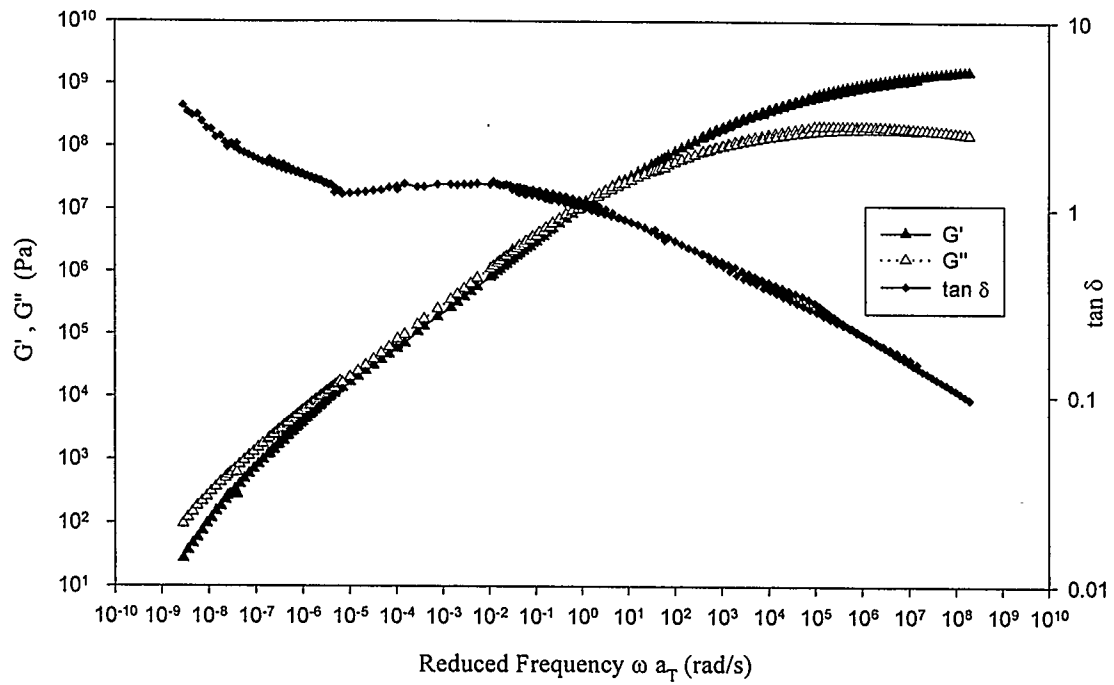


Figure A 29 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A200/300 Pen grade+6%SBS RTFO aged

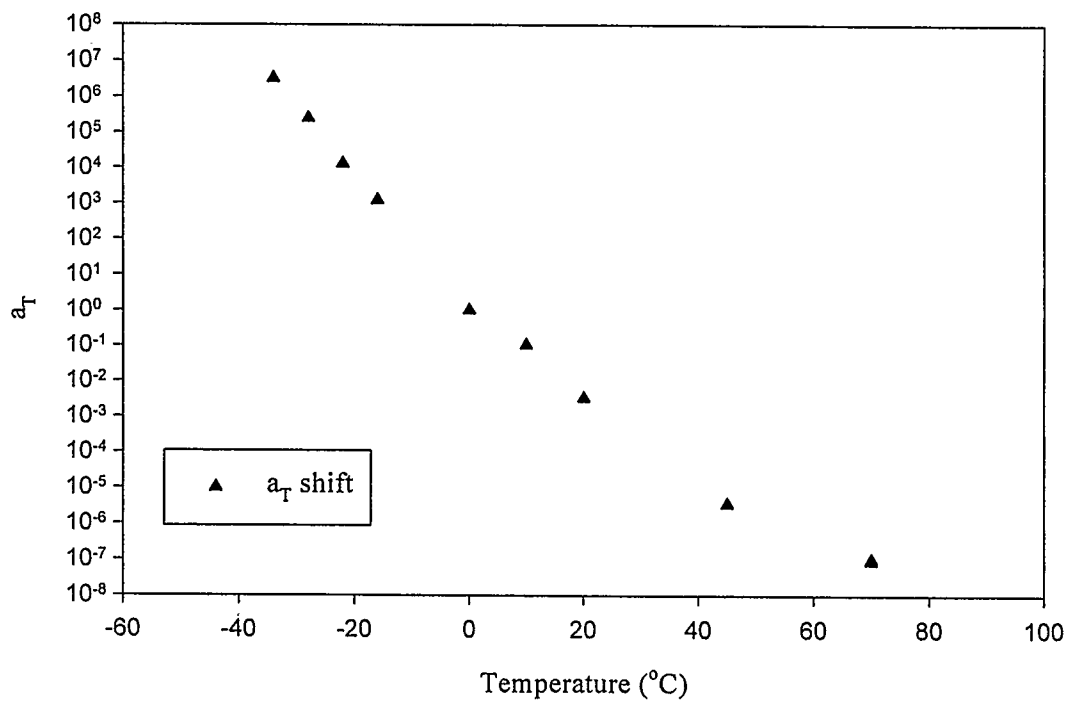


Figure A 30 TTS a_T shift factor for Mastic, A200/300 Pen grade+6%SBS RTFO aged

Mastic, A200/300 Pen grade+6%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-34.00	3.12E+06	8.76E-01	1	2.21E+08	4.78E-09	1	8.35E-11	5.48E-09
-27.96	2.42E+05	8.98E-01	2	2.02E+08	2.89E-08	2	1.05E-10	3.35E-08
-22.01	1.29E+04	9.19E-01	3	2.30E+08	1.78E-07	3	1.66E-10	2.17E-07
-16.03	1.20E+03	9.41E-01	4	2.61E+08	1.18E-06	4	3.00E-10	1.57E-06
-0.01	1.00E+00	1.00E+00	5	2.22E+08	7.78E-06	5	4.61E-10	1.08E-05
10.01	1.04E-01	1.04E+00	6	1.69E+08	4.28E-05	6	7.05E-10	6.13E-05
20.10	3.36E-03	1.07E+00	7	1.49E+08	2.42E-04	7	1.33E-09	3.89E-04
45.00	3.50E-06	1.16E+00	8	9.40E+07	1.23E-03	8	2.44E-09	2.07E-03
70.00	9.04E-08	1.26E+00	9	5.99E+07	6.49E-03	9	4.17E-09	1.14E-02
70.00	9.95E-08	1.26E+00	10	2.70E+07	2.64E-02	10	6.26E-09	4.24E-02
			11	2.37E+07	1.12E-01	11	1.54E-08	2.29E-01
			12	1.15E+07	5.62E-01	12	3.67E-08	1.25E+00
			13	5.51E+06	3.10E+00	13	7.20E-08	7.19E+00
			14	1.60E+06	1.29E+01	14	1.03E-07	2.29E+01
			15	1.15E+06	4.03E+01	15	5.09E-07	1.19E+02
			16	4.63E+05	2.77E+02	16	1.95E-06	9.50E+02
			17	1.52E+05	2.60E+03	17	6.44E-06	9.48E+03
			18	3.40E+04	2.10E+04	18	1.99E-05	6.26E+04
			19	1.50E+04	1.71E+05	19	4.11E-05	5.77E+05
			20	3.47E+03	9.63E+05			
			21	1.27E+03	4.38E+06			
			22	4.29E+02	2.05E+07			
			23	1.37E+02	1.01E+08			
			24	1.71E+01	1.58E+09			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 29 Mastic, A200/300 Pen grade+6%SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	21.59
C ₂	142.89
r ²	0.997
Std. Err.	0.2615

Table A 30 Mastic, A200/300 Pen grade+6%SBS RTFO aged, WLF a_T shift constants

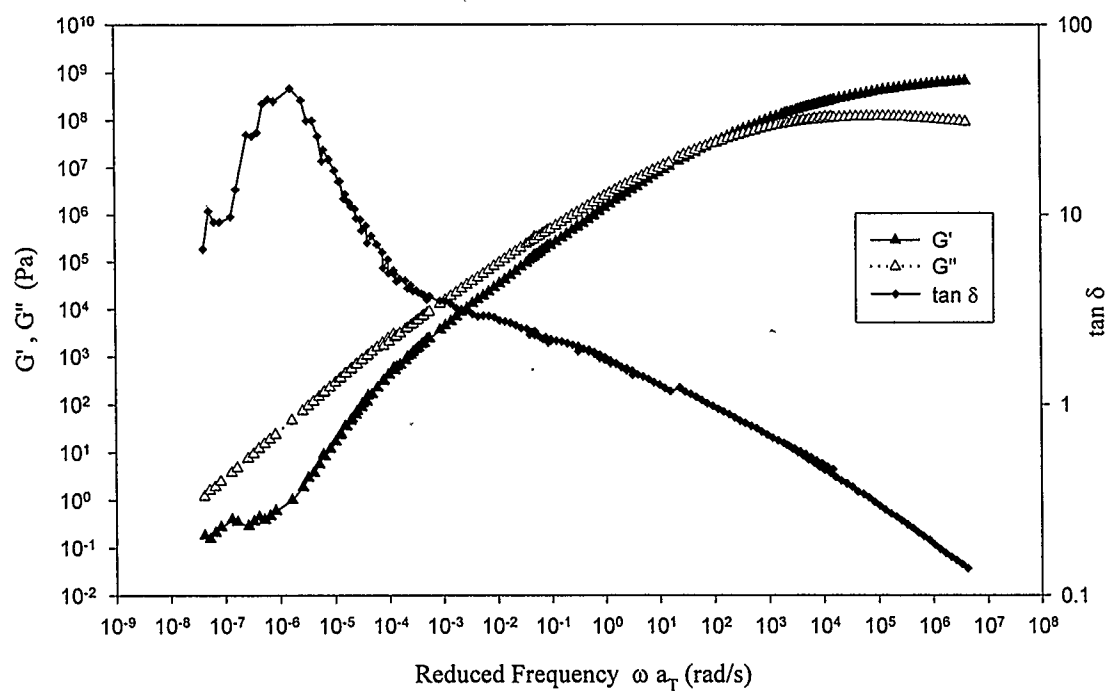


Figure A 31 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+2%EVA

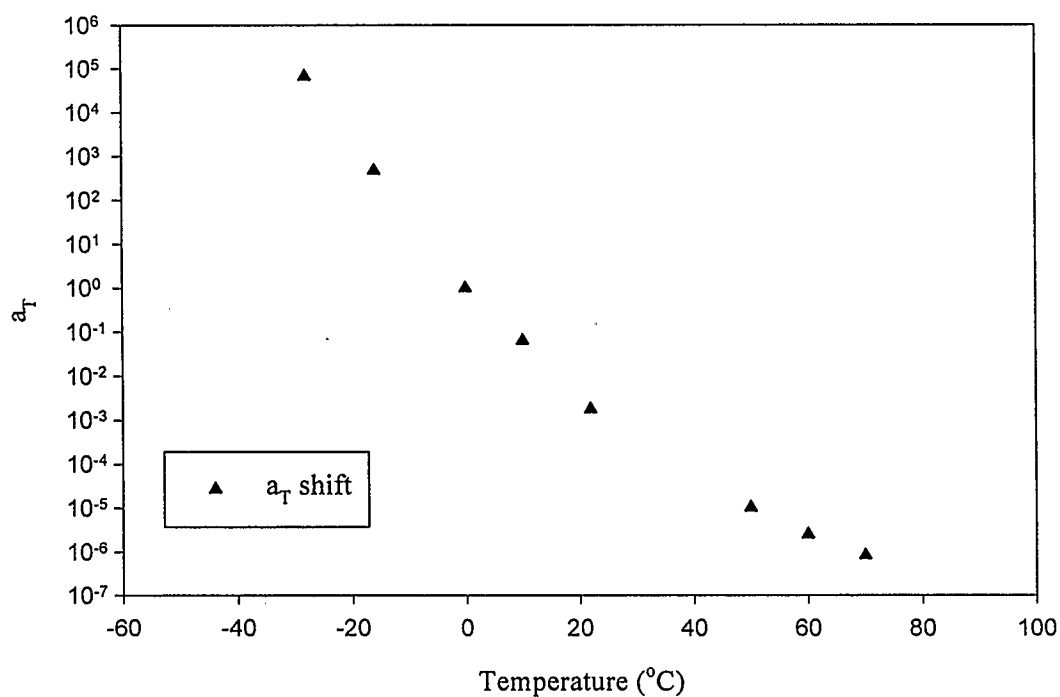


Figure A 32 TTS a_T shift factor for A200/300 Pen grade+2%EVA

A200/300 Pen grade+2%EVA (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-28.01	6.73E+04	0.90	1	1.31E+08	2.33E-07	1	2.45E-10	2.79E-07
-16.00	4.71E+02	0.94	2	1.02E+08	1.21E-06	2	2.78E-10	1.43E-06
-0.07	1.00E+00	1.00	3	1.34E+08	5.68E-06	3	5.60E-10	7.52E-06
9.99	6.33E-02	1.04	4	1.17E+08	2.86E-05	4	8.42E-10	3.97E-05
22.00	1.77E-03	1.08	5	1.15E+08	1.29E-04	5	1.92E-09	2.14E-04
50.00	1.02E-05	1.18	6	8.24E+07	6.89E-04	6	4.38E-09	1.36E-03
60.00	2.46E-06	1.22	7	4.41E+07	3.81E-03	7	1.01E-08	8.55E-03
70.00	8.23E-07	1.26	8	2.11E+07	2.09E-02	8	3.17E-08	6.24E-02
			9	6.25E+06	1.30E-01	9	8.67E-08	3.93E-01
			10	1.91E+06	7.25E-01	10	2.14E-07	2.28E+00
			11	4.46E+05	3.43E+00	11	7.37E-07	1.05E+01
			12	1.68E+05	1.69E+01	12	1.58E-06	5.51E+01
			13	3.28E+04	7.25E+01	13	5.89E-06	2.26E+02
			14	1.28E+04	3.16E+02	14	2.16E-05	1.25E+03
			15	2.99E+03	1.69E+03	15	7.02E-05	6.90E+03
			16	6.00E+02	8.72E+03	16	9.12E-05	2.90E+04
			17	7.60E+01	3.17E+04	17	1.54E-04	1.46E+05
			18	5.41E+00	1.50E+05	18	1.28E-01	1.63E+07
			19	3.55E-01	2.08E+07			
			20	6.95E+00	2.26E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 31 A200/300 Pen grade+2%EVA, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	17.49
C ₂	127.48
r ²	0.999
Std. Err.	0.1227

Table A 32 A200/300 Pen grade+2%EVA, WLF a_T shift constants

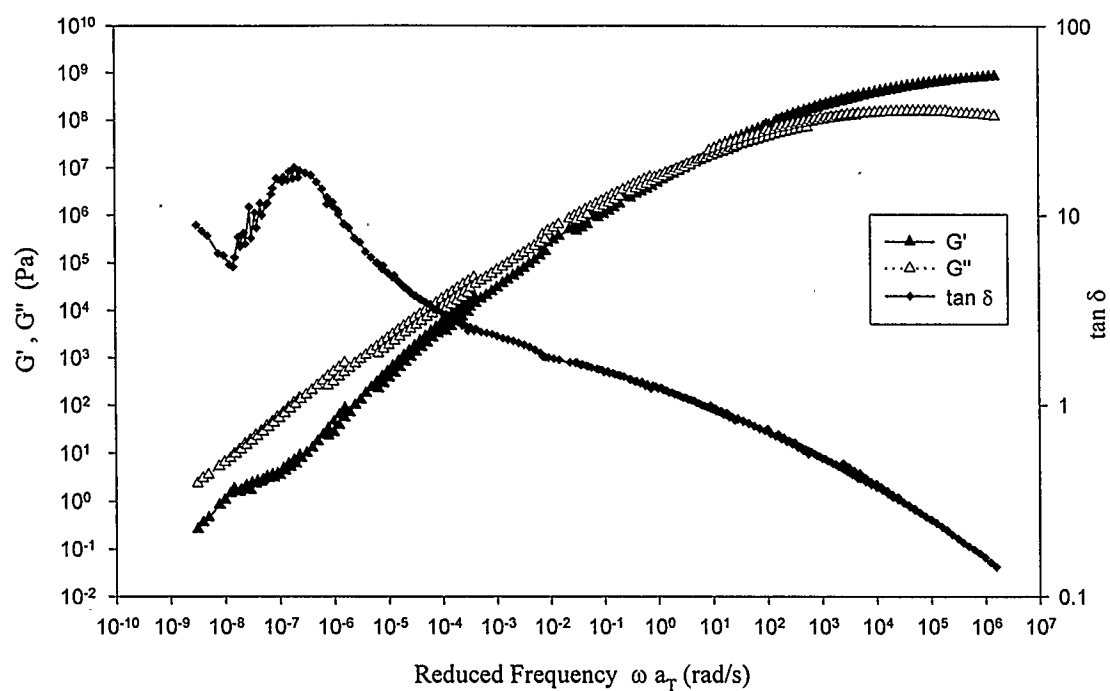


Figure A 33 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+2%EVA RTFO aged

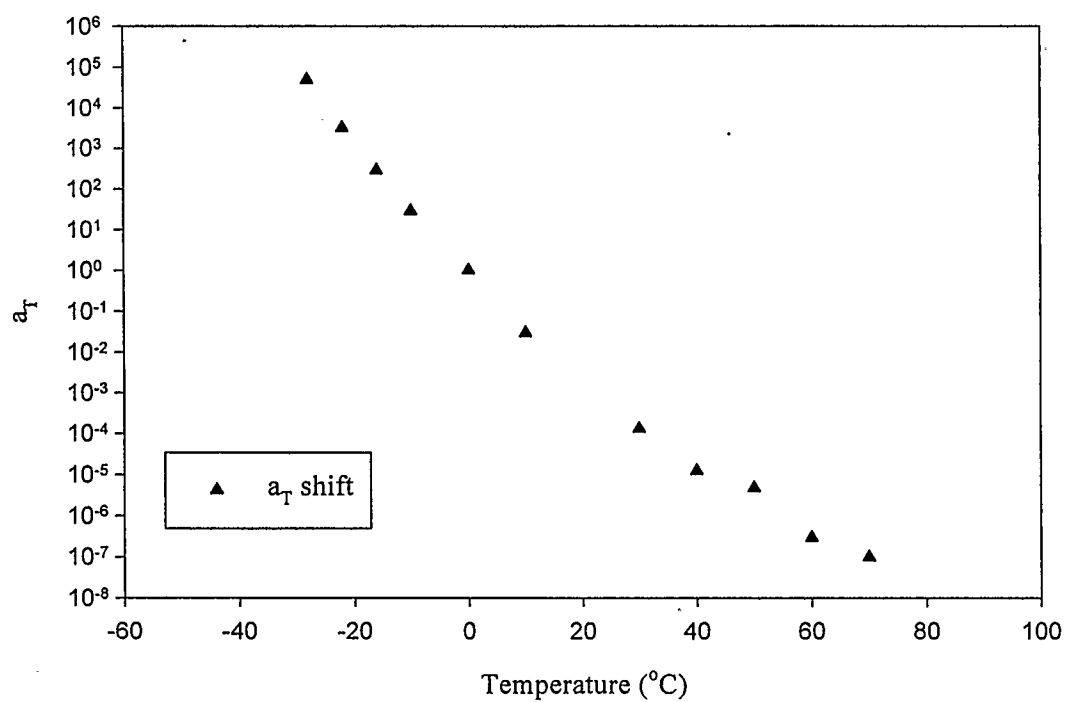


Figure A 34 TTS a_T shift factor for A200/300 Pen grade+2%EVA RTFO aged

A200/300 Pen grade+2%EVA RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-28.03	4.89E+04	0.90	1	1.82E+08	6.43E-07	1	2.11E-10	7.83E-07
-22.00	3.18E+03	0.92	2	1.49E+08	3.66E-06	2	2.57E-10	4.46E-06
-16.03	2.85E+02	0.94	3	1.49E+08	1.57E-05	3	3.91E-10	2.02E-05
-10.05	2.84E+01	0.96	4	1.48E+08	6.48E-05	4	6.93E-10	9.07E-05
0.01	1.00E+00	1.00	5	1.31E+08	2.87E-04	5	1.27E-09	4.47E-04
10.03	2.92E-02	1.04	6	9.87E+07	1.26E-03	6	2.96E-09	2.31E-03
30.00	1.31E-04	1.11	7	7.42E+07	7.60E-03	7	1.20E-08	2.21E-02
40.00	1.23E-05	1.15	8	2.63E+07	7.64E-02	8	3.48E-08	2.45E-01
50.00	4.68E-06	1.18	9	7.04E+06	6.03E-01	9	1.37E-07	2.06E+00
60.00	2.92E-07	1.22	10	2.61E+06	6.56E+00	10	6.33E-07	3.46E+01
70.00	9.87E-08	1.26	11	4.07E+05	7.64E+01	11	2.46E-06	4.18E+02
			12	4.12E+04	6.36E+02	12	3.65E-06	1.43E+03
			13	1.86E+04	1.99E+03	13	4.61E-05	1.18E+04
			14	5.40E+03	2.43E+04	14	3.14E-04	2.67E+05
			15	3.04E+02	3.89E+05	15	3.57E-04	2.57E+06
			16	7.93E+00	2.72E+06	16	2.57E-02	4.08E+07
			17	1.88E+00	5.26E+07	17	5.04E-02	1.31E+08
			18	9.39E-01	1.69E+08			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 33 A200/300 Pen grade+2%EVA RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	25.68
C ₂	180.59
r ²	0.998
Std. Err.	0.170

Table A 34 A200/300 Pen grade+2%EVA RTFO aged, WLF a_T shift constants

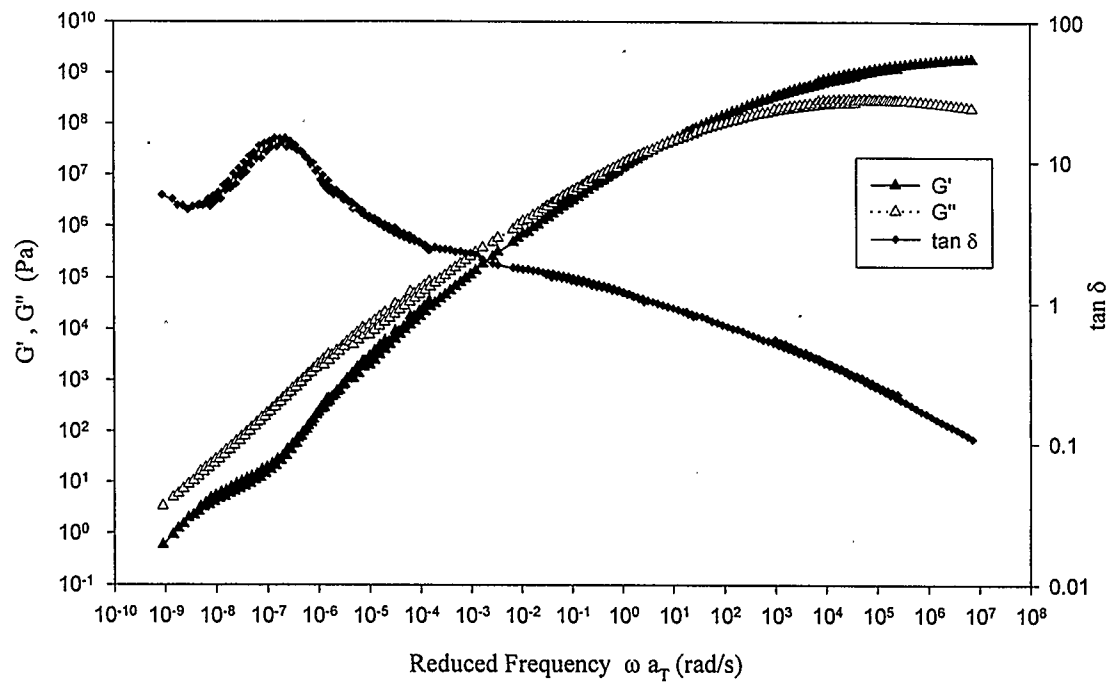


Figure A 35 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A200/300 Pen grade + 2 % EVA RTFO aged

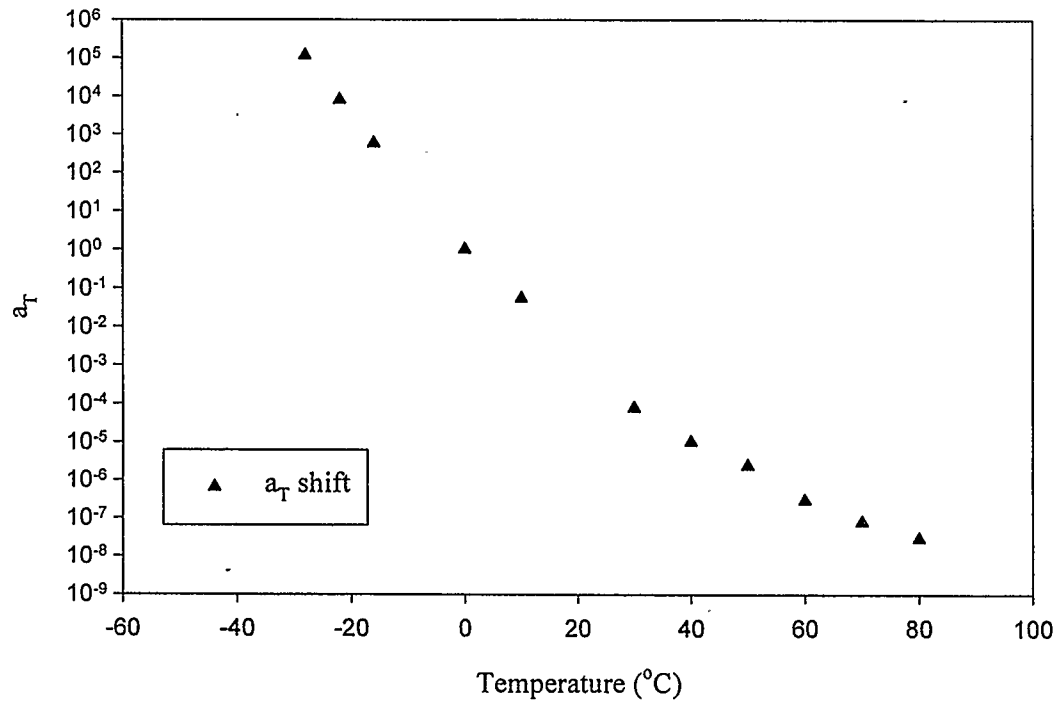


Figure A 36 TTS a_T shift factor for Mastic, A200/300 Pen grade+2%EVA RTFO aged

Mastic, A200/300 Pen grade+2%EVA RTFO aged (continued)

Temperature shift factors			Relaxation spectra			Retardation spectra		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-27.99	1.14E+05	1.00	1	3.11E+08	1.79E-07	1	8.68E-11	2.11E-07
-21.96	7.90E+03	0.78	2	2.30E+08	9.56E-07	2	8.97E-11	1.11E-06
-15.99	5.83E+02	0.57	3	3.65E+08	5.21E-06	3	2.08E-10	6.89E-06
-0.03	1.00E+00	1.00	4	3.12E+08	2.83E-05	4	3.24E-10	3.93E-05
10.00	5.41E-02	-0.36	5	2.70E+08	1.39E-04	5	6.07E-10	2.13E-04
30.00	7.80E-05	-1.07	6	1.76E+08	6.98E-04	6	8.78E-10	1.07E-03
40.00	1.01E-05	-1.43	7	1.35E+08	2.97E-03	7	1.93E-09	5.24E-03
50.00	2.39E-06	-1.79	8	9.46E+07	1.60E-02	8	4.98E-09	3.55E-02
60.00	2.89E-07	-2.14	9	3.86E+07	9.35E-02	9	9.71E-09	1.97E-01
70.00	7.80E-08	-2.50	10	2.08E+07	4.86E-01	10	2.48E-08	1.26E+00
80.00	2.85E-08	-2.86	11	6.91E+06	2.52E+00	11	6.70E-08	6.78E+00
			12	2.47E+06	1.29E+01	12	1.88E-07	3.67E+01
			13	8.30E+05	6.70E+01	13	7.63E-07	2.16E+02
			14	3.61E+05	5.17E+02	14	4.63E-06	3.05E+03
			15	2.38E+04	6.78E+03	15	1.73E-10	6.80E+03
			16	3.47E+04	6.82E+03	16	1.22E-05	3.58E+04
			17	5.40E+03	4.88E+04	17	4.84E-05	1.83E+05
			18	1.65E+03	2.57E+05	18	1.07E-04	1.15E+06
			19	1.87E+02	1.35E+06	19	9.13E-04	1.48E+07
			20	1.18E+01	1.65E+07			
			21	6.69E+00	1.32E+08			
			22	1.05E+00	9.90E+08			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 35 **Mastic, A200/300 Pen grade+2%EVA RTFO aged, shift factors, calculated relaxation and retardation spectra**

WLF a _T constants:	
T _{ref}	0
C ₁	22.171
C ₂	147.01
r ²	0.998
Std. Err.	0.1893

Table A 36 **Mastic, A200/300 Pen grade+2%EVA RTFO aged, WLF a_T shift constants**

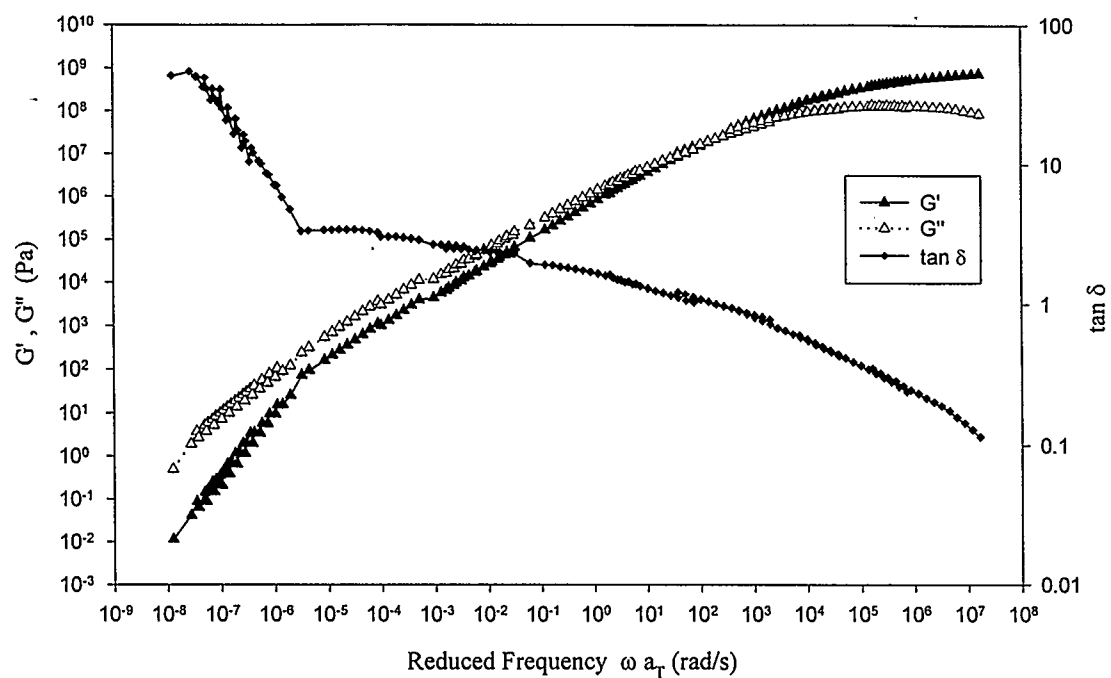


Figure A 37 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+4%EVA

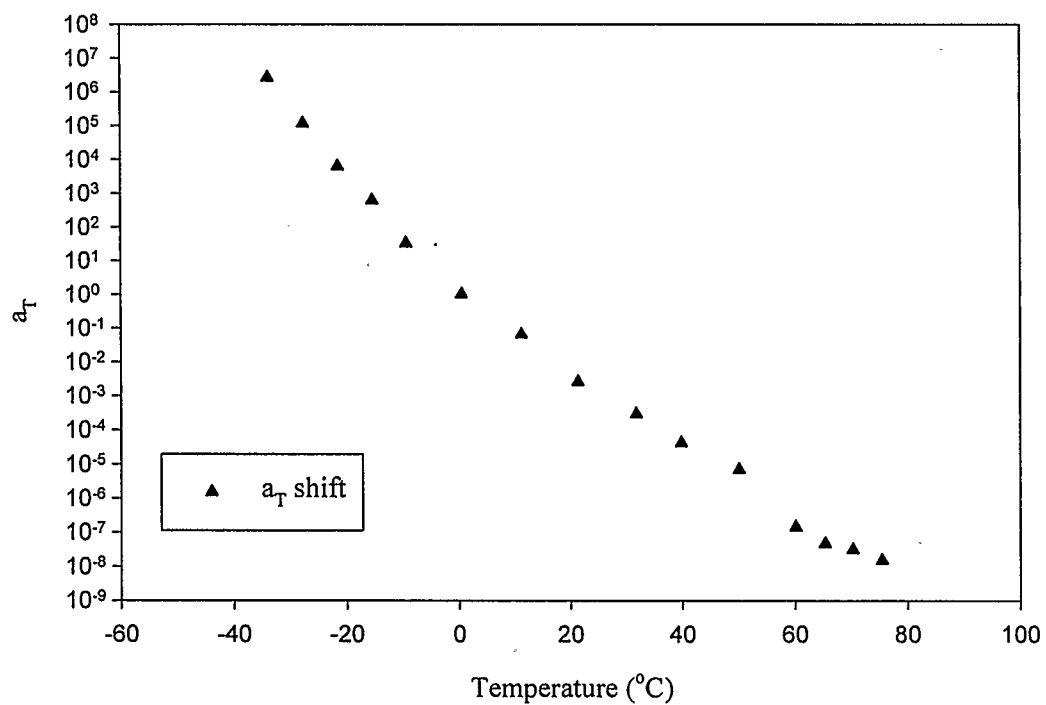


Figure A 38 TTS a_T shift factor for A200/300 Pen grade+4%EVA

A200/300 Pen grade+4%EVA (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-33.83	2.61E+06	1.00	1	1.24E+08	7.42E-08	1	1.99E-10	8.68E-08
-27.64	1.14E+05	0.82	2	1.52E+08	4.35E-07	2	3.71E-10	5.53E-07
-21.51	6.17E+03	0.64	3	1.27E+08	2.31E-06	3	4.79E-10	2.97E-06
-15.39	6.09E+02	0.45	4	1.44E+08	1.01E-05	4	1.09E-09	1.53E-05
-9.40	3.23E+01	0.96	5	1.07E+08	5.32E-05	5	1.77E-09	8.55E-05
0.48	1.00E+00	1.00	6	9.11E+07	2.54E-04	6	6.01E-09	5.94E-04
11.23	6.53E-02	-0.33	7	3.76E+07	1.68E-03	7	9.88E-09	3.77E-03
21.42	2.61E-03	-0.63	8	1.17E+07	6.61E-03	8	2.62E-08	1.45E-02
31.82	2.89E-04	-0.94	9	6.55E+06	3.00E-02	9	6.01E-08	7.33E-02
39.86	4.14E-05	-1.18	10	2.30E+06	1.34E-01	10	8.89E-08	2.75E-01
			11	9.69E+05	4.20E-01	11	3.09E-07	1.04E+00
			12	5.20E+05	1.91E+00	12	1.66E-06	7.57E+00
			13	1.69E+05	1.79E+01	13	7.35E-06	9.84E+01
			14	2.24E+04	1.73E+02	14	6.25E-05	1.00E+03
			15	5.51E+03	2.71E+03	15	1.93E-04	1.29E+04
			16	8.62E+02	2.27E+04	16	9.90E-04	1.19E+05
			17	1.70E+02	2.06E+05	17	2.26E-03	2.04E+06
			18	3.72E+00	2.24E+06	18	5.95E-03	2.21E+07
			19	9.42E-02	2.26E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 37 A200/300 Pen grade+4%EVA, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	24.467
C ₂	163.91
r ²	0.996
Std. Err.	0.306

Table A 38 A200/300 Pen grade+4%EVA, WLF a_T shift constants

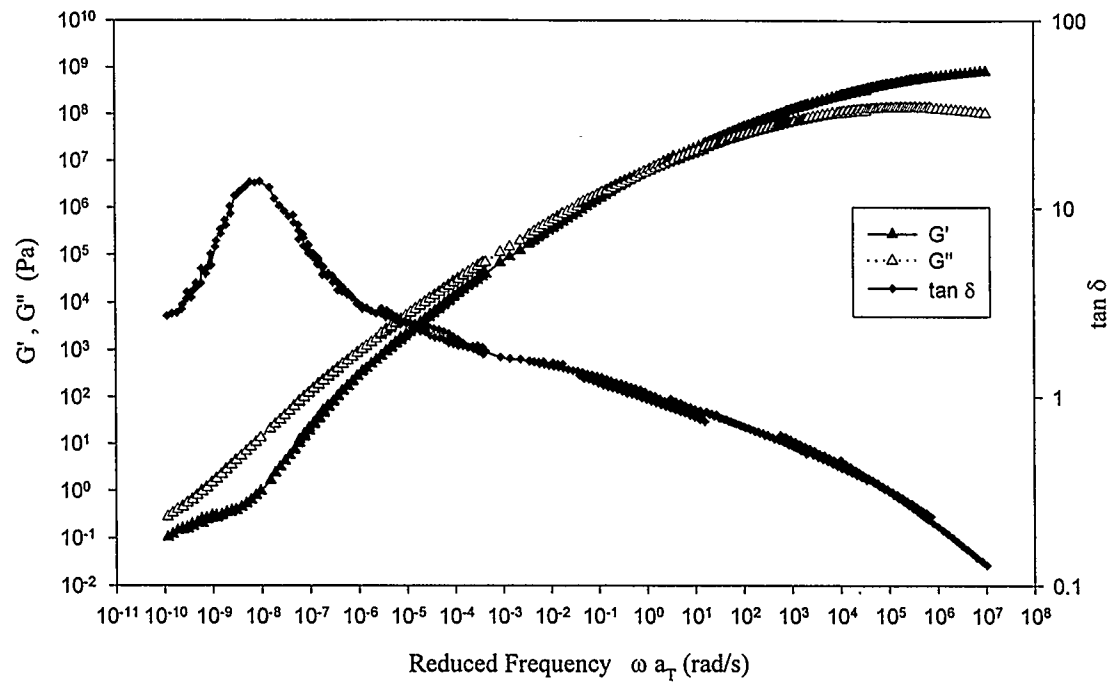


Figure 40 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+4%EVA RTFO aged

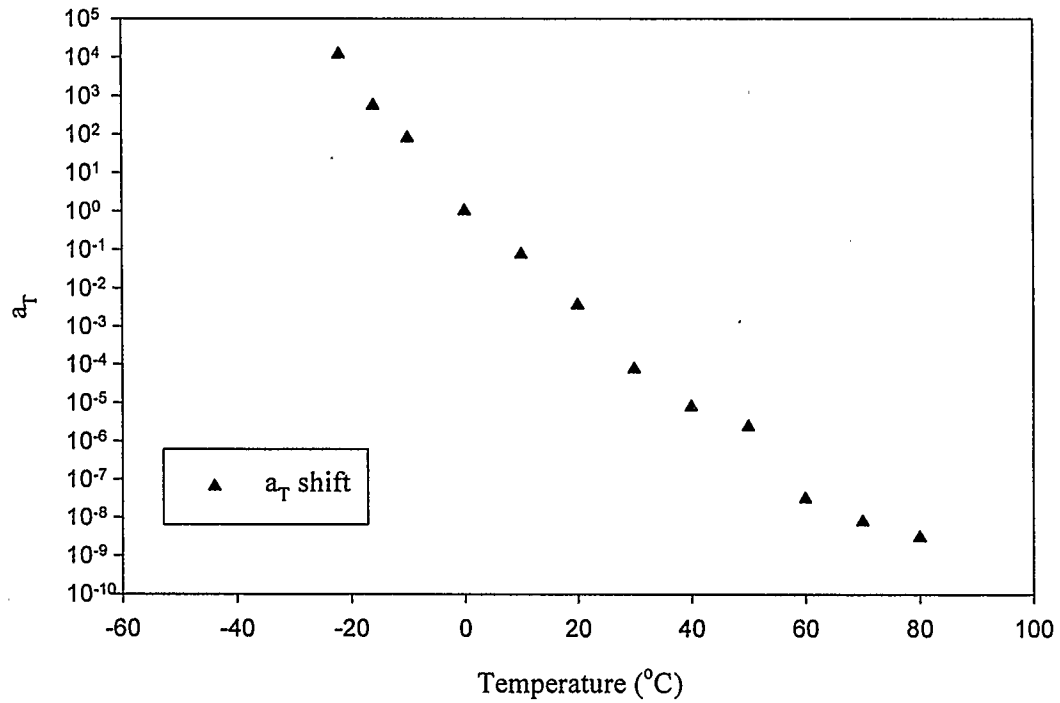


Figure A 39 TTS a_T shift factor for A200/300 Pen grade+4%EVA RTFO aged

A200/300 Pen grade+4%EVA RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-27.99	1.61E+05	0.90	1	1.68E+08	1.41E-07	1	2.39E-10	1.73E-07
-21.98	1.16E+04	0.92	2	1.60E+08	1.03E-06	2	3.52E-10	1.31E-06
-16.00	5.51E+02	0.94	3	1.59E+08	6.02E-06	3	5.92E-10	8.24E-06
-10.00	7.94E+01	0.96	4	1.31E+08	3.06E-05	4	9.62E-10	4.44E-05
0.00	1.00E+00	1.00	5	9.77E+07	1.40E-04	5	1.75E-09	2.17E-04
9.99	7.40E-02	1.04	6	8.20E+07	8.01E-04	6	3.99E-09	1.49E-03
20.02	3.55E-03	1.07	7	4.49E+07	4.99E-03	7	7.81E-09	9.68E-03
30.00	7.51E-05	1.11	8	2.58E+07	2.94E-02	8	2.16E-08	6.93E-02
40.00	7.79E-06	1.15	9	1.03E+07	2.05E-01	9	3.60E-08	4.34E-01
50.00	2.35E-06	1.18	10	3.99E+06	8.98E-01	10	6.98E-08	1.79E+00
60.00	3.05E-08	-0.23	11	2.23E+06	3.71E+00	11	1.82E-07	8.70E+00
			12	1.13E+06	1.93E+01	12	5.93E-07	6.27E+01
			13	2.79E+05	1.17E+02	13	1.87E-06	3.55E+02
			14	1.00E+05	6.93E+02	14	6.59E-06	2.45E+03
			15	2.76E+04	4.63E+03	15	1.48E-05	1.48E+04
			16	5.50E+03	2.16E+04	16	2.26E-05	4.55E+04
			17	2.49E+03	6.13E+04	17	7.73E-05	1.73E+05
			18	9.81E+02	2.43E+05	18	3.25E-04	9.51E+05
			19	2.64E+02	1.36E+06	19	8.76E-04	6.13E+06
			20	3.72E+01	7.50E+06			
			21	1.94E+00	5.65E+07			
			22	1.64E-01	1.91E+09			
			23	1.41E-01	1.25E+10			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 39 A200/300 Pen grade+4%EVA RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	28.14
C ₂	179.31
r ²	0.997
Std. Err.	0.284

Table A 40 A200/300 Pen grade+4%EVA RTFO aged, WLF a_T shift constants

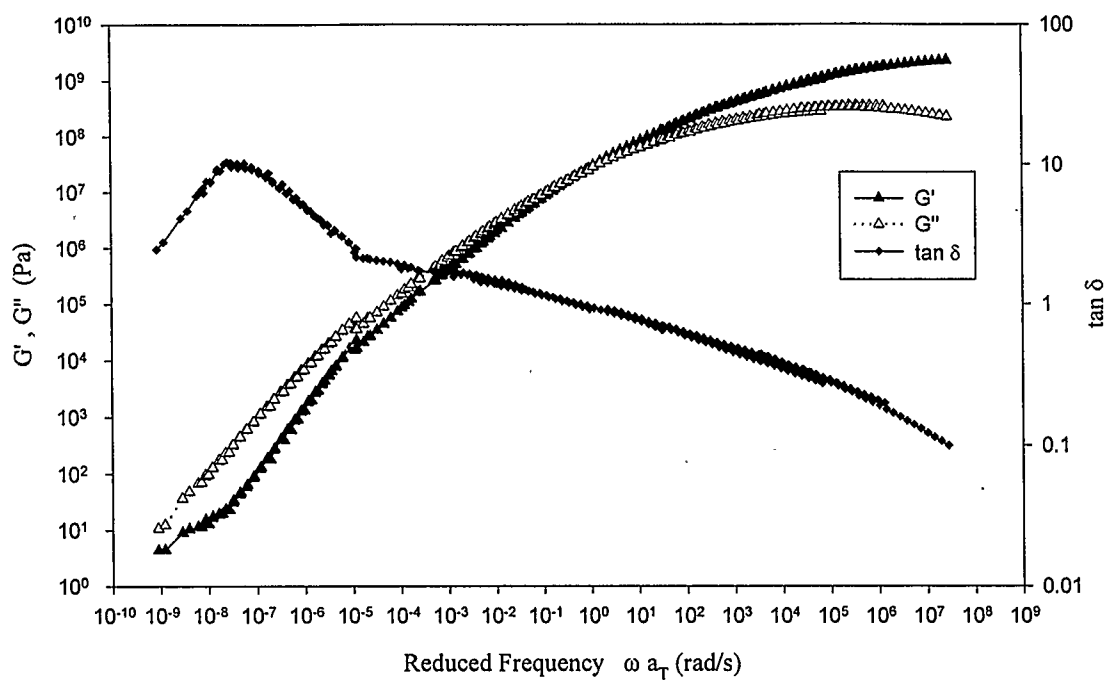


Figure A 40 Master curves at $T_r = 0^\circ\text{C}$ for Mastic, A200/300 Pen grade+4%EVA RTFO aged

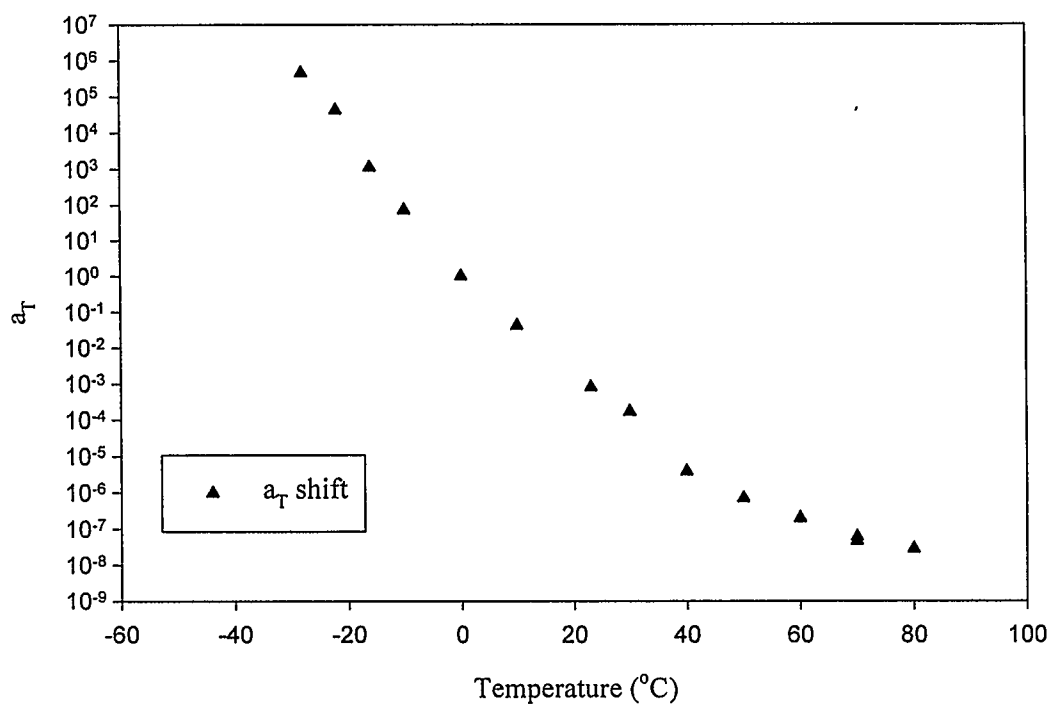


Figure A 41 TTS a_T shift factor for Mastic, A200/300 Pen grade+4%EVA RTFO aged

Mastic, A200/300 Pen grade+4%EVA RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-27.98	4.51E+05	0.90	1	3.61E+08	4.54E-08	1	6.19E-11	5.28E-08
-21.95	4.21E+04	0.92	2	2.44E+08	2.49E-07	2	5.45E-11	2.80E-07
-16.02	1.10E+03	0.94	3	4.36E+08	1.22E-06	3	1.39E-10	1.57E-06
-10.00	7.20E+01	0.96	4	3.96E+08	7.15E-06	4	2.19E-10	9.67E-06
0.02	1.00E+00	1.00	5	3.17E+08	3.67E-05	5	3.64E-10	5.21E-05
9.96	4.12E-02	1.04	6	2.60E+08	2.52E-04	6	5.34E-10	3.72E-04
23.10	7.93E-04	1.08	7	1.79E+08	1.16E-03	7	8.79E-10	1.78E-03
30.00	1.69E-04	1.11	8	1.37E+08	5.39E-03	8	1.79E-09	9.27E-03
40.00	3.84E-06	1.15	9	8.58E+07	2.79E-02	9	3.62E-09	5.22E-02
50.00	6.87E-07	1.18	10	4.64E+07	1.49E-01	10	6.10E-09	2.78E-01
60.00	1.91E-07	1.22	11	2.50E+07	6.39E-01	11	1.60E-08	1.38E+00
60.00	1.97E-07	1.22	12	1.34E+07	3.62E+00	12	4.04E-08	9.24E+00
70.00	4.59E-08	1.26	13	4.91E+06	2.07E+01	13	9.96E-08	5.45E+01
70.00	5.99E-08	-2.50	14	1.74E+06	1.08E+02	14	2.82E-07	3.08E+02
80.00	2.80E-08	-2.86	15	5.71E+05	5.70E+02	15	1.04E-06	1.81E+03
			16	2.07E+05	3.80E+03	16	3.29E-06	1.36E+04
			17	4.36E+04	2.37E+04	17	8.47E-06	6.18E+04
			18	1.84E+04	1.21E+05	18	2.99E-07	1.40E+05
			19	7.05E+03	1.48E+05	19	2.04E-05	6.79E+05
			20	1.98E+03	8.53E+05			
			21	2.11E+02	4.08E+06			
			22	1.10E+01	2.35E+08			
			23	7.34E+01	1.35E+07			
			24	3.89E+00	7.34E+09			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 41 Mastic, A200/300 Pen grade+4%EVA RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	20.26
C ₂	123.65
r ²	0.998
Std. Err.	0.235

Table A 42 Mastic, A200/300 Pen grade+4%EVA RTFO aged, WLF a_T shift constants

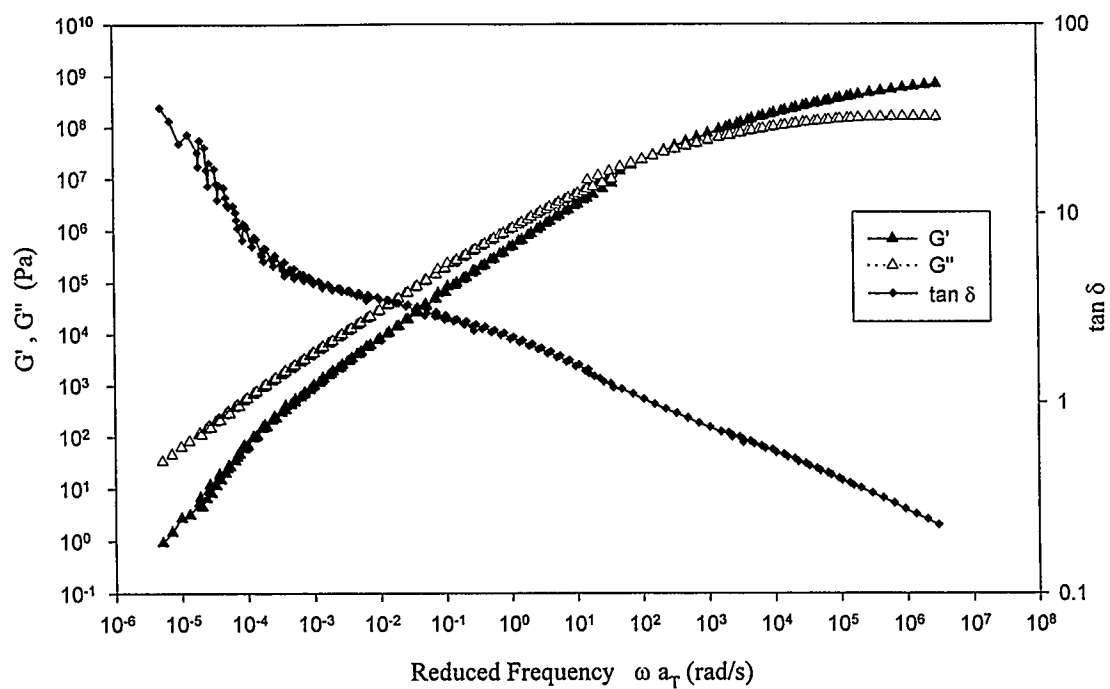


Figure A 42 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+1%SBS

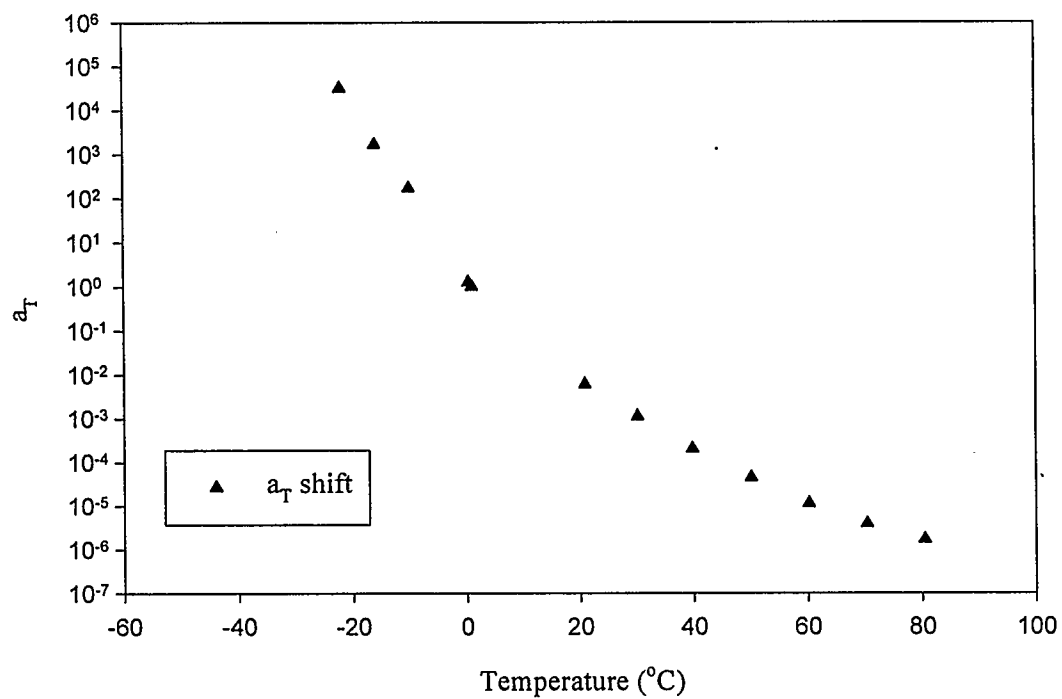


Figure A 43 TTS a_T shift factor for A200/300 Pen grade+1%SBS

A200/300 Pen grade+1%SBS (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-22.00	3.20E+04	0.92	1	2.45E+08	3.05E-07	1	4.01E-10	4.19E-07
-15.99	1.68E+03	0.94	2	1.77E+08	2.00E-06	2	5.70E-10	2.77E-06
-10.03	1.68E+02	0.96	3	1.53E+08	1.07E-05	3	1.02E-09	1.62E-05
0.37	1.24E+00	1.00	4	1.16E+08	5.53E-05	4	1.92E-09	9.24E-05
1.00	1.00E+00	1.00	5	7.70E+07	2.81E-04	5	3.80E-09	5.19E-04
20.95	5.99E-03	1.07	6	4.68E+07	1.42E-03	6	9.27E-09	3.12E-03
30.24	1.11E-03	1.11	7	2.61E+07	8.34E-03	7	3.17E-08	2.93E-02
39.86	2.01E-04	1.14	8	5.78E+06	5.59E-02	8	1.21E-07	2.29E-01
50.08	4.40E-05	1.18	9	1.16E+06	3.82E-01	9	3.51E-07	1.40E+00
60.21	1.13E-05	1.22	10	2.51E+05	2.04E+00	10	1.31E-06	7.31E+00
70.38	3.79E-06	1.25	11	7.65E+04	1.09E+01	11	3.82E-06	4.70E+01
80.46	1.66E-06	1.29	12	1.11E+04	5.96E+01	12	1.37E-05	2.06E+02
			13	3.42E+03	2.64E+02	13	4.95E-05	1.03E+03
			14	8.23E+02	1.30E+03	14	1.63E-04	5.28E+03
			15	1.76E+02	6.36E+03	15	6.18E-04	8.11E+04
			16	3.73E+00	8.52E+04			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 43 A200/300 Pen grade+1%SBS, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	10.89
C ₂	73.50
r ²	0.996
Std. Err.	0.220

Table A 44 A200/300 Pen grade+1%SBS, WLF a_T shift constants

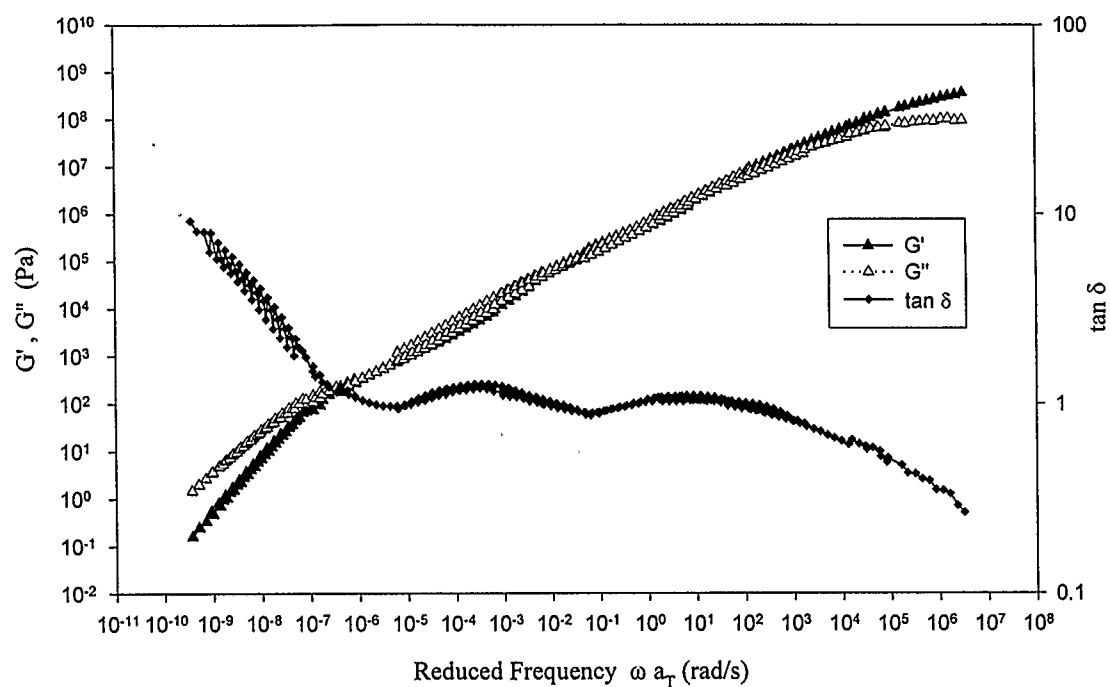


Figure A 44 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+8%SBS

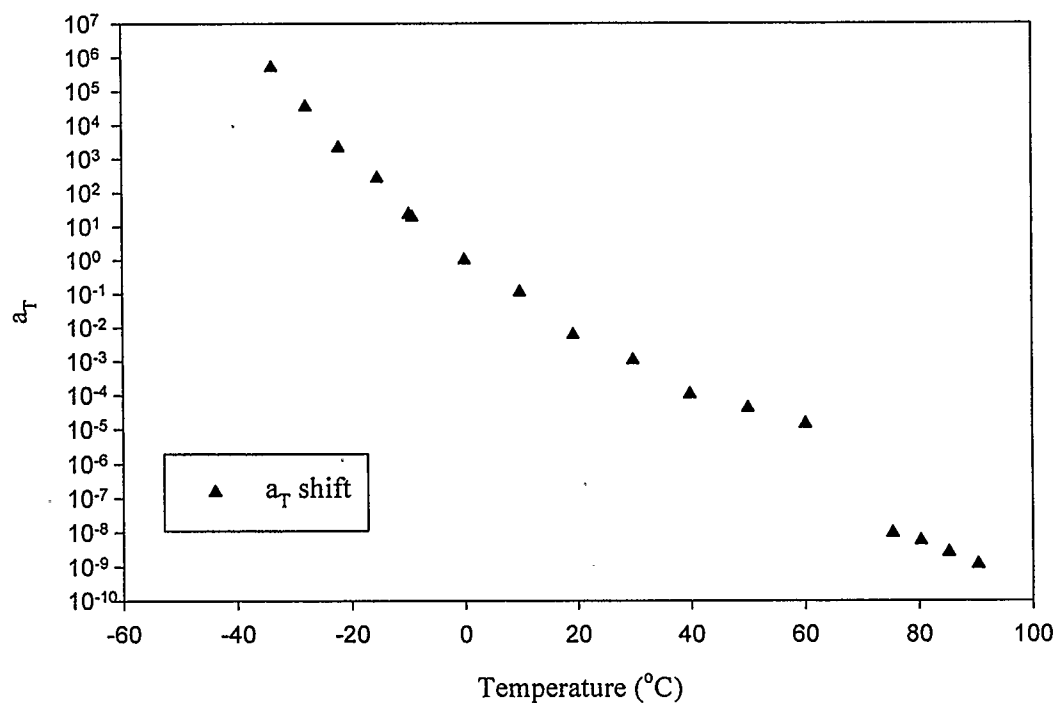


Figure A 45 TTS a_T shift factor for A200/300 Pen grade+8%SBS

A200/300 Pen grade+8%SBS (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-33.71	4.99E+05	0.88	1	1.28E+08	2.62E-07	1	6.44E-10	3.51E-07
-27.77	3.43E+04	0.90	2	9.72E+07	1.02E-06	2	1.20E-09	1.45E-06
-22.06	2.10E+03	0.65	3	8.57E+07	5.46E-06	3	2.02E-09	8.53E-06
-15.27	2.62E+02	0.45	4	6.12E+07	2.44E-05	4	4.34E-09	4.34E-05
-9.76	2.25E+01	0.29	5	3.65E+07	1.22E-04	5	7.22E-09	2.26E-04
-9.20	1.86E+01	0.97	6	1.53E+07	4.45E-04	6	1.37E-08	7.86E-04
0.03	1.00E+00	1.00	7	9.18E+06	1.67E-03	7	2.38E-08	2.98E-03
9.83	1.11E-01	1.04	8	6.94E+06	6.80E-03	8	9.72E-08	1.86E-02
19.29	5.89E-03	-0.57	9	2.91E+06	5.56E-02	9	3.14E-07	1.78E-01
29.90	1.06E-03	-0.89	10	9.04E+05	4.90E-01	10	8.28E-07	1.74E+00
39.92	1.04E-04	-1.18	11	3.70E+04	2.27E+00	11	9.93E-07	2.94E+00
50.08	4.07E-05	-1.49	12	1.44E+05	7.70E+00	12	1.86E-06	1.44E+01
60.18	1.40E-05	-1.79	13	8.38E+04	3.21E+01	13	4.32E-06	7.02E+01
75.40	9.27E-09	-0.13	14	3.69E+04	1.45E+02	14	1.11E-05	3.40E+02
80.34	5.60E-09	-0.15	15	1.37E+04	7.88E+02	15	2.79E-12	7.88E+02
85.21	2.51E-09	-0.15	16	6.74E+03	7.88E+02	16	6.64E-05	3.67E+03
90.39	1.12E-09	-0.16	17	3.67E+03	8.41E+03	17	2.17E-04	2.75E+04
			18	1.15E+03	6.88E+04	18	5.32E-04	1.91E+05
			19	4.46E+02	4.58E+05	19	2.07E-03	1.58E+06
			20	1.80E+02	4.72E+06			
			21	5.26E+01	2.30E+07			
			22	5.92E+00	1.47E+08			
			23	6.90E-01	1.33E+09			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 45 A200/300 Pen grade+8%SBS, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	28.94
C ₂	217.39
r ²	0.986
Std. Err.	0.574

Table A 46 A200/300 Pen grade+8%SBS, WLF a_T shift constants

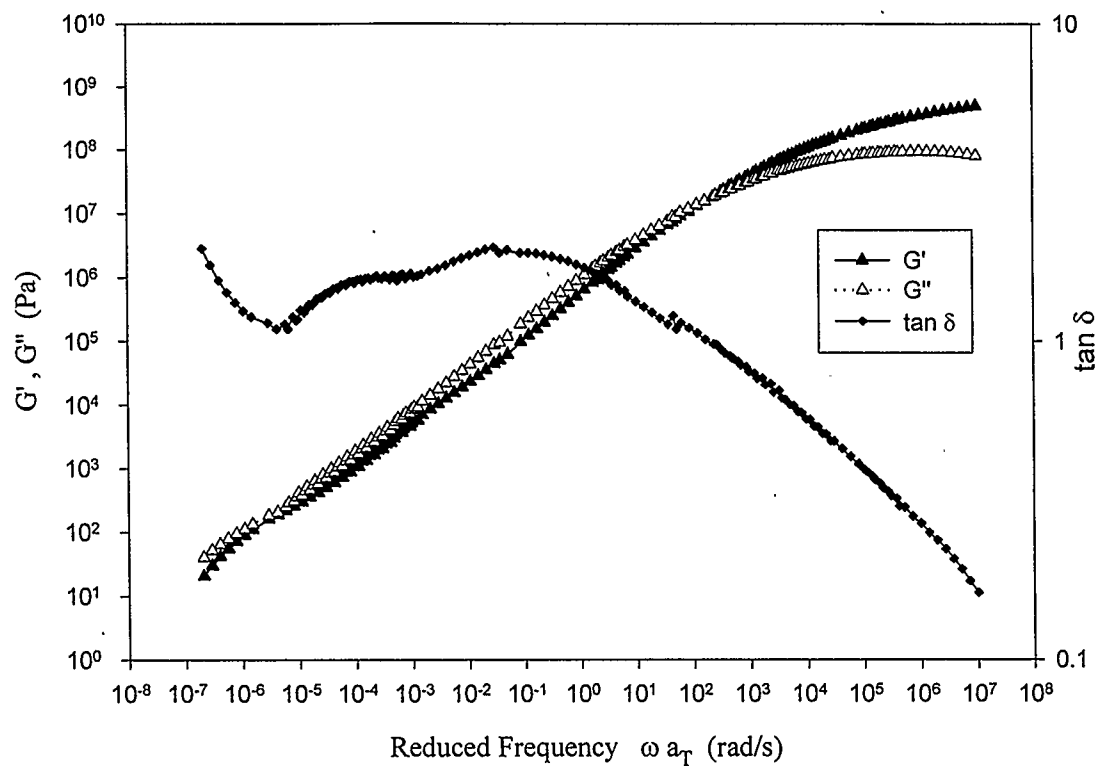


Figure A 46 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+4%SBS linear

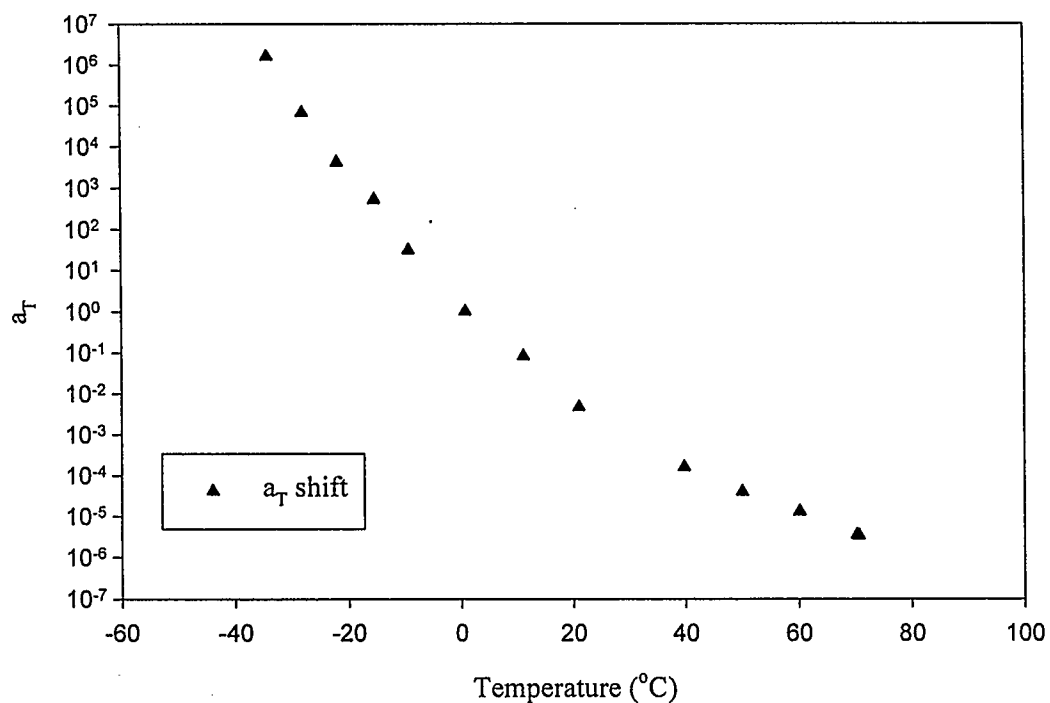


Figure A 47 TTS a_T shift factor for A200/300 Pen grade+4%SBS linear

A200/300 Pen grade+4%SBS linear (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-34.05	1.60E+06	0.87	1	1.21E+08	1.08E-07	1	4.29E-10	1.37E-07
-27.90	6.70E+04	0.90	2	1.09E+08	6.48E-07	2	6.56E-10	8.62E-07
-21.83	4.17E+03	0.92	3	9.74E+07	3.36E-06	3	1.05E-09	4.78E-06
-15.27	5.17E+02	0.94	4	8.84E+07	1.66E-05	4	2.04E-09	2.69E-05
-9.25	3.05E+01	0.96	5	6.29E+07	8.31E-05	5	3.80E-09	1.48E-04
0.83	1.00E+00	1.00	6	4.22E+07	4.04E-04	6	8.71E-09	8.56E-04
11.21	8.16E-02	-0.33	7	2.24E+07	2.10E-03	7	2.28E-08	5.36E-03
21.15	4.67E-03	-0.62	8	9.93E+06	1.22E-02	8	5.44E-08	3.42E-02
39.83	1.57E-04	-1.17	9	3.48E+06	6.99E-02	9	1.17E-07	1.77E-01
50.05	3.93E-05	-1.47	10	1.15E+06	3.22E-01	10	3.06E-07	8.41E-01
60.20	1.29E-05	-1.77	11	3.85E+05	1.46E+00	11	9.58E-07	4.08E+00
70.293	3.48E-06	-2.06	12	1.33E+05	7.72E+00	12	4.24E-06	2.63E+01
70.632	3.34E-06	-2.07	13	3.04E+04	5.12E+01	13	1.32E-05	1.45E+02
			14	9.83E+03	2.61E+02	14	4.49E-05	7.70E+02
			15	3.96E+03	1.48E+03	15	1.64E-04	5.32E+03
			16	9.79E+02	9.71E+03	16	5.12E-04	2.94E+04
			17	3.06E+02	5.49E+04	17	1.42E-03	1.41E+05
			18	1.40E+02	3.11E+05	18	2.94E-03	7.48E+05
			19	7.59E+01	1.66E+06	19	3.27E-02	1.16E+07
			20	1.39E+01	3.86E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 47 A200/300 Pen grade+4%SBS linear, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	13.96
C ₂	108.66
r ²	0.998
Std. Err.	0.1742

Table A 48 A200/300 Pen grade+4%SBS linear, WLF a_T shift constants

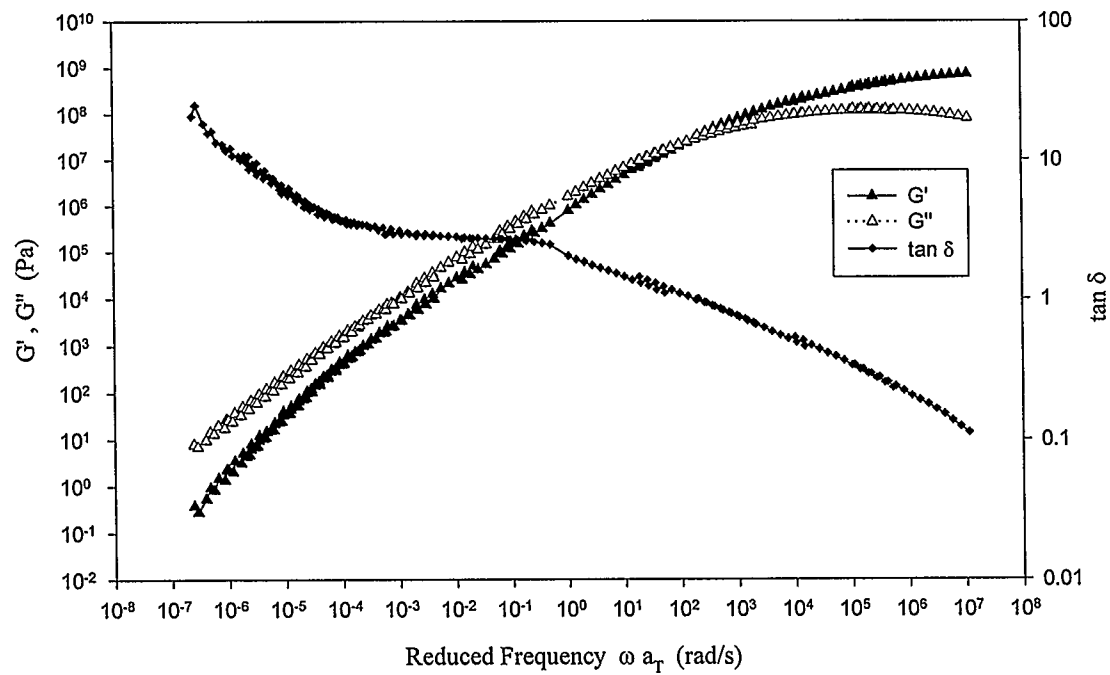


Figure A 48 Master curves at $T_r = 0^\circ\text{C}$ for A200/300 Pen grade+2%Elvaloy

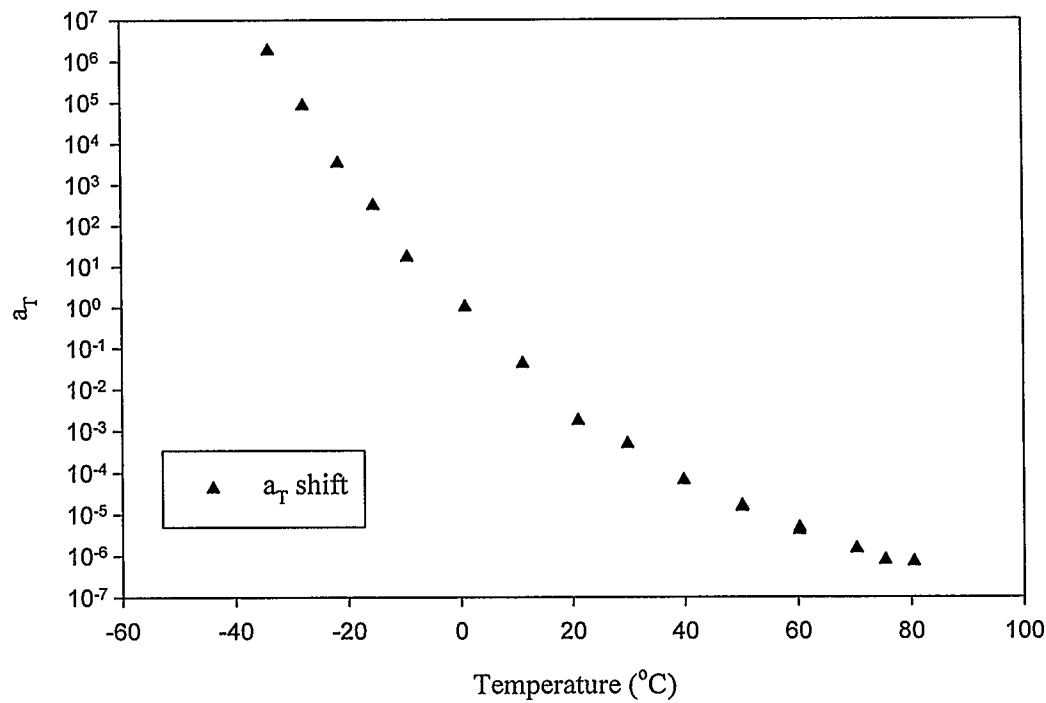


Figure A 49 TTS a_T shift factor for A200/300 Pen grade 2% Elvaloy

A200/300 Pen grade+2%Elvaloy (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lamba [s]
-33.74	1.80E+06	1.00	1	1.05E+08	9.71E-08	1	1.98E-10	1.12E-07
-27.68	8.33E+04	0.82	2	1.07E+08	4.88E-07	2	2.75E-10	5.81E-07
-21.59	3.30E+03	0.64	3	1.02E+08	1.84E-06	3	3.98E-10	2.27E-06
-15.34	3.00E+02	0.45	4	1.35E+08	8.40E-06	4	8.89E-10	1.20E-05
-9.37	1.64E+01	0.28	5	1.13E+08	4.41E-05	5	1.66E-09	6.99E-05
0.87	1.00E+00	1.00	6	9.71E+07	2.51E-04	6	4.48E-09	5.22E-04
11.12	4.09E-02	1.04	7	4.21E+07	1.51E-03	7	6.66E-09	2.88E-03
21.05	1.71E-03	-0.62	8	2.18E+07	5.93E-03	8	2.04E-08	1.43E-02
29.88	4.82E-04	-0.89	9	9.57E+06	3.14E-02	9	5.91E-08	8.91E-02
39.86	6.44E-05	-1.18	10	3.50E+06	1.87E-01	10	2.24E-07	7.05E-01
50.10	1.43E-05	-1.48	11	8.66E+05	1.36E+00	11	7.55E-07	5.55E+00
50.17	1.55E-05	-1.49	12	1.70E+05	8.95E+00	12	2.62E-06	3.82E+01
60.24	3.94E-06	-1.79	13	1.96E+04	5.09E+01	13	4.14E-06	8.93E+01
60.30	4.51E-06	-1.79	14	2.13E+04	1.33E+02	14	1.26E-05	4.65E+02
70.37	1.43E-06	-2.09	15	4.09E+03	6.08E+02	15	6.46E-05	2.27E+03
75.46	7.52E-07	-2.24	16	1.50E+03	3.35E+03	16	2.66E-04	1.64E+04
80.53	6.90E-07	-2.39	17	2.69E+02	2.25E+04	17	8.78E-04	1.30E+05
			18	2.63E+01	1.54E+05	18	4.99E-03	1.29E+06
			19	2.04E+00	1.43E+06			
			20	6.95E+00	2.26E+07			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 49 A200/300 Pen grade 2% Elvaloy, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	15.79
C ₂	117.32
r ²	0.999
Std. Err.	0.1529

Table A 50 A200/300 Pen grade 2% Elvaloy, WLF a_T shift constants

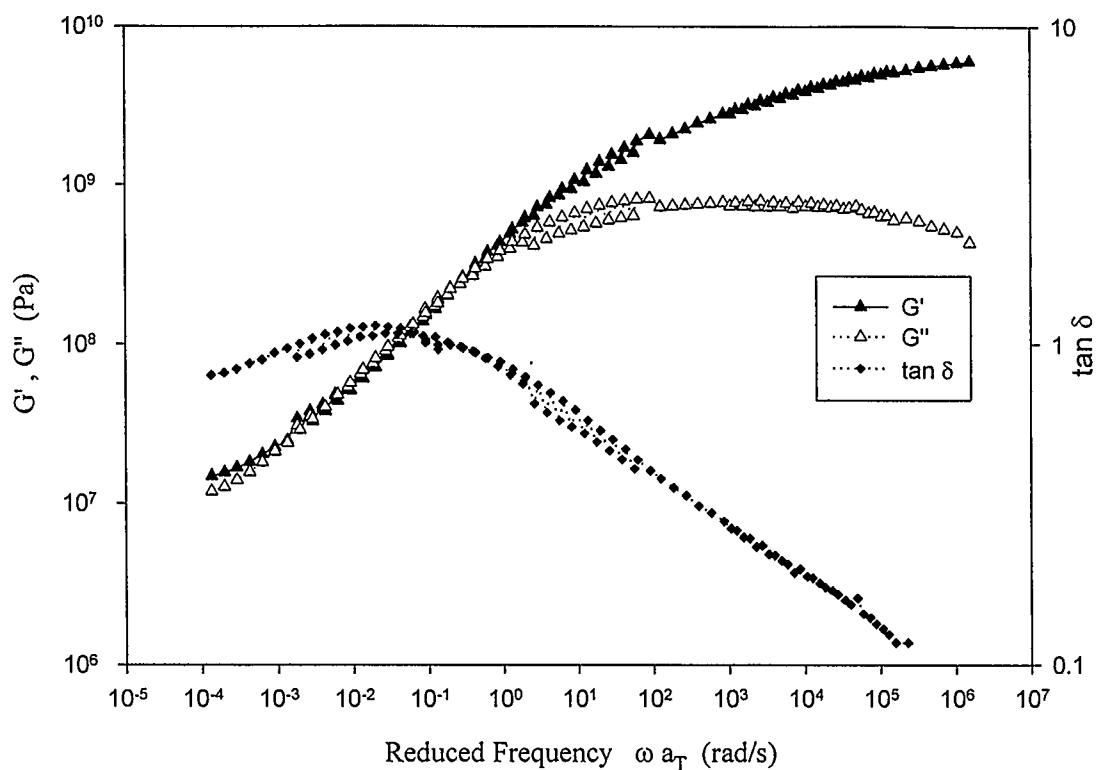


Figure A 50 Master curves at $T_r = 0^\circ\text{C}$ for core with A200/300 Pen grade+4%SBS RTFO aged

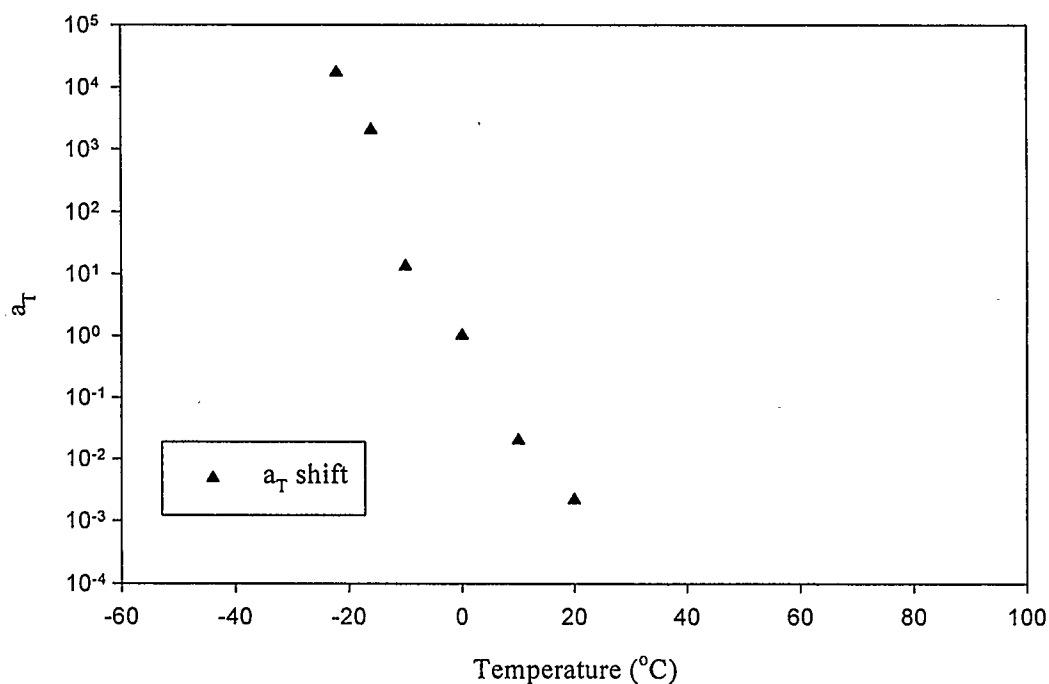


Figure A 51 TTS a_T shift factor for core with A200/300 Pen grade+4%SBS RTFO aged

Core with A200/300 Pen grade+4% SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-22.06	1.70E+04	0.92	1	7.03E+08	8.81E-07	1	1.71E-11	9.84E-07
-16.00	2.02E+03	0.94	2	6.77E+08	5.24E-06	2	2.11E-11	5.91E-06
-9.97	1.32E+01	0.45	3	9.06E+08	3.27E-05	3	3.82E-11	3.94E-05
0.06	1.00E+00	1.00	4	8.77E+08	2.15E-04	4	5.53E-11	2.69E-04
10.02	2.00E-02	-0.45	5	8.95E+08	1.37E-03	5	9.67E-11	1.85E-03
20.02	2.17E-03	-0.91	6	9.06E+08	1.19E-02	6	1.73E-10	1.79E-02
			7	6.08E+08	6.52E-02	7	2.77E-10	1.01E-01
			8	4.06E+08	3.03E-01	8	4.11E-10	4.77E-01
			9	3.08E+08	1.18E+00	9	1.16E-09	2.35E+00
			10	1.77E+08	6.76E+00	10	3.35E-09	1.67E+01
			11	6.28E+07	4.54E+01	11	7.26E-09	1.01E+02
			12	2.76E+07	2.86E+02	12	1.10E-08	5.60E+02
			13	9.08E+06	1.06E+03	13	2.19E-08	1.79E+03
			14	1.70E+07	9.60E+03			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 51 Core with A200/300 Pen grade+4 % SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	18.60
C ₂	117.55
r ²	0.984
Std. Err.	0.3766

Table A 52 Core with A200/300 Pen grade+4 % SBS RTFO aged, WLF a_T shift constants

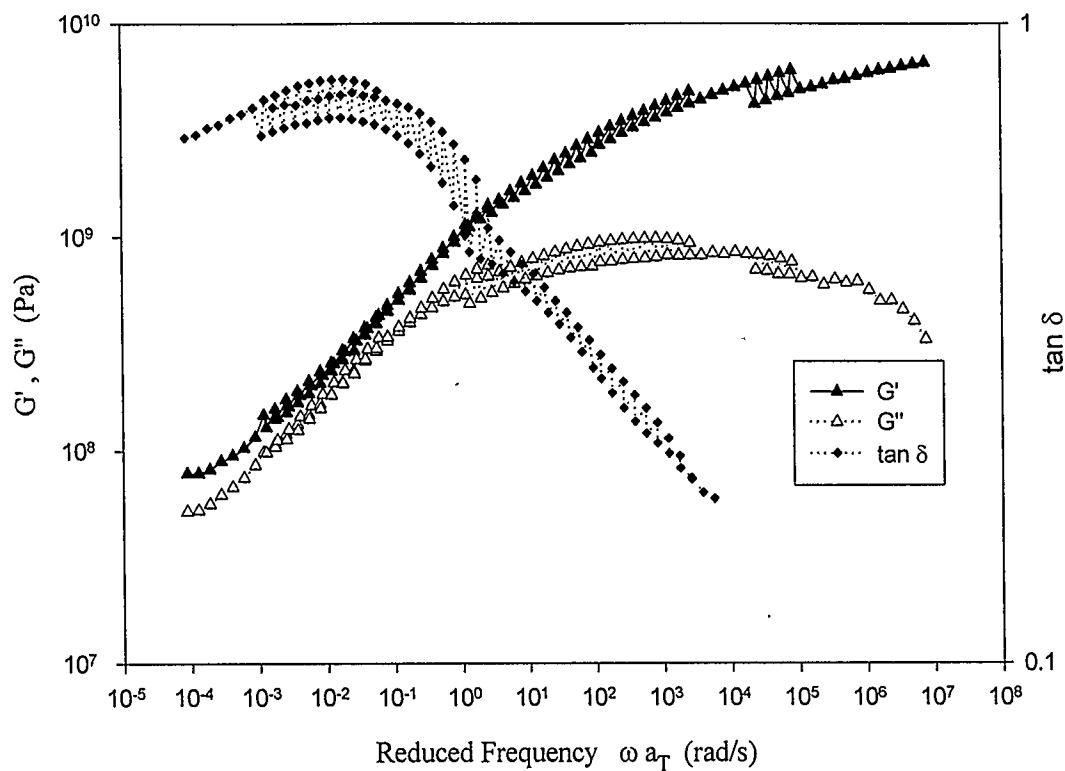


Figure A 52 Master curve for Marshal75 with A200/300 Pen grade + 4 % SBS RTFO aged

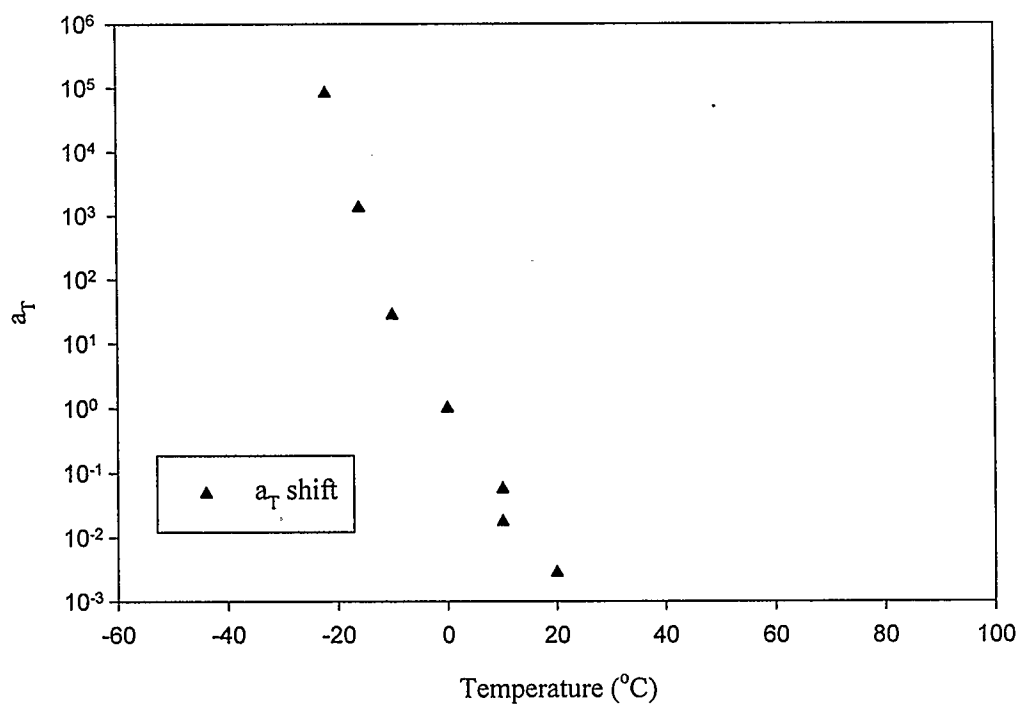


Figure A 53 TTS a_T shift factor for Marshal75 with A200/300 Pen grade + 4 % SBS RTFO aged

Marshall75 with A200/300 Pen grade+4%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-21.98	8.24E+04	1.00	1	6.18E+08	2.39E-07	1	9.70E-12	2.58E-07
-15.96	1.31E+03	0.94	2	8.07E+08	1.70E-06	2	1.57E-11	1.91E-06
-10.00	2.78E+01	0.46	3	8.49E+08	1.52E-05	3	2.05E-11	1.74E-05
0.02	1.00E+00	1.00	4	8.16E+08	8.52E-05	4	2.67E-11	9.89E-05
10.06	1.74E-02	-0.46	5	1.04E+09	6.07E-04	5	4.67E-11	7.57E-04
10.10	5.57E-02	-0.46	6	8.33E+08	3.40E-03	6	5.88E-11	4.26E-03
20.03	2.80E-03	-0.91	7	6.91E+08	1.53E-02	7	7.81E-11	1.94E-02
			8	6.76E+08	6.82E-02	8	1.38E-10	9.34E-02
			9	6.73E+08	4.38E-01	9	2.60E-10	6.78E-01
			10	4.72E+08	2.46E+00	10	5.20E-10	4.16E+00
			11	3.15E+08	1.62E+01	11	1.02E-09	3.00E+01
			12	1.40E+08	8.79E+01	12	1.62E-09	1.49E+02
			13	9.37E+07	4.68E+02	13	2.76E-09	8.35E+02
			14	3.02E+07	1.69E+03	14	3.80E-09	2.47E+03
			15	7.98E+07	1.49E+04			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 53 **Marshall75 with A200/300 Pen grade + 4 % SBS RTFO aged, shift factors, calculated relaxation and retardation spectra**

WLF a _T constants:	
T _{ref}	0
C ₁	12.42
C ₂	78.63
r ²	0.993
Std. Err.	0.2427

Table A 54 **Marshall75 with A200/300 Pen grade+ 4 % SBS RTFO aged, WLF a_T shift constants**

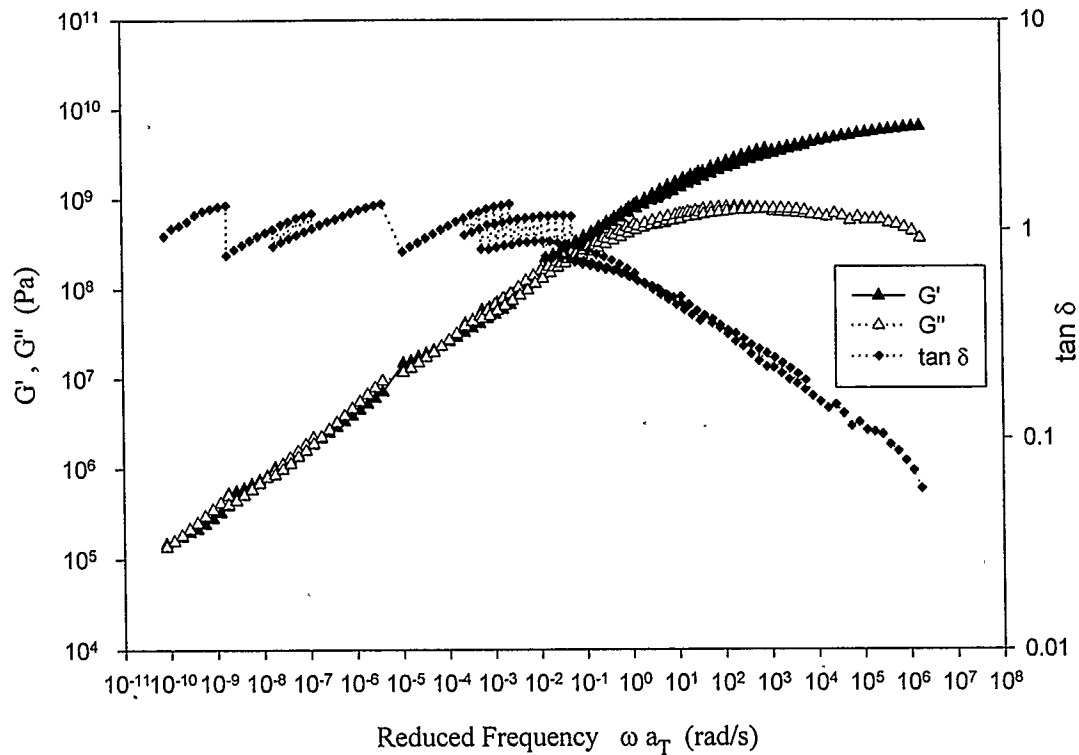


Figure53 Master curves at $T_r = 0^\circ\text{C}$ for wheel compaction with A200/300 Pen grade + 4 % SBS RTFO aged

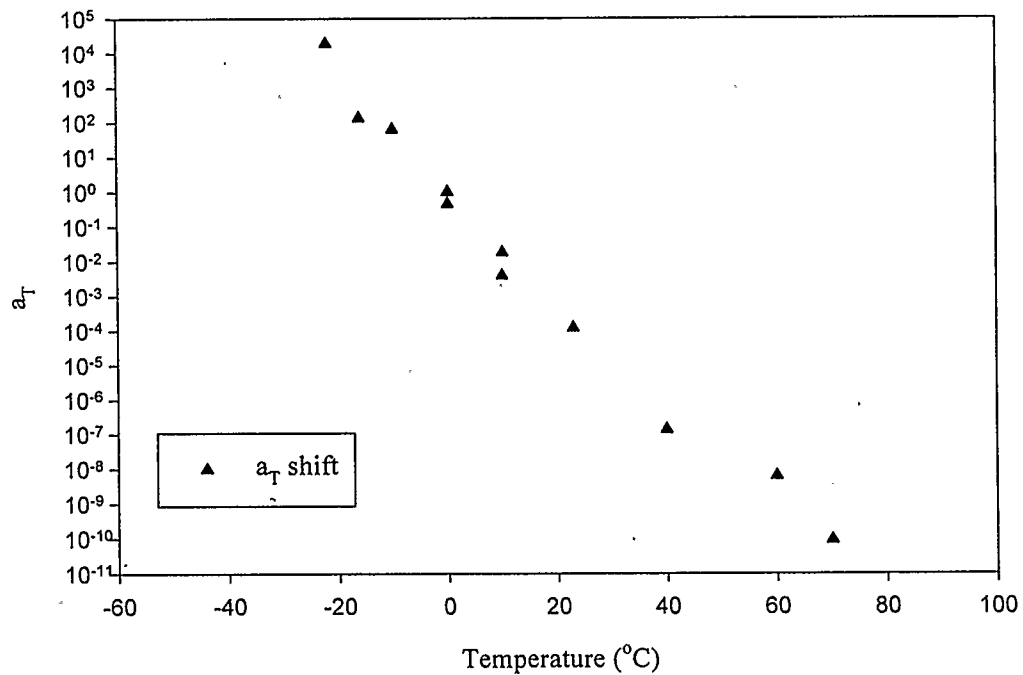


Figure A 54 TTS a_T shift factor for wheel compaction with A200/300 Pen grade + 4 % SBS RTFO aged

Wheel compaction with A200/300 Pen grade+4%SBS RTFO aged (continued)

Time temperature shift factors*			Relaxation spectra**			Retardation spectra**		
T [°C]	a _T --	b _T --	No. --	g [Pa]	lambda [s]	No. --	j 1/[Pa]	lambda [s]
-21.98	1.90E+04	1.00	1	6.01E+08	8.88E-07	1	1.30E-11	9.70E-07
-16.04	1.33E+02	0.94	2	7.42E+08	5.11E-06	2	2.07E-11	5.79E-06
-10.00	6.31E+01	0.96	3	7.70E+08	3.65E-05	3	2.79E-11	4.23E-05
0.02	1.00E+00	1.00	4	8.78E+08	2.53E-04	4	4.37E-11	3.08E-04
0.03	4.59E-01	0.00	5	7.98E+08	1.50E-03	5	5.85E-11	1.87E-03
9.96	3.91E-03	-0.45	6	7.48E+08	7.09E-03	6	9.08E-11	9.26E-03
10.04	1.83E-02	-0.46	7	6.97E+08	3.58E-02	7	1.47E-10	4.99E-02
23.00	1.20E-04	-1.05	8	5.06E+08	1.55E-01	8	2.37E-10	2.23E-01
39.999	1.34E-07	-1.81	9	4.72E+08	8.88E-01	9	4.21E-10	1.44E+00
60.006	6.15E-09	-2.72	10	2.18E+08	3.52E+00	10	5.66E-10	5.18E+00
69.999	8.93E-11	-3.18	11	2.03E+08	1.44E+01	11	1.18E-09	2.50E+01
			12	1.13E+08	6.18E+01	12	2.66E-09	1.15E+02
			13	7.33E+07	3.80E+02	13	5.76E-09	7.90E+02
			14	3.49E+07	2.37E+03	14	1.48E-08	5.31E+03
			15	5.96E+06	1.36E+04	15	5.79E-09	1.67E+04
			16	1.02E+07	3.37E+04	16	2.76E-08	6.08E+04
			17	9.46E+06	2.76E+05	17	8.30E-08	7.72E+05
			18	1.76E+06	1.65E+06	18	1.17E-07	2.88E+06
			19	1.83E+06	7.88E+06	19	4.04E-07	2.41E+07
			20	6.47E+05	5.53E+07			
			21	5.25E+05	6.45E+08			
			22	1.96E+05	1.29E+10			

* Shift factors determined by ARES software, ver. 6.5.7, 2002

** Spectra determined by IRIS software, ver. 5.1, 1997

Table A 55 Wheel compaction with A200/300 Pen grade + 4 % SBS RTFO aged, shift factors, calculated relaxation and retardation spectra

WLF a _T constants:	
T _{ref}	0
C ₁	53.45
C ₂	305.29
r ²	0.986
Std. Err.	0.4919

Table A 56 Wheel compaction with A200/300 Pen grade + 4 % SBS RTFO aged, WLF a_T shift constants

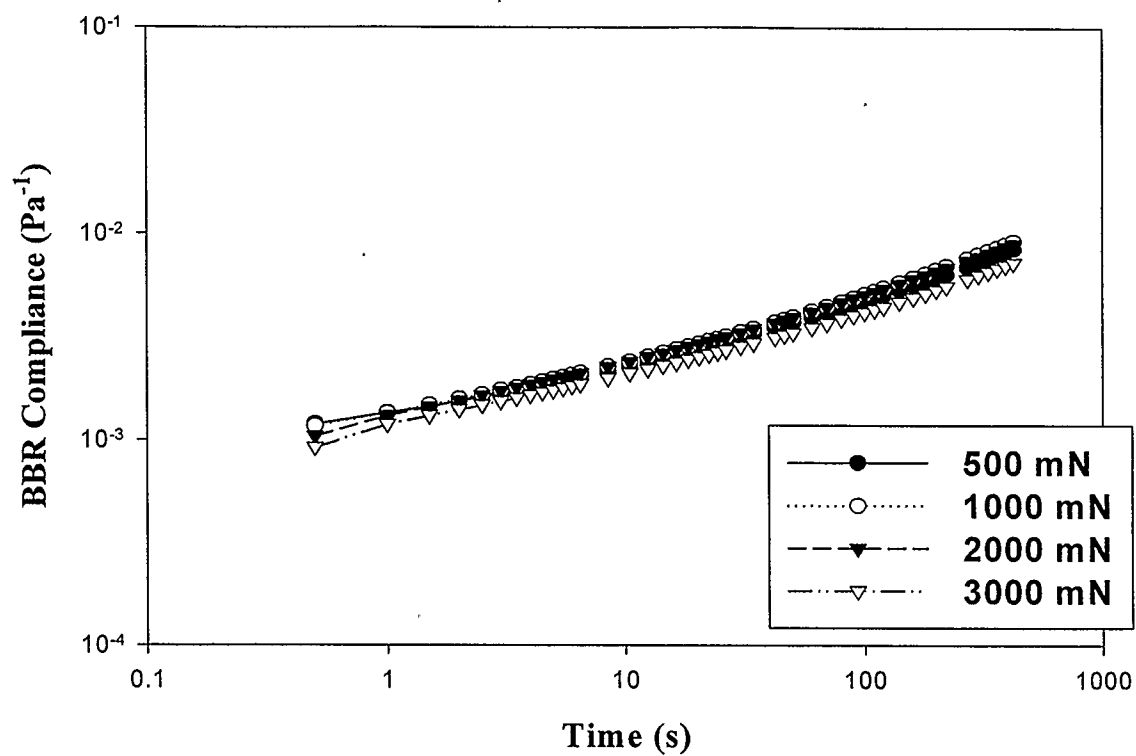


Figure A 55 Asphalt Binder, BBR Creep Compliance, $T = -28^\circ\text{C}$

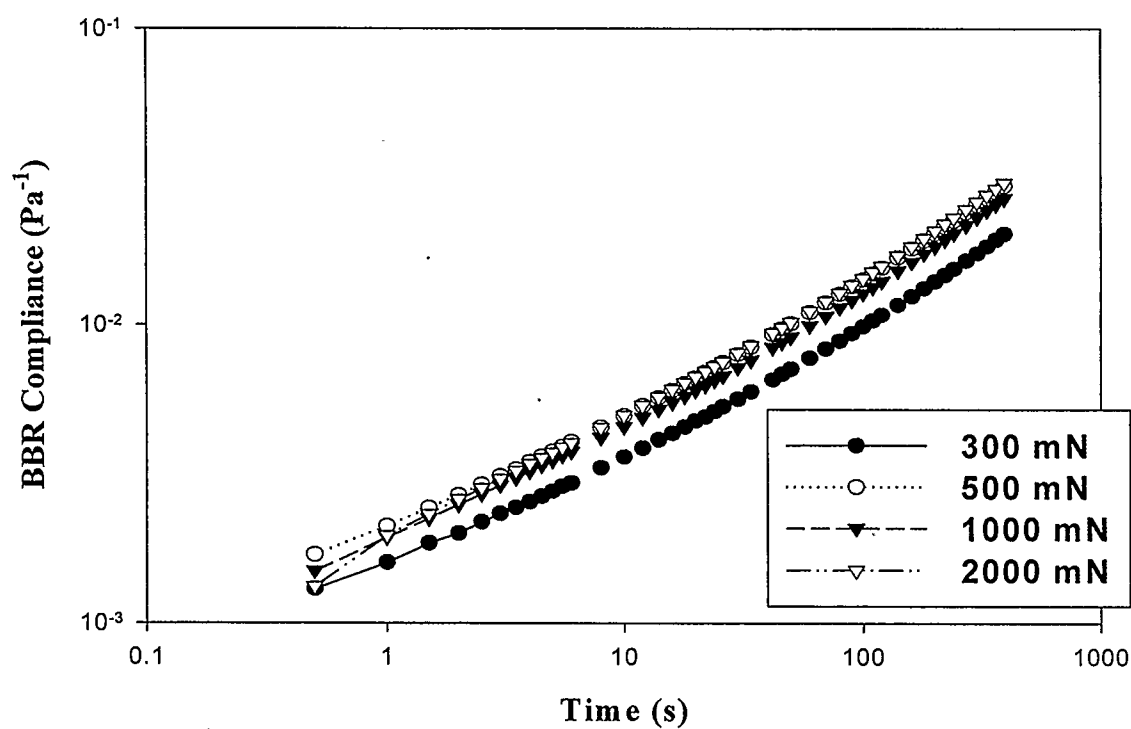


Figure A 56 Mastic, BBR Creep Compliance, $T = -16^\circ\text{C}$

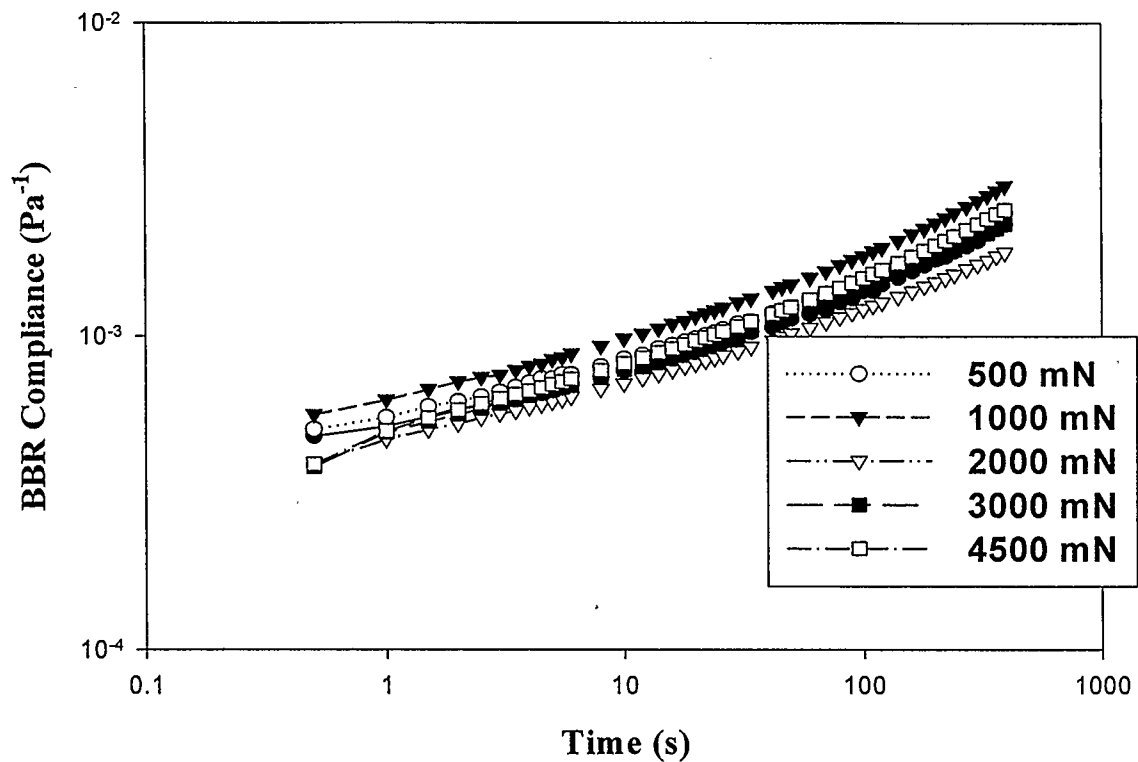


Figure A 57 Mastic, BBR Creep Compliance, $T = -28^\circ\text{C}$

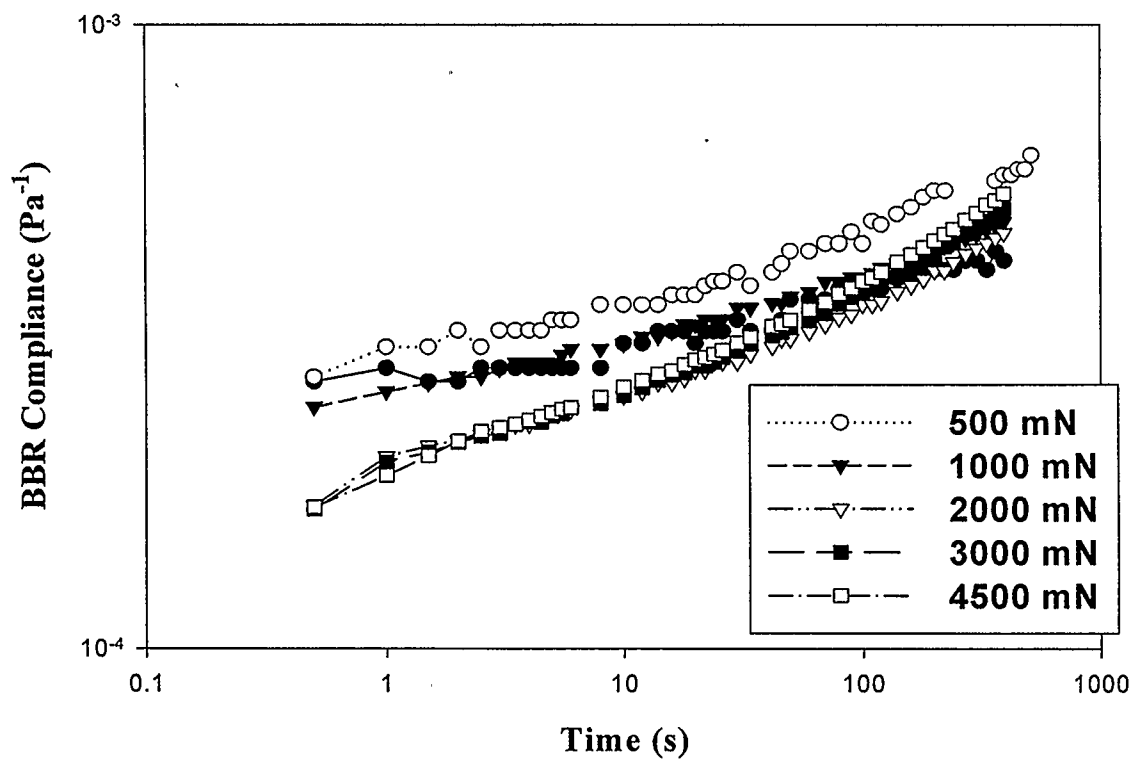


Figure A 58 HMA, BBR Creep Compliance, $T = 10^\circ\text{C}$

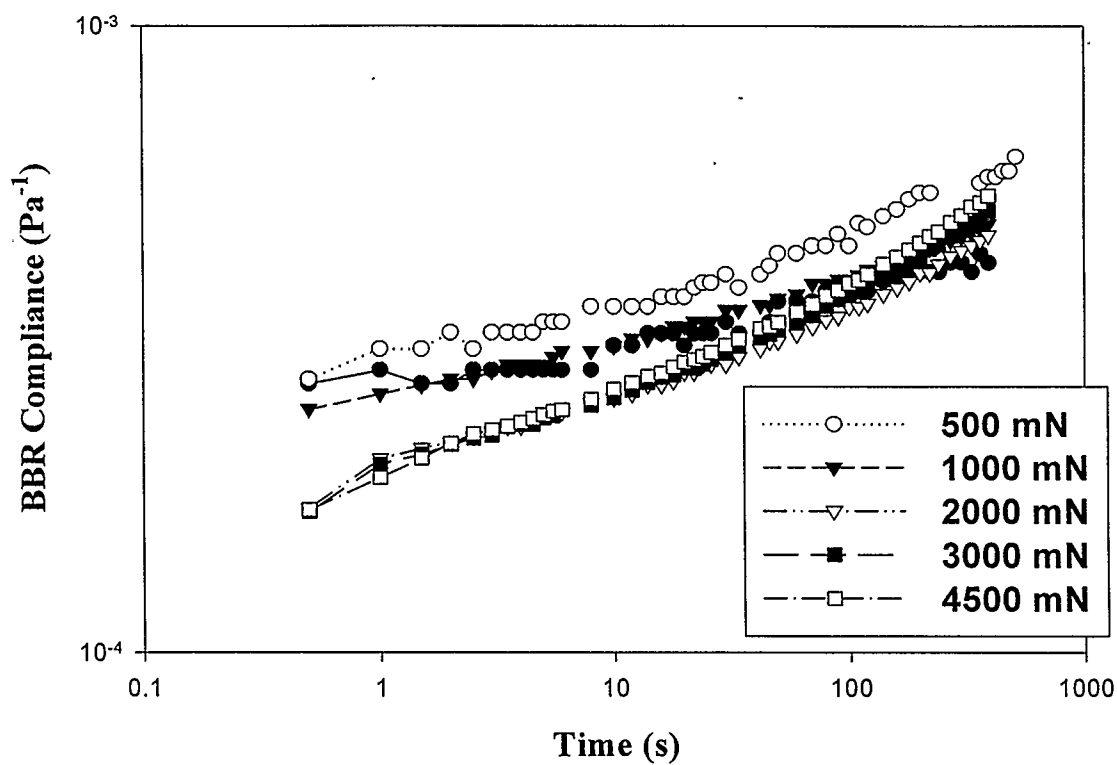


Figure A 59 HMA, BBR Creep Compliance $T = 0^\circ\text{C}$

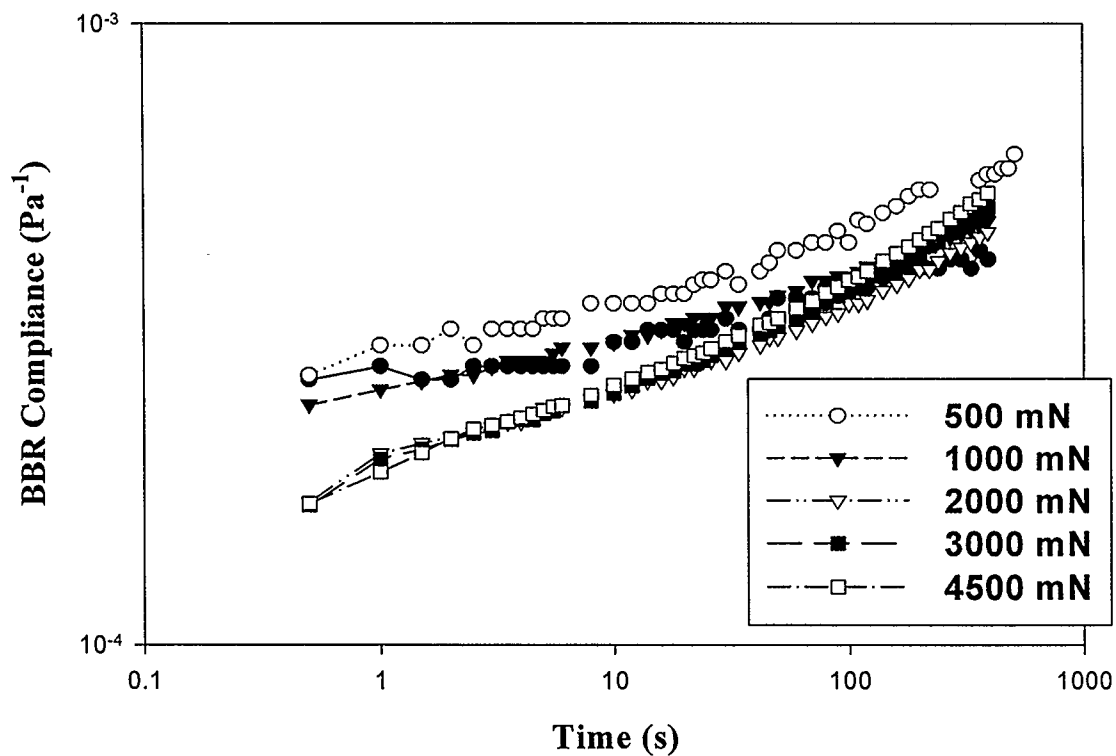


Figure A 60 HMA, BBR Creep Compliance $T = -16^\circ\text{C}$

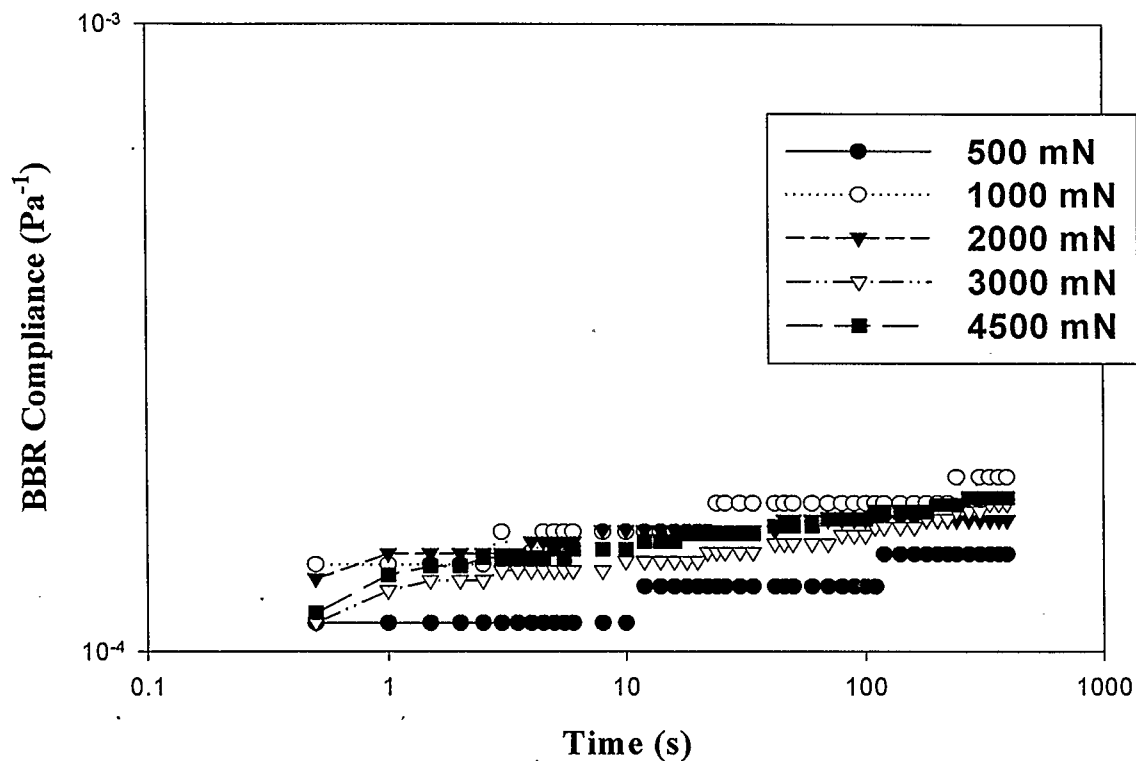


Figure A 61 HMA, BBR Creep Compliance $T = -16^\circ\text{C}$

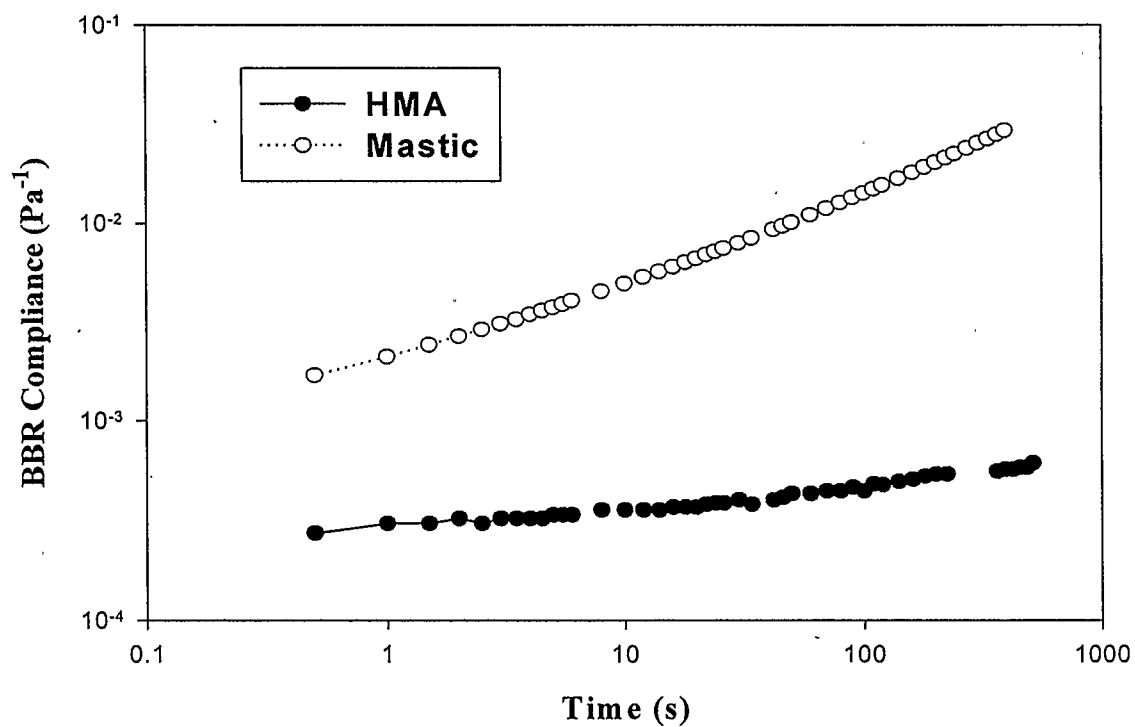


Figure A 62 HMA, Mastic, BBR Creep Compliance, Load 500 mN, $T = -16^\circ\text{C}$

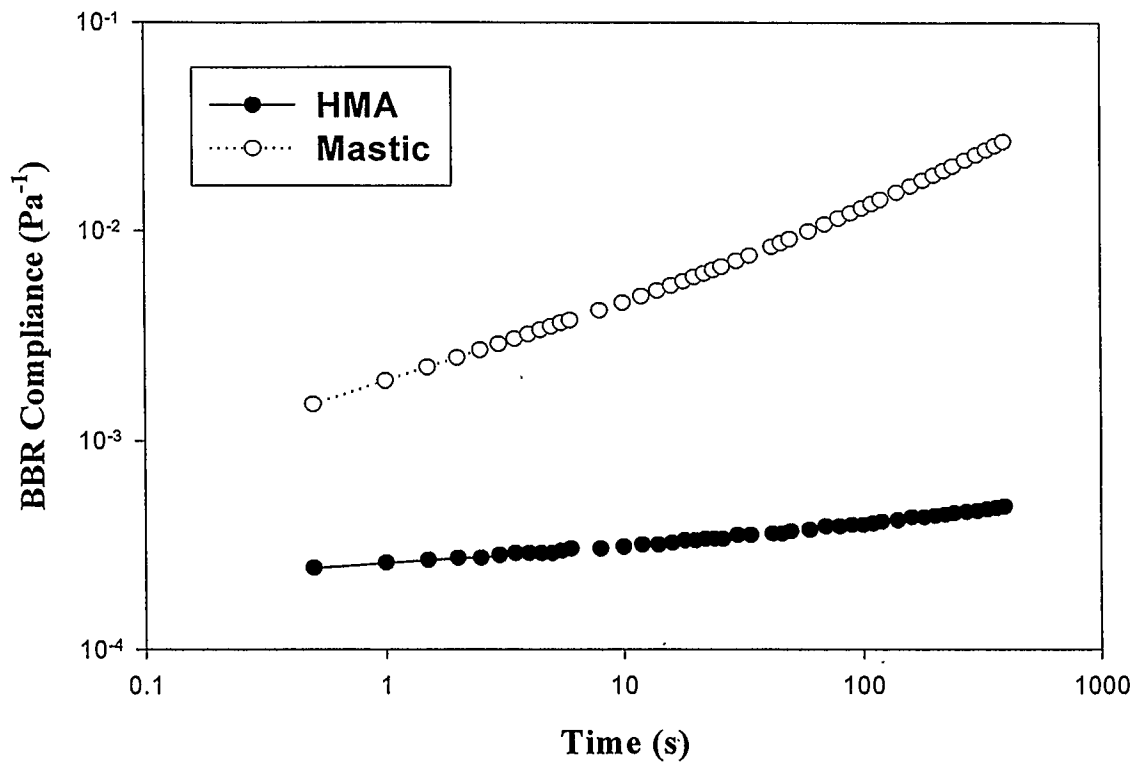


Figure A 63 HMA, Mastic, BBR Creep Compliance, Load 1000 mN, $T = -16^\circ\text{C}$

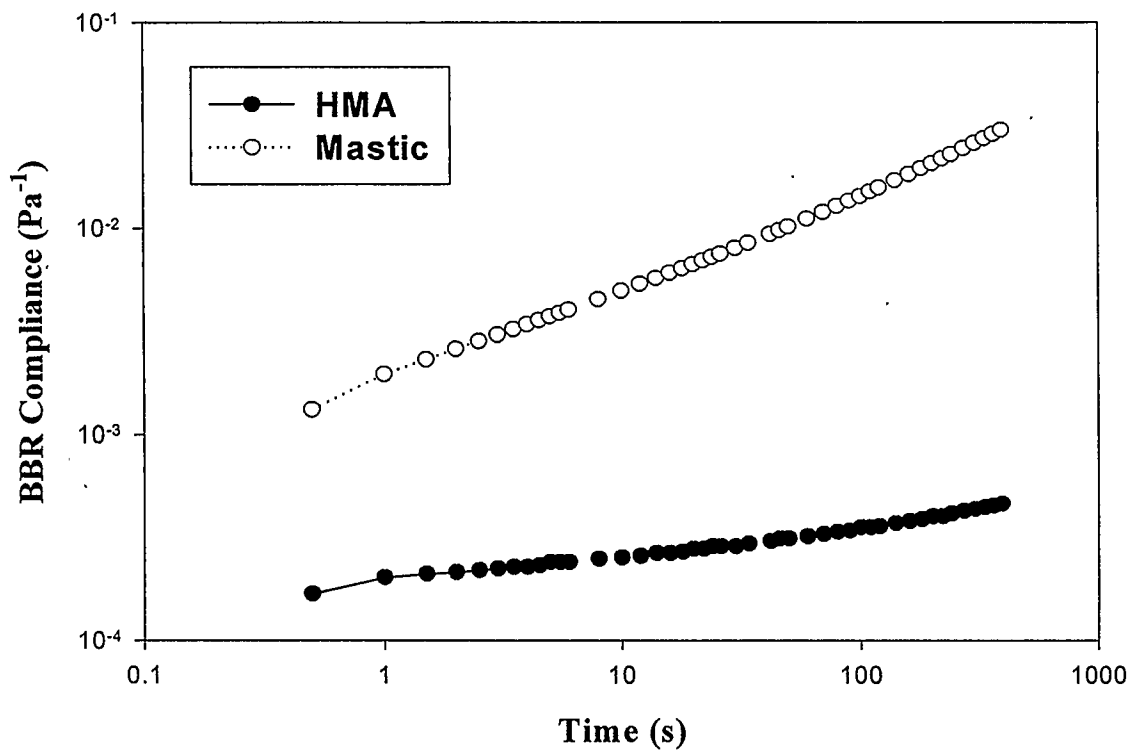


Figure A 64 HMA, Mastic, BBR Creep Compliance, Load 2000 mN, $T = -16^\circ\text{C}$

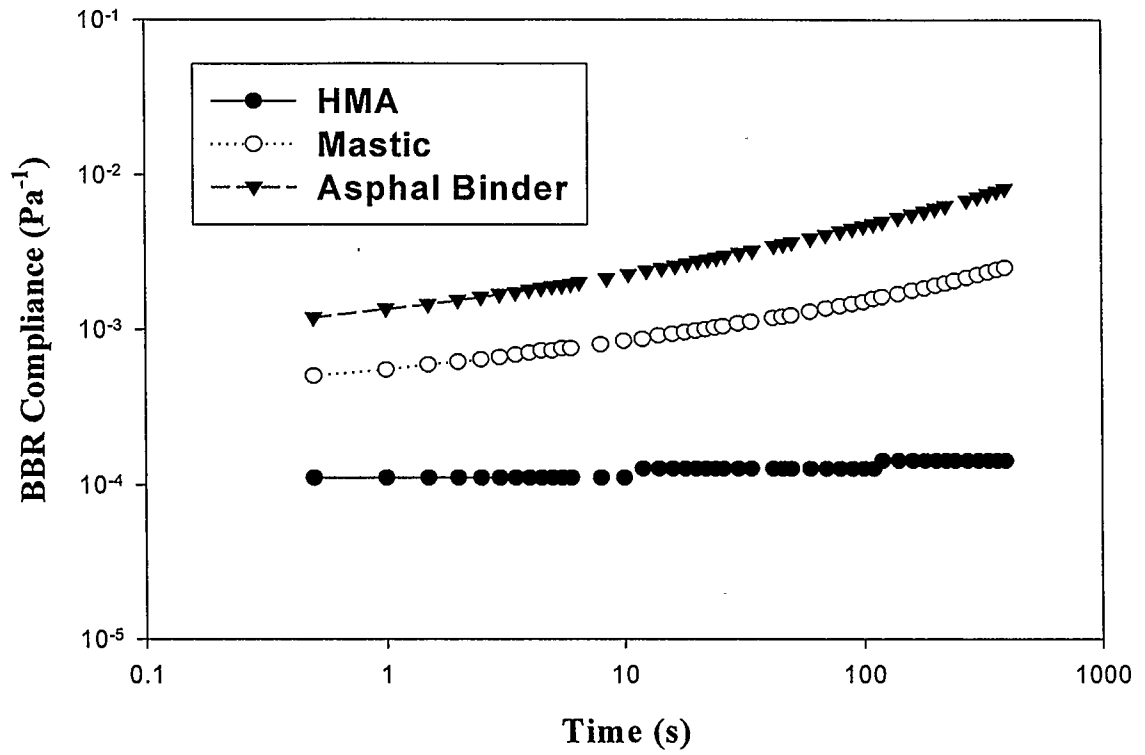


Figure A65 HMA, Mastic, Asphalt Binder, BBR Creep Compliance, Load 500 mN, $T = -28^\circ\text{C}$

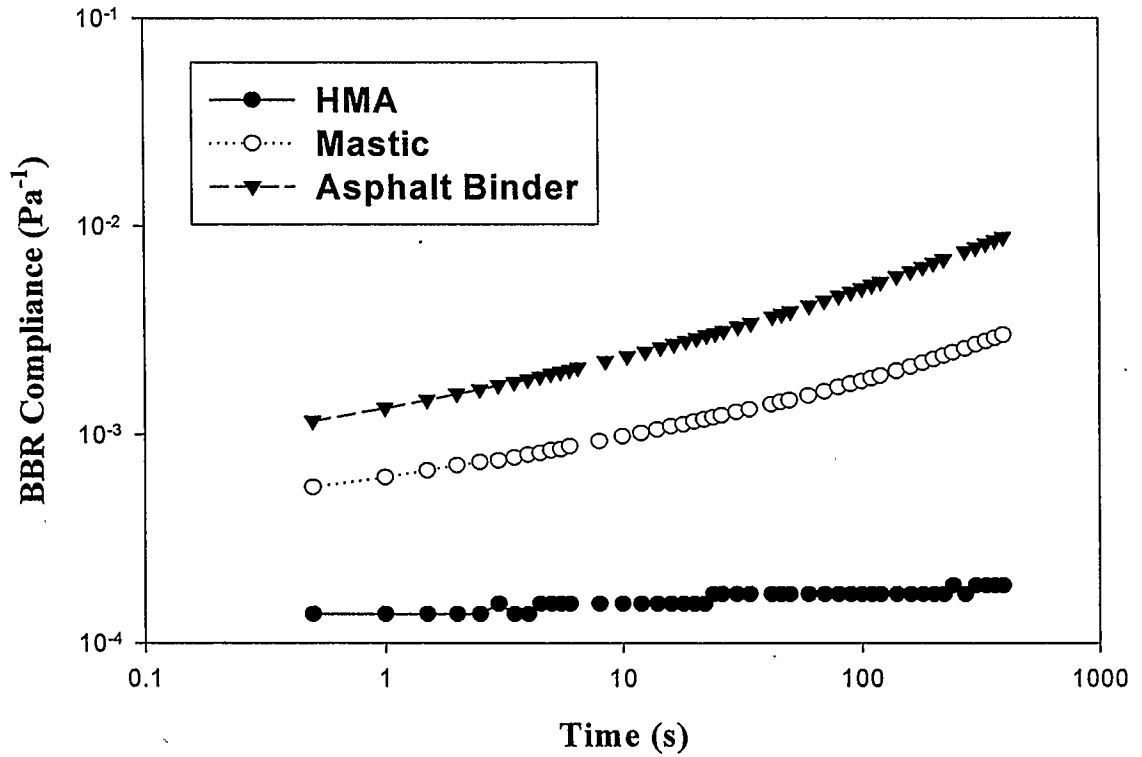


Figure A 66 HMA, Mastic, Asphalt Binder, BBR Creep Compliance, Load 1000 mN, $T = -28^\circ\text{C}$

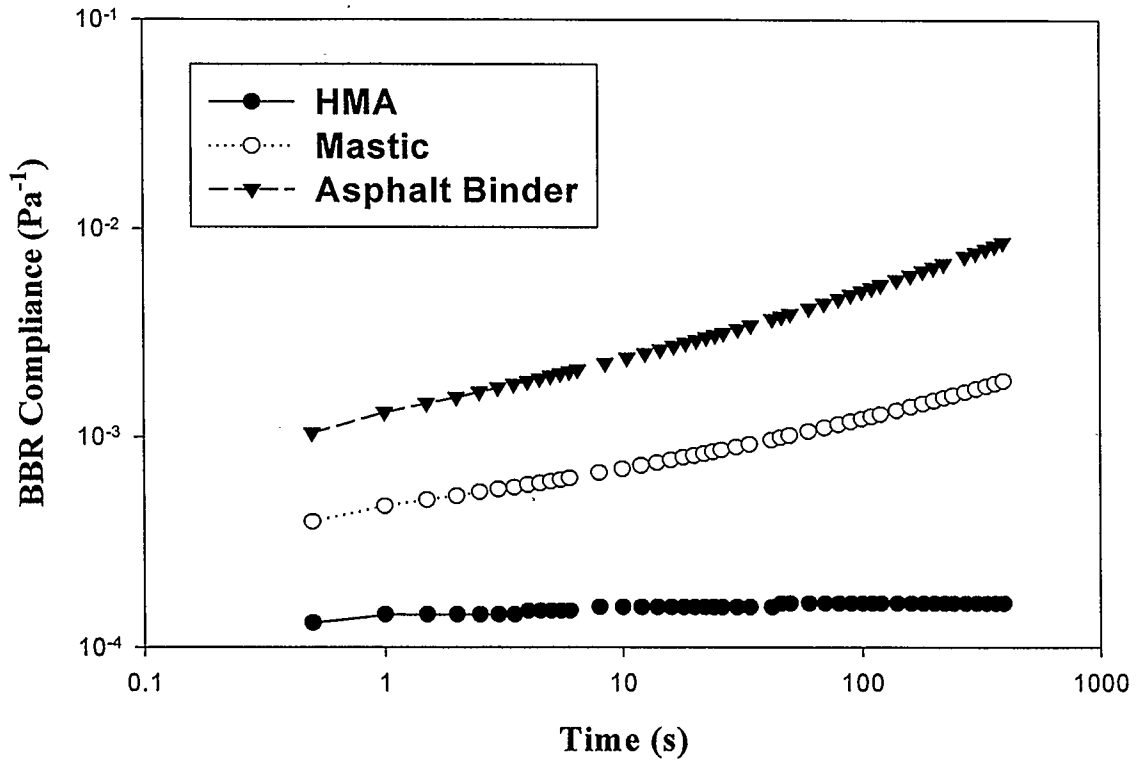


Figure A67 HMA, Mastic, Asphalt Binder, BBR Creep Compliance, Load 2000 mN, $T = -28^\circ\text{C}$

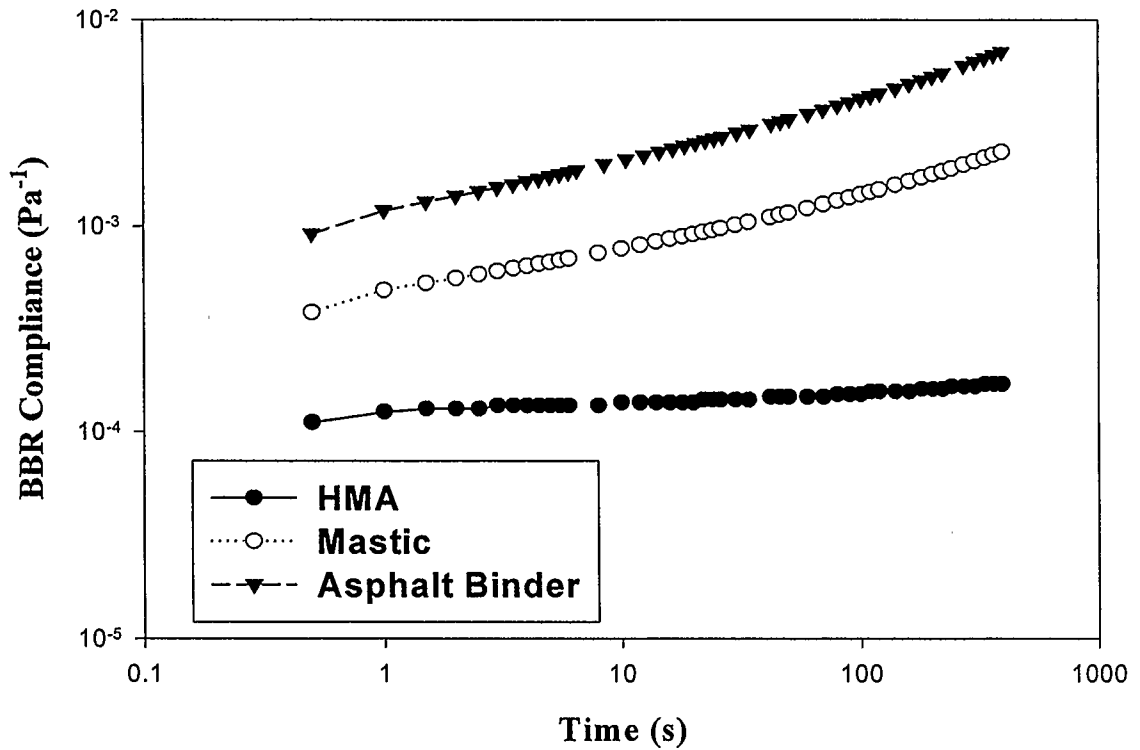


Figure A68 HMA, Mastic, Asphalt Binder, BBR Creep Compliance, Load 3000 mN, $T = -28^\circ\text{C}$

APPENDIX B

CALCULATED DATA

Reference temp. $T_r = 0\text{ }^{\circ}\text{C}$

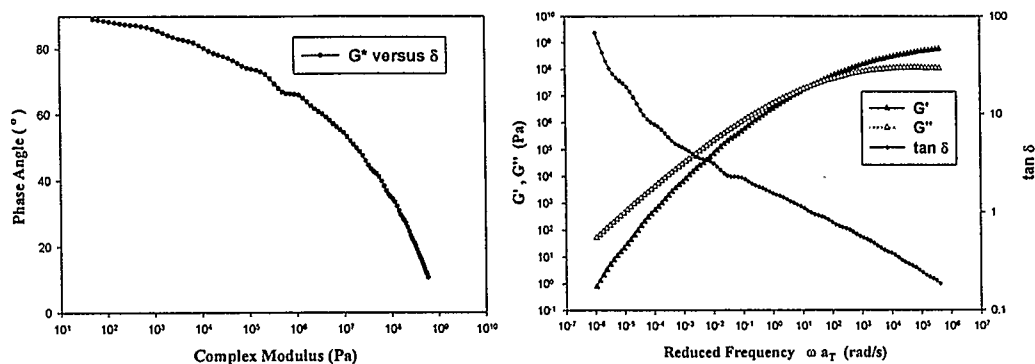


Figure B 1 Black diagram and master curves for A150/200 Pen grade

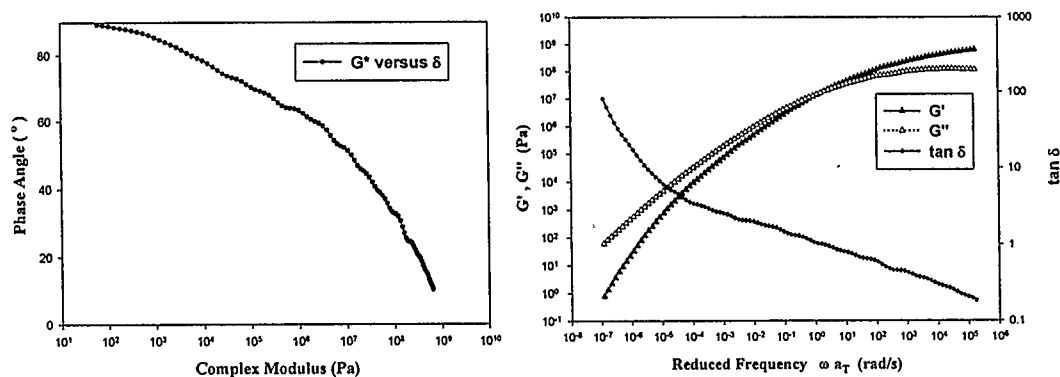


Figure B 2 Black diagram and master curves for A150/200 Pen grade RTFO aged

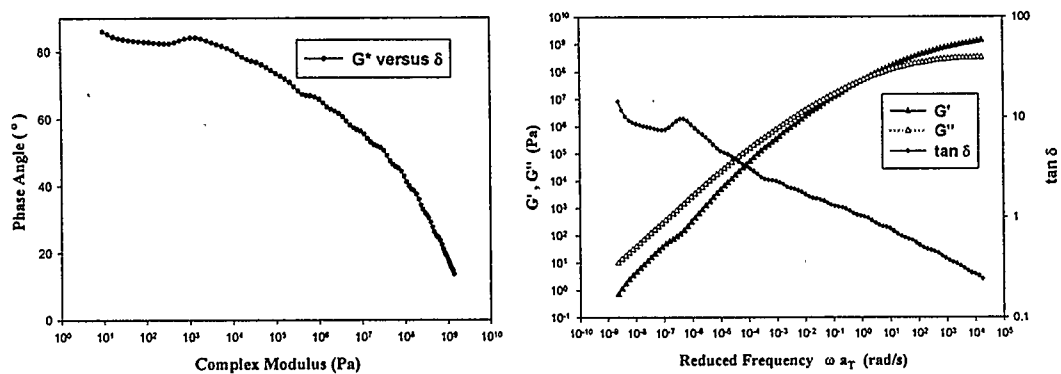


Figure B 3 Black diagram and master curves for Mastic, A200/300 Pen grade RTFO aged

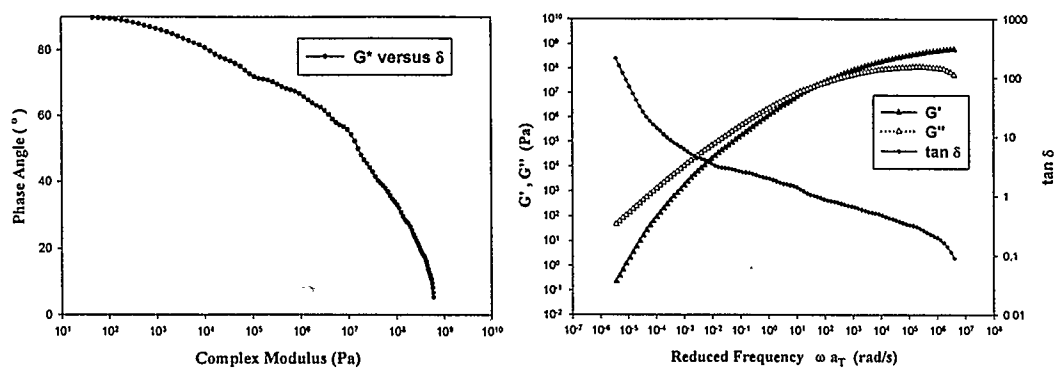


Figure B 4 Black diagram and master curves for A200/300 Pen grade

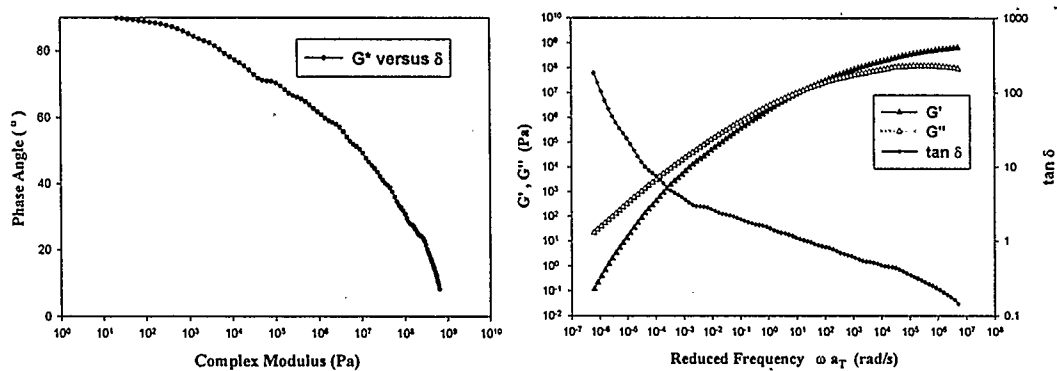


Figure B 5 Black diagram and master curves for A200/300 Pen grade RTFO aged

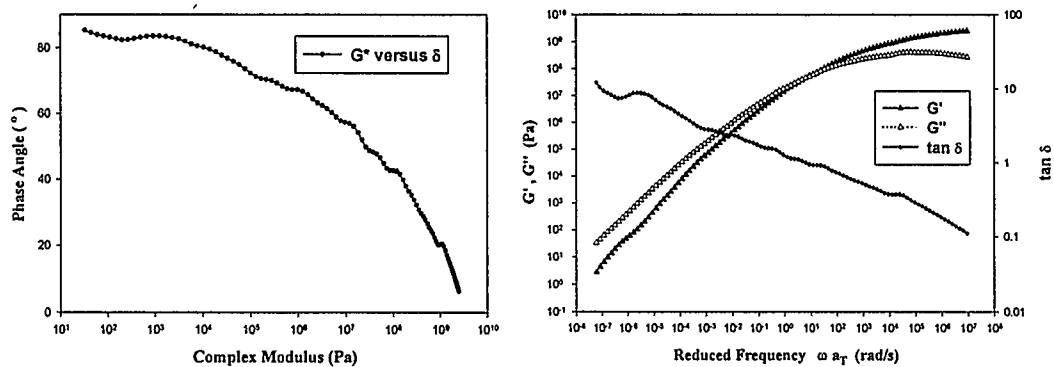


Figure B 6 Black diagram and master curves for Mastic, A200/300 Pen grade RTFO aged

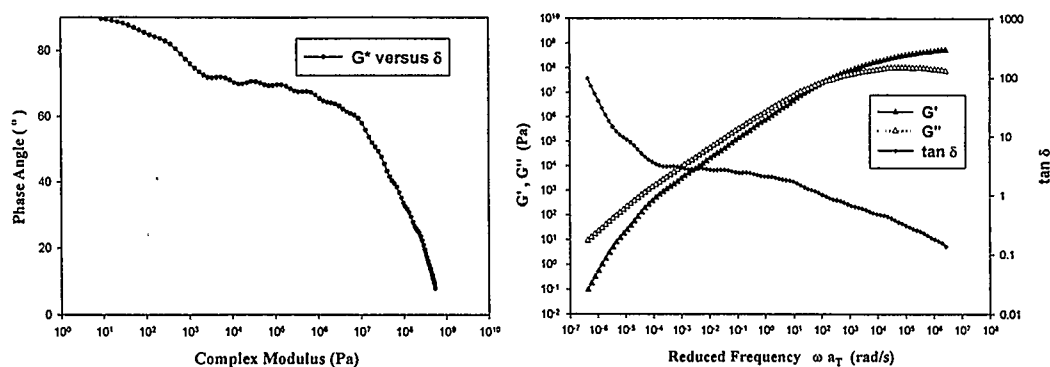


Figure B 7 Black diagram and master curves for A200/300 Pen grade + 2 % SBS

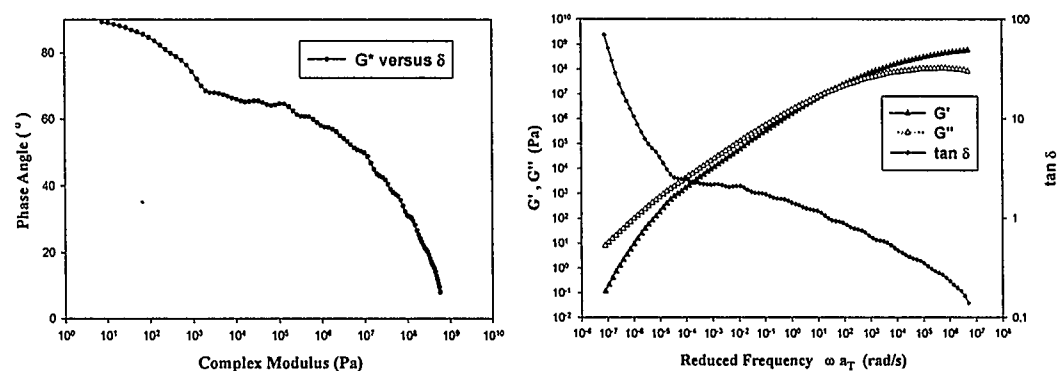


Figure B 8 Black diagram and master curves for A200/300 Pen grade + 2 % SBS RTFO aged

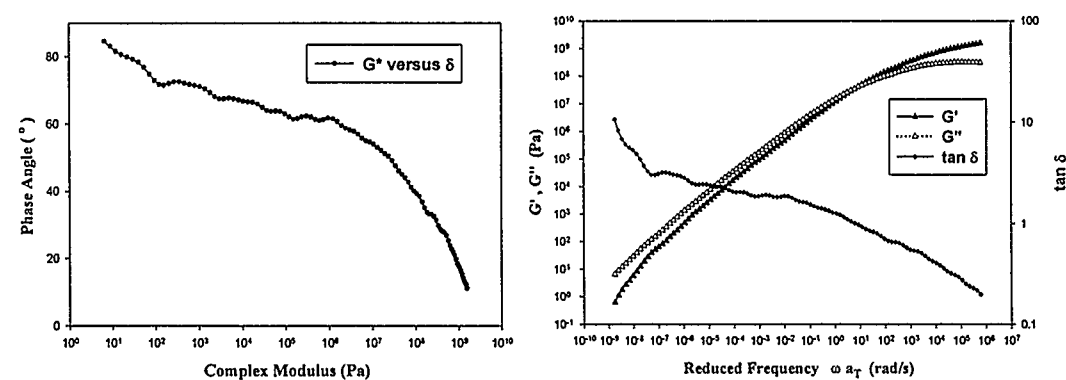


Figure B 9 Black diagram and master curves for Mastic, A200/300 Pen grade + 2 % SBS RTFO aged

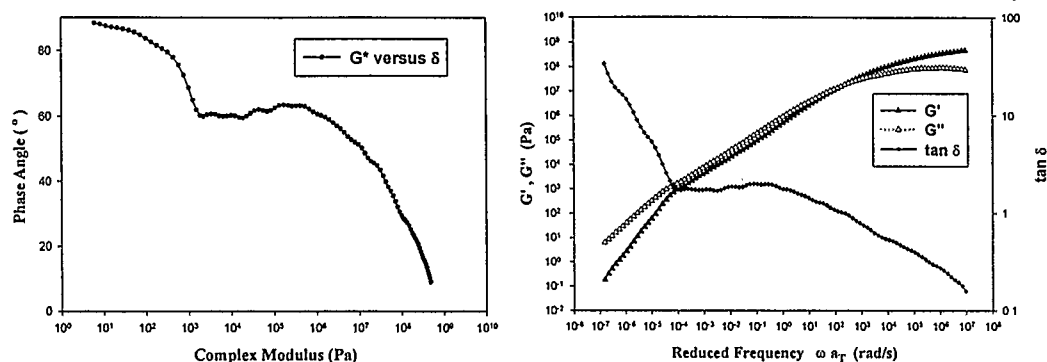


Figure B 10 Black diagram and master curves for A200/300 Pen grade + 4 % SBS

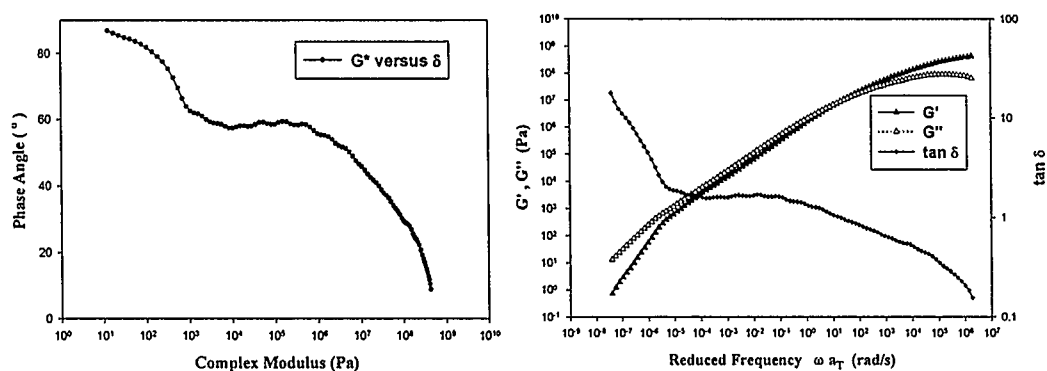


Figure B 11 Black diagram and master curve for A200/300 Pen grade + 4 % SBS RTFO aged

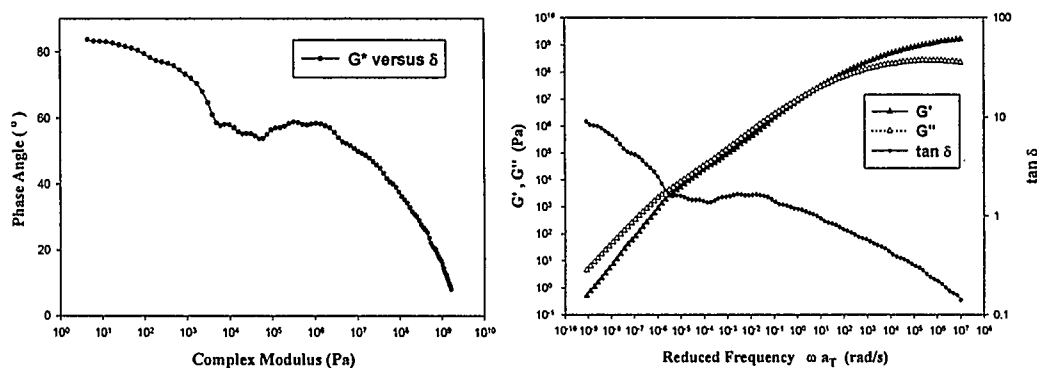


Figure B 12 Black diagram and master curves for Mastic, A200/300 Pen grade + 4 % SBS RTFO aged

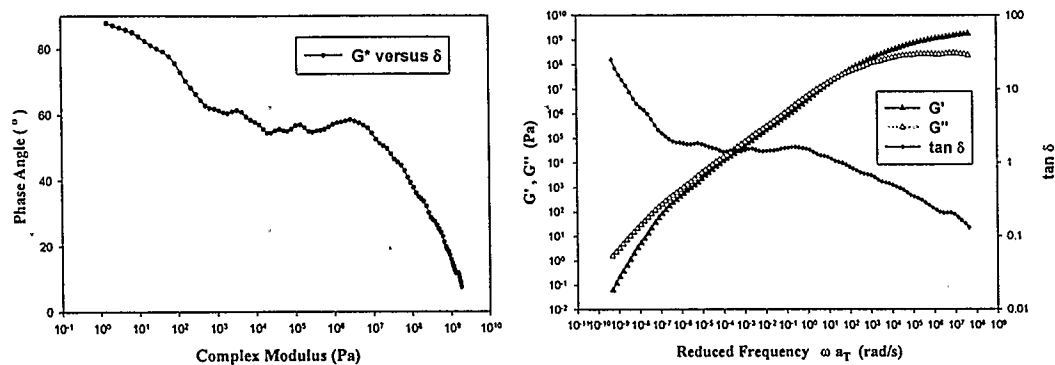


Figure B 13 Black diagram and master curves for A200/300 Pen grade + 6 % SBS

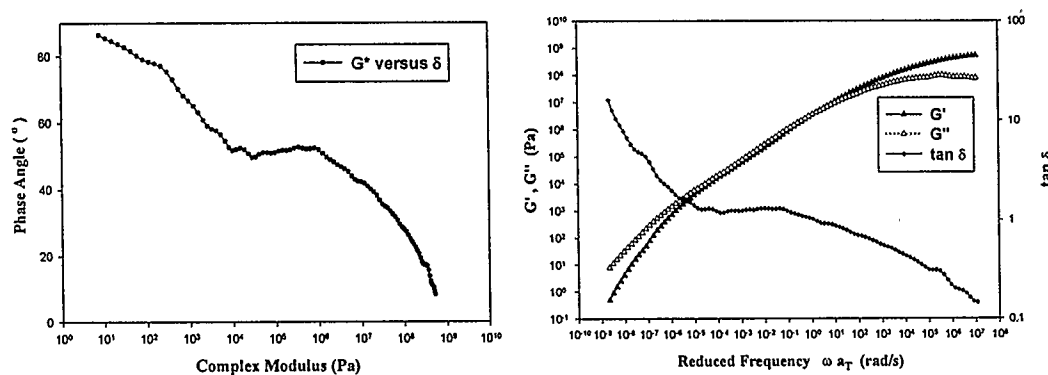


Figure B 14 Black diagram and master curves for A200/300 Pen grade + 6 % SBS RTFO aged

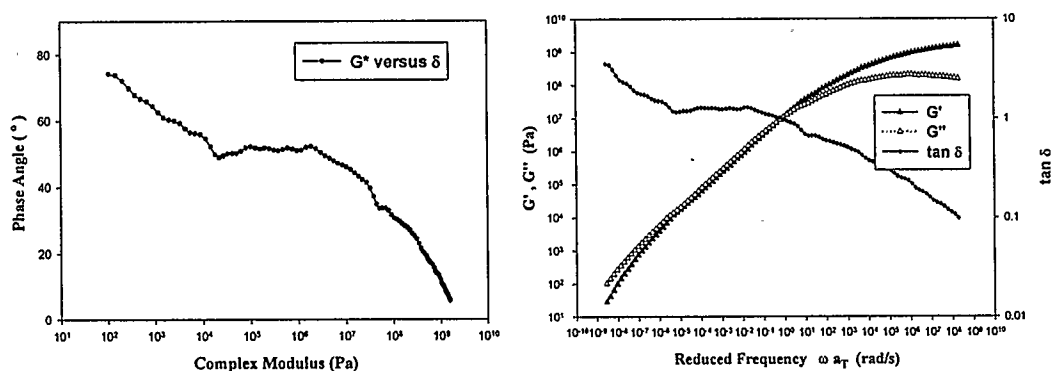


Figure B 15 Black diagram and master curve for Mastic, A200/300 Pen grade + 6 % SBS RTFO aged

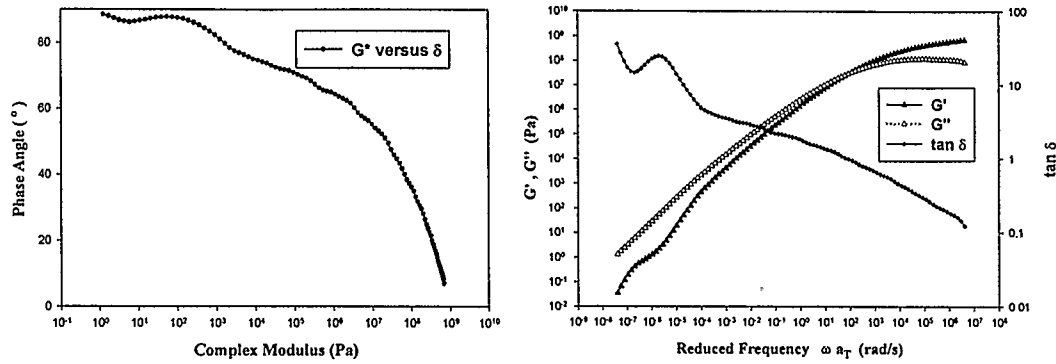


Figure B 16 Black diagram and master curve for A200/300 Pen grade+2%EVA

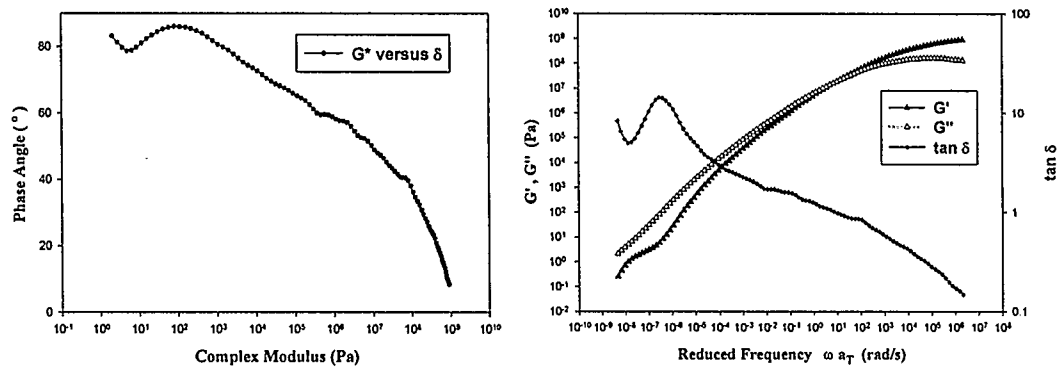


Figure B 17 Black diagram and master curve for A200/300 Pen grade+2%EVA RTFO aged

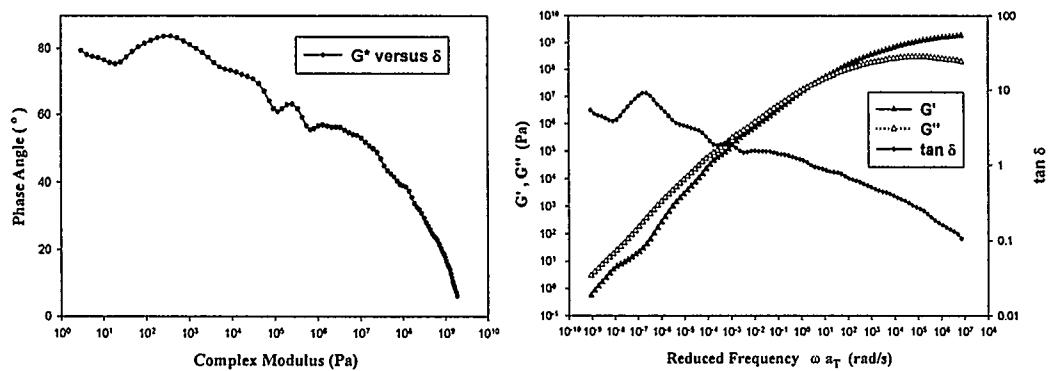


Figure B 18 Black diagram and master curves for Mastic, A200/300 Pen grade+ 2 % EVA RTFO aged

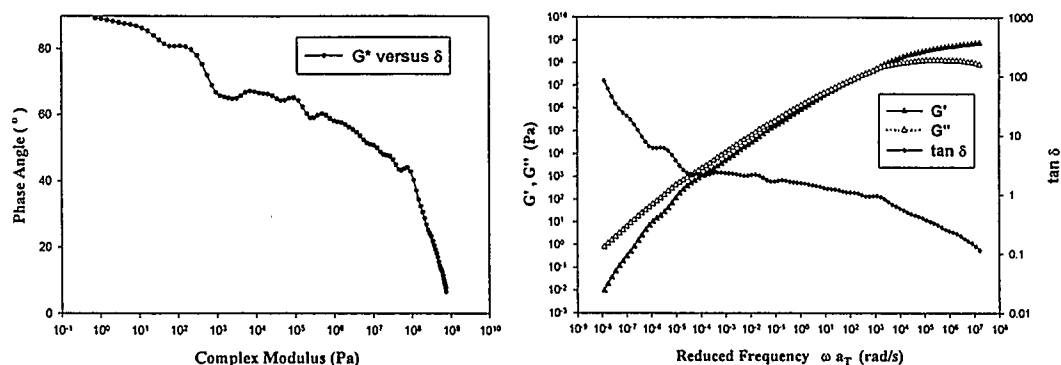


Figure B 19 Black diagram and master curves for A200/300 Pen grade + 4 % EVA

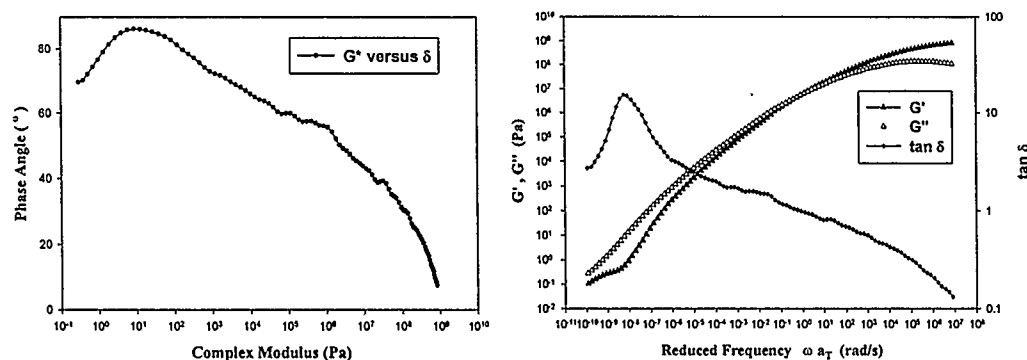


Figure B 20 Black diagram and master curves for A200/300 Pen grade + 4 % EVA RTFO aged

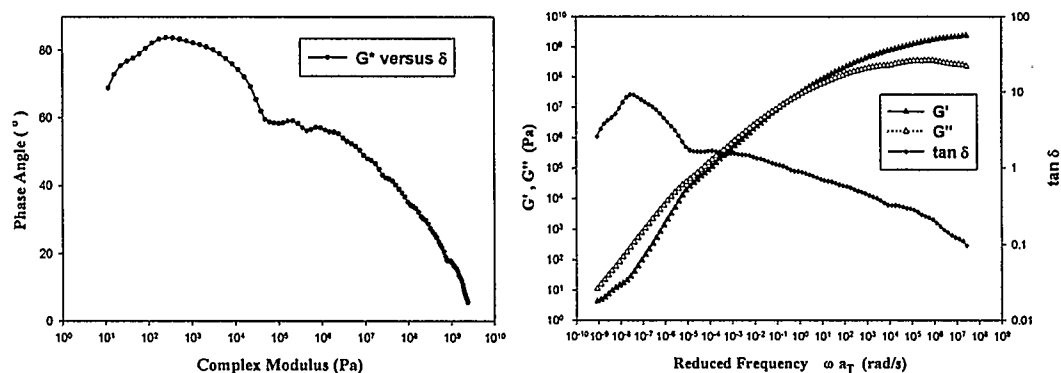


Figure B 21 Black diagram and master curves for Mastic, A200/300 Pen grade + 4 % EVA RTFO aged

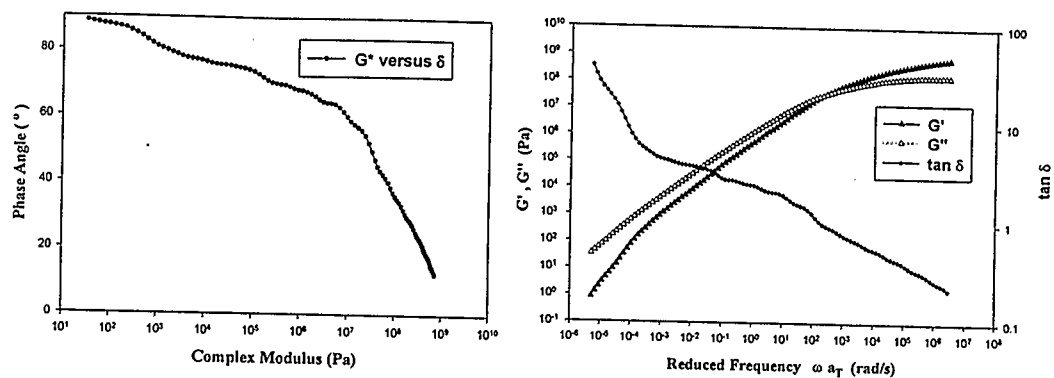


Figure B 22 Black diagram and master curves for A200/300 Pen grade + 1 % SBS

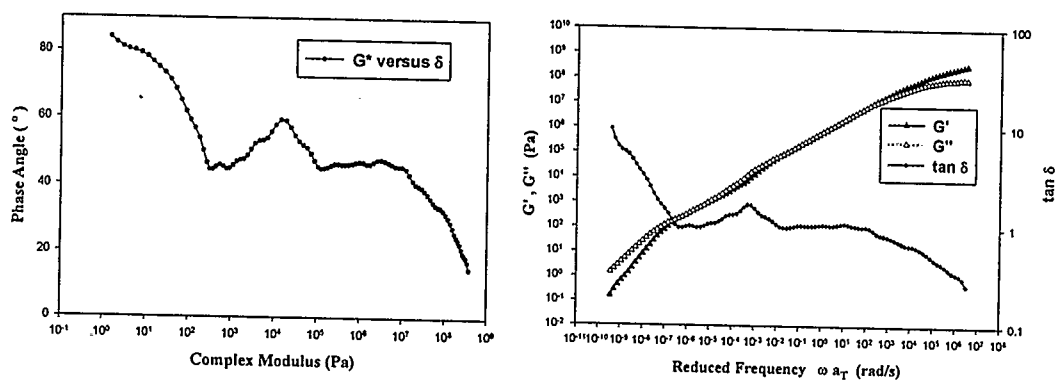


Figure B 23 Black diagram and master curves for A200/300 Pen grade + 8 % SBS

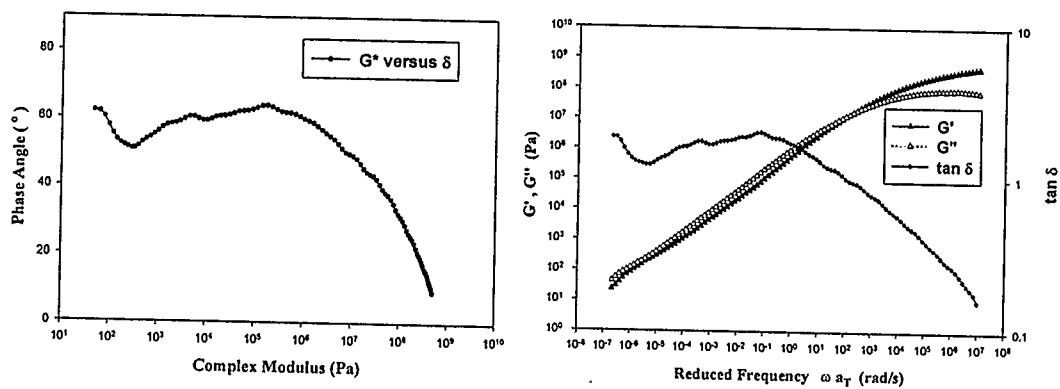


Figure B 24 Black diagram and master curves for A200/300 Pen grade + 4 % SBS linear

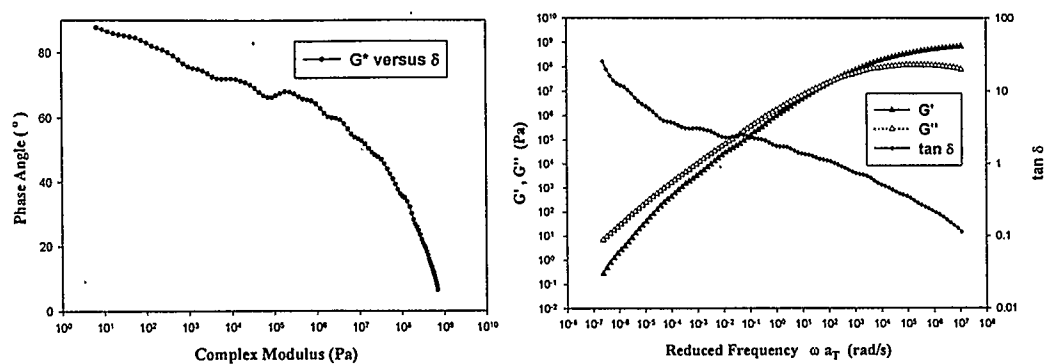


Figure B 25 Black diagram and master curves for A200/300 Pen grade + 2 % EGA

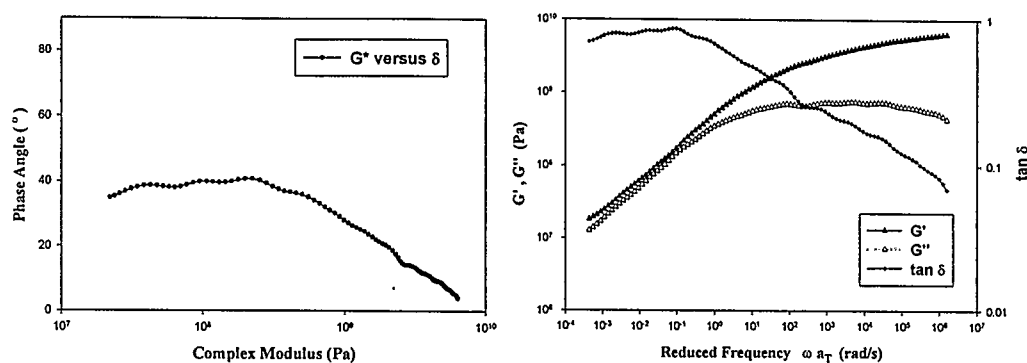


Figure B 26 Black diagram and master curves for HMA - core sample

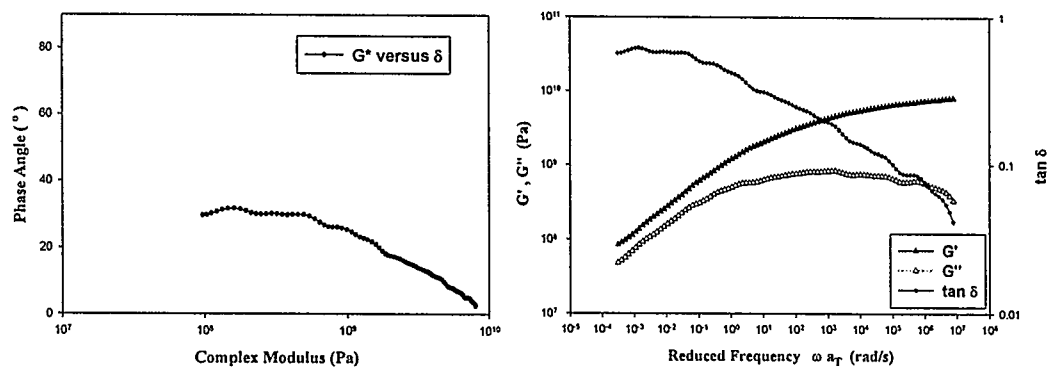


Figure B 27 Black diagram and master curves for HMA - Marshall 75 sample

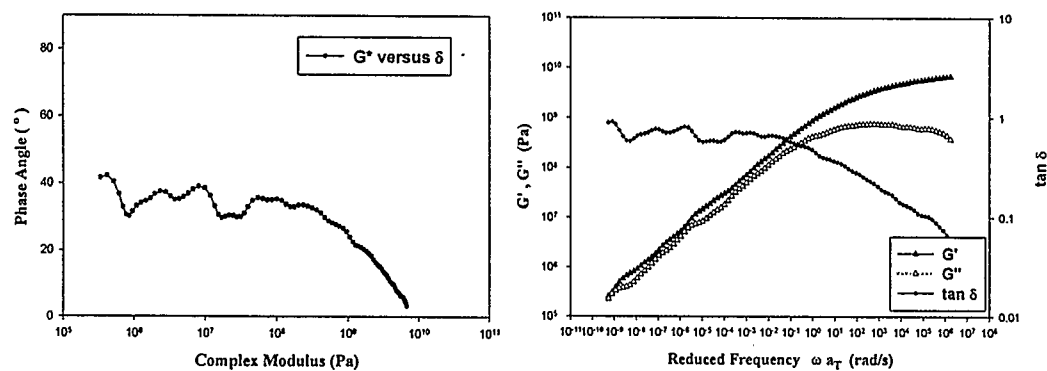


Figure B 28 Black diagram and master curves for HMA - Wheel compaction sample

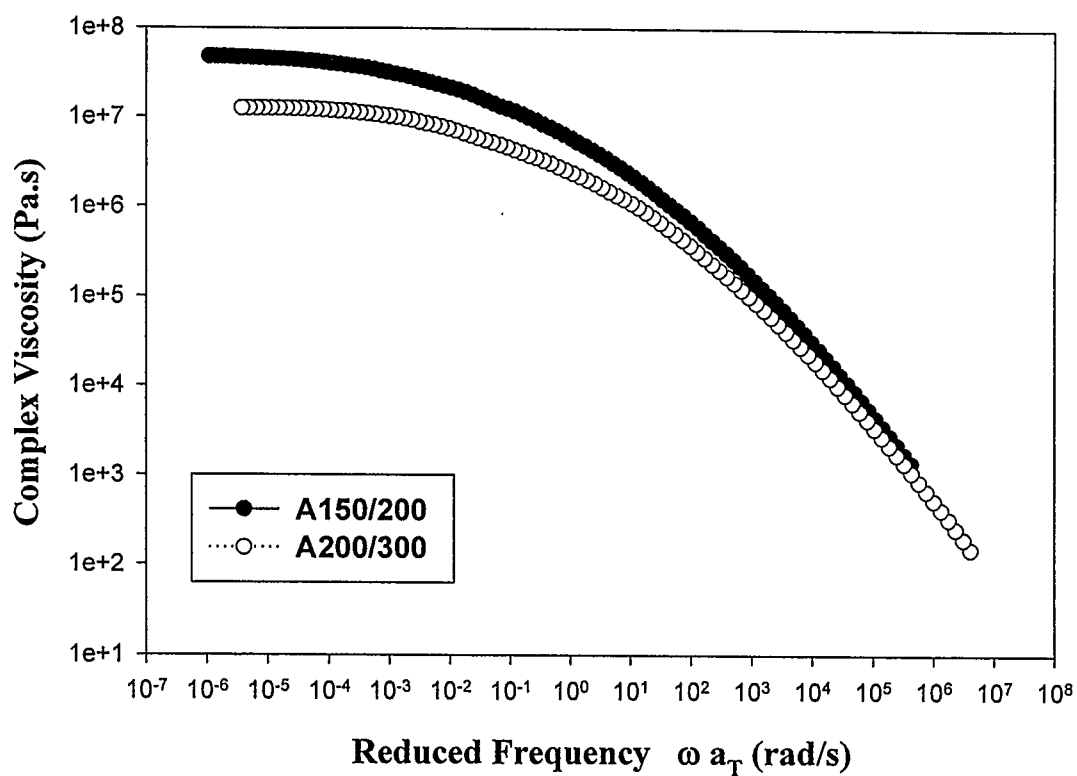


Figure B 29 Complex viscosity, A150/200 Pen grade and A200/300 Pen grade

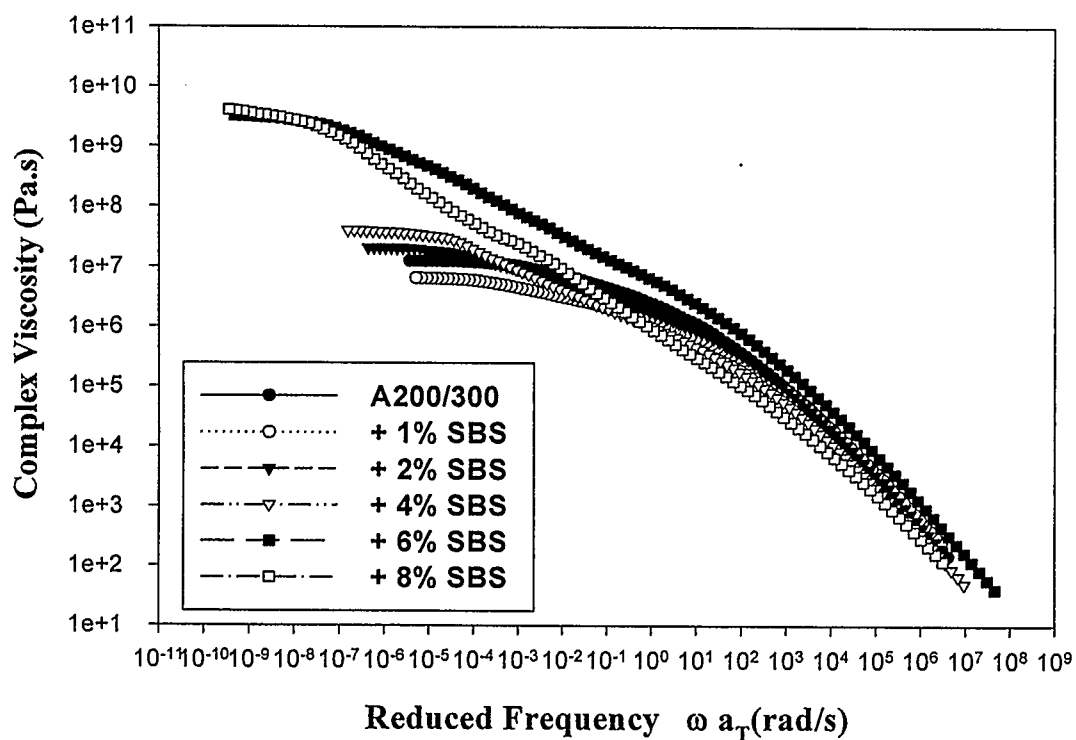


Figure B 30 Complex viscosity, A200/300 Pen grade + 1, 2, 4, 6, 8 % SBS

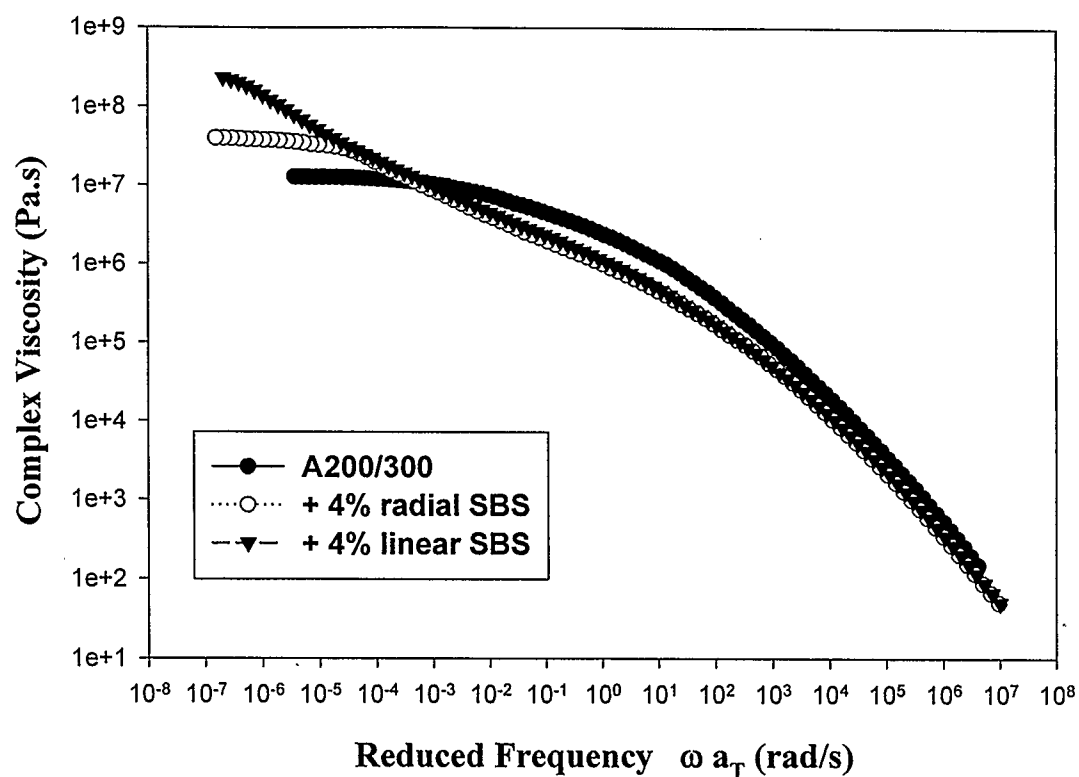


Figure B 31 Complex viscosity, A200/300 Pen grade + 4 % radial and linear SBS

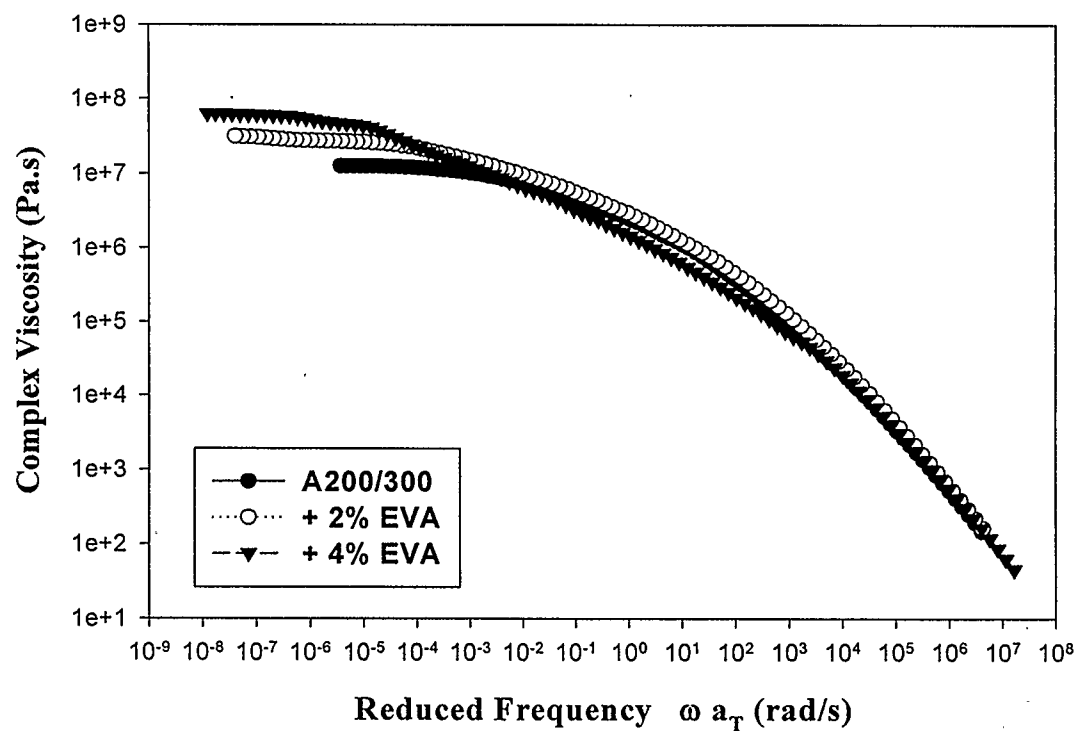


Figure B 32 Complex viscosity, A200/300 Pen grade + 2, 4 % EVA

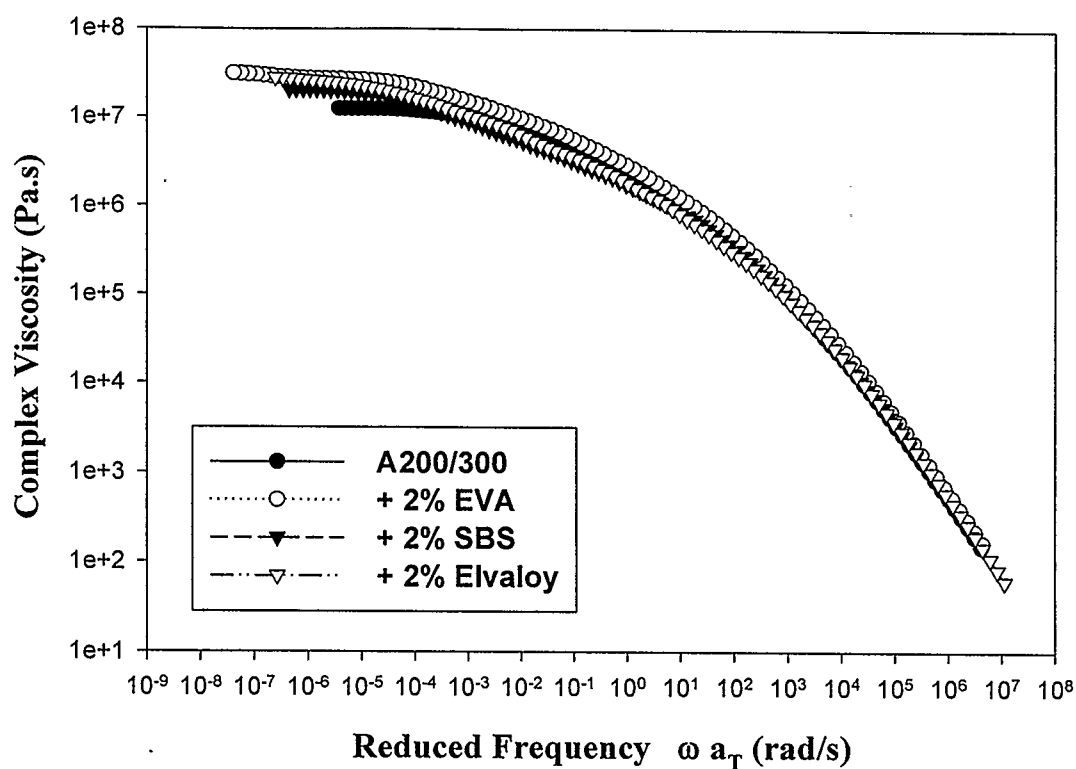


Figure B 33 Complex viscosity, A200/300 Pen grade + 2 % radial SBS, EVA, EGA

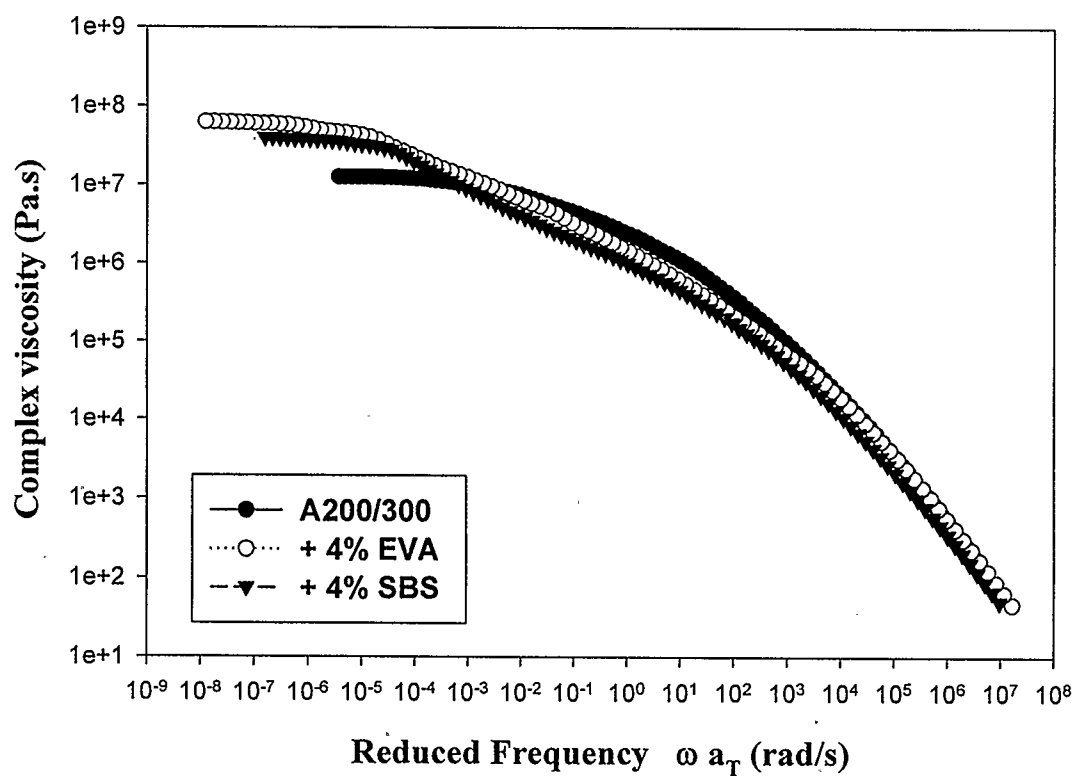


Figure B 34 Complex viscosity, A200/300 Pen grade + 4 % radial SBS, EVA

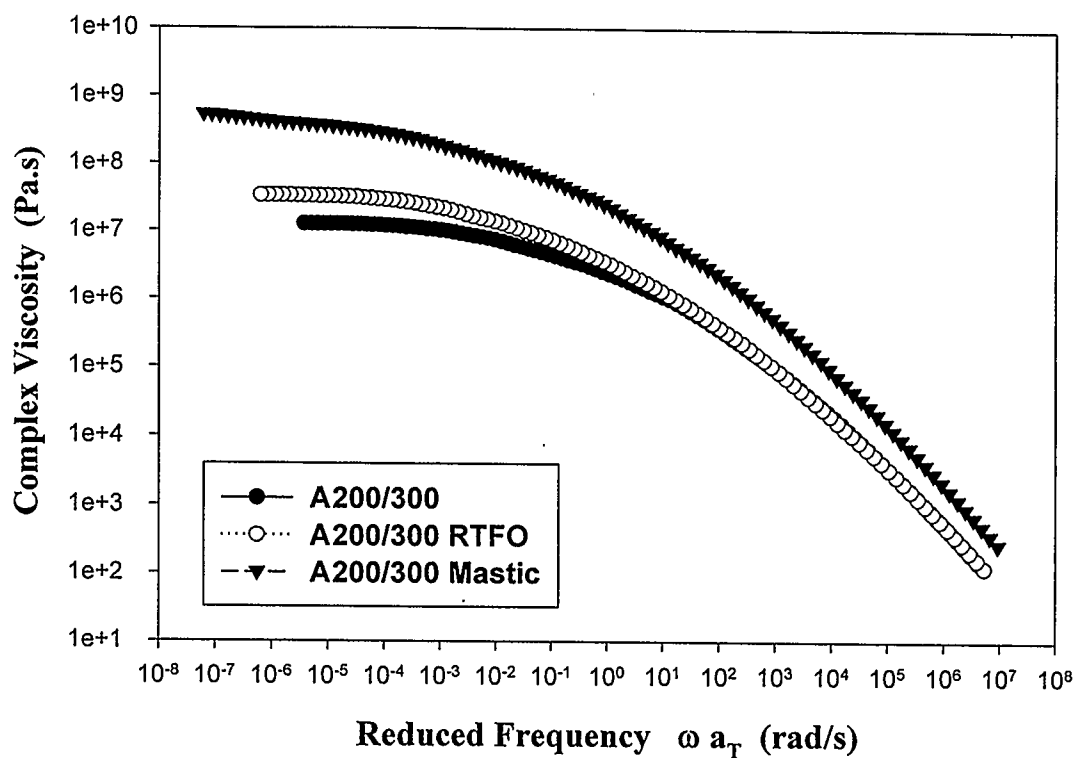


Figure B 35 Complex viscosity, A200/300 Pen grade + RTFO aged and Mastic

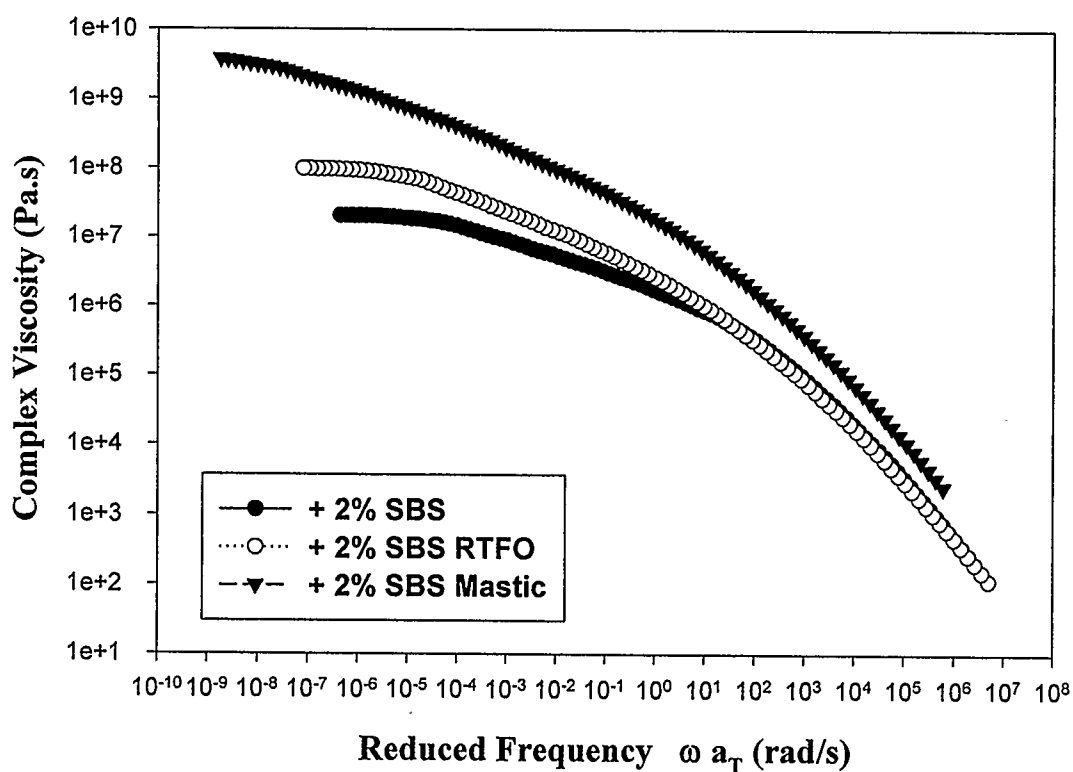


Figure B 36 Complex viscosity, A200/300 Pen grade + 2 % radial SBS, 2 % radial SBS RTFO aged and Mastic

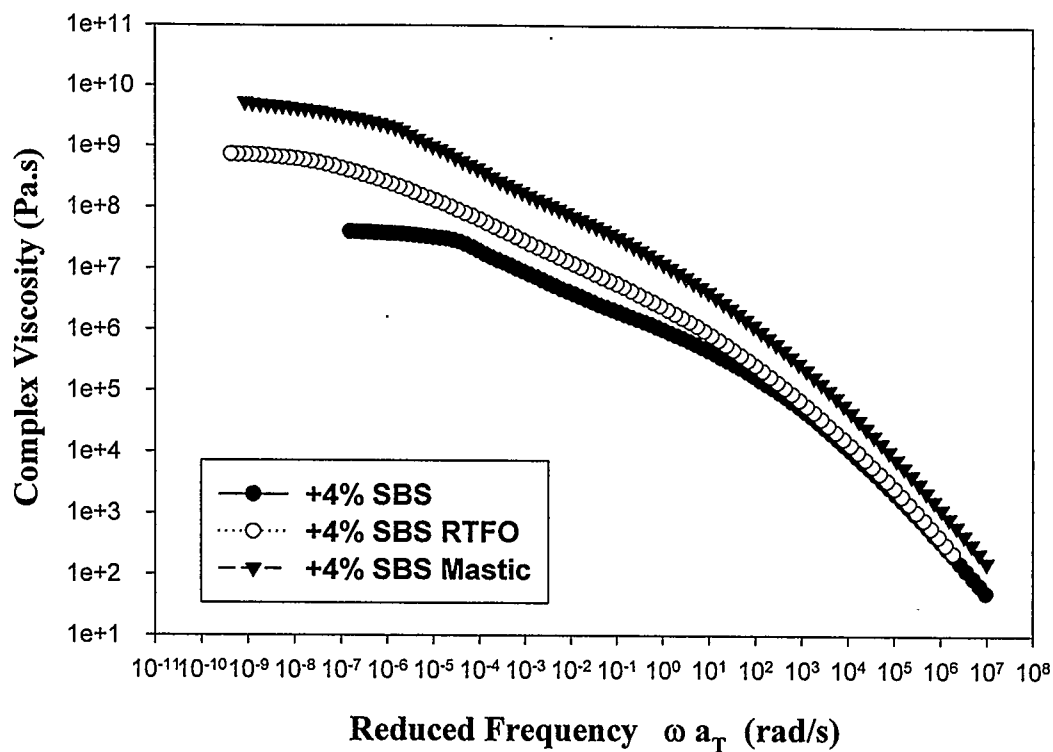


Figure B 37 Complex viscosity, A200/300 Pen grade + 4 % radial SBS, 4 % radial SBS RTFO aged and Mastic

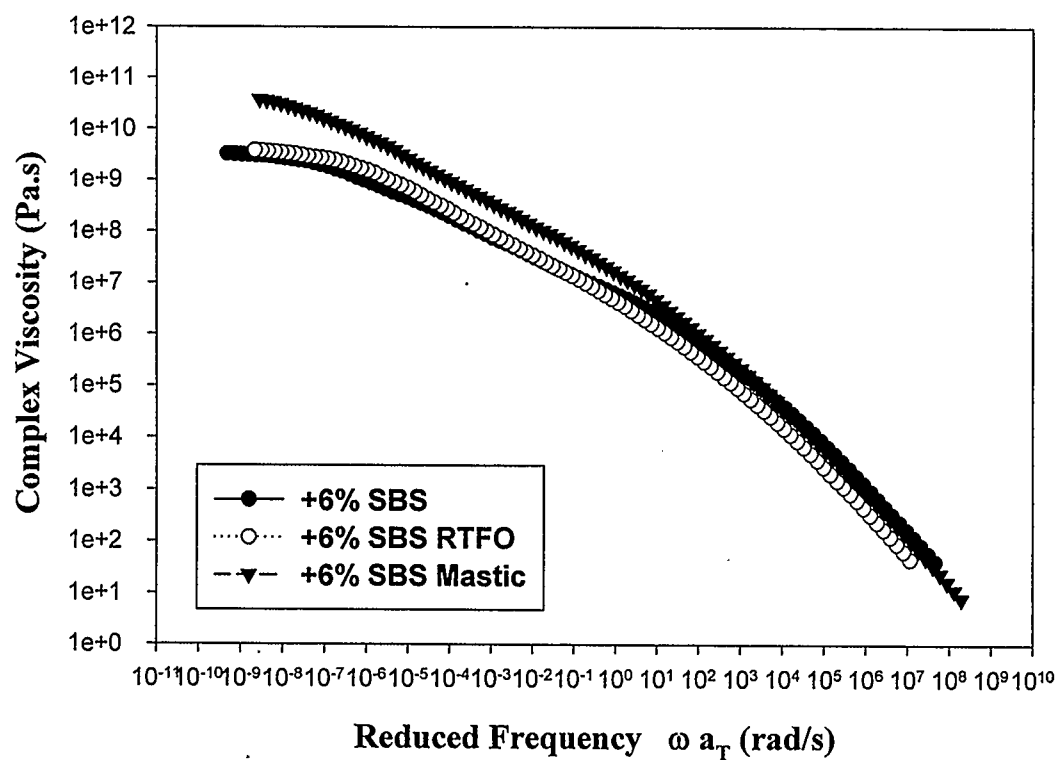


Figure B 38 Complex viscosity, A200/300 Pen grade + 6 % radial SBS, 6 % radial SBS RTFO aged and Mastic

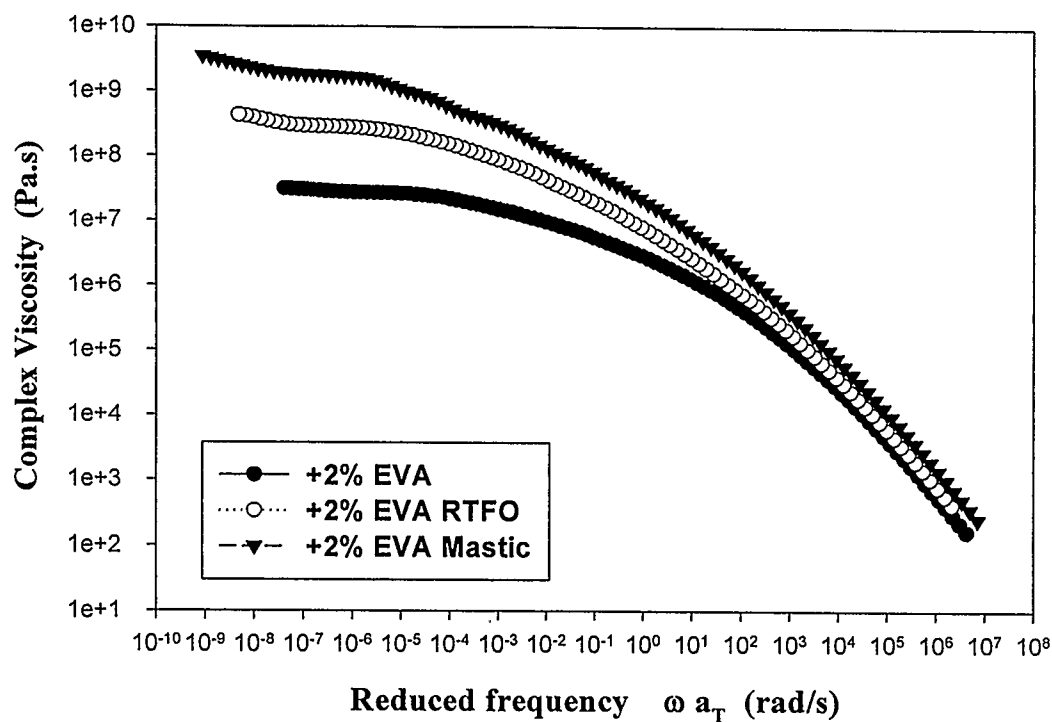


Figure B 39 Complex viscosity, A200/300 Pen grade + 2 % EVA, 2 % EVA RTFO aged and Mastic

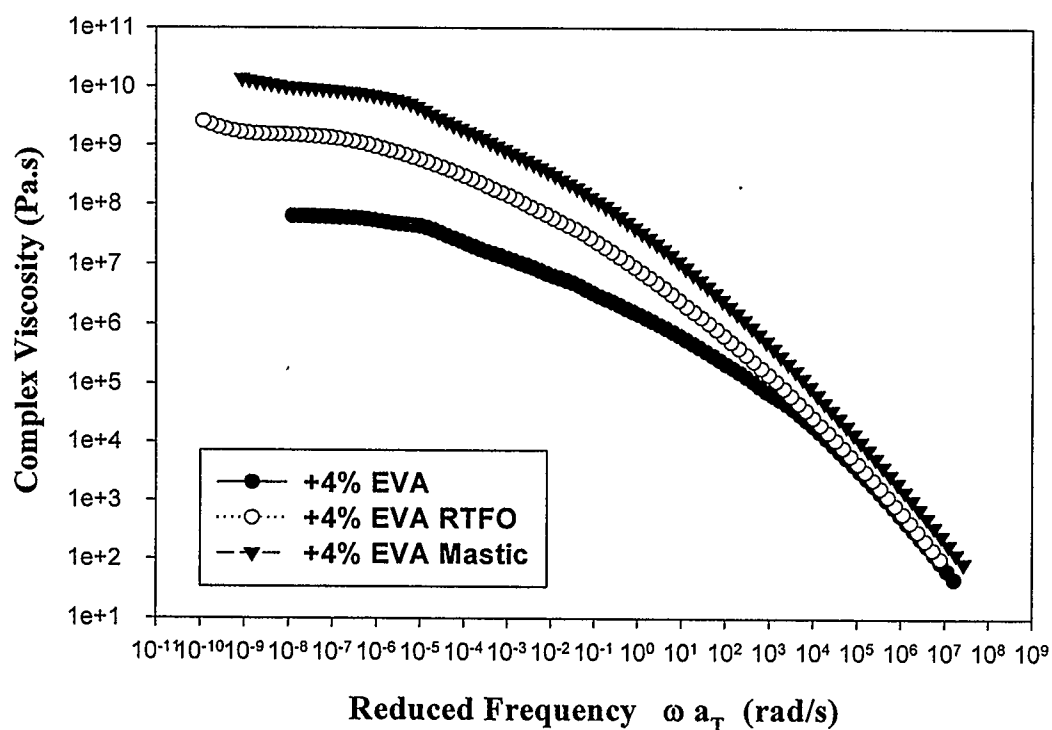


Figure B 40 Complex viscosity, A200/300 Pen grade + 4 % EVA, 4 % EVA RTFO aged and Mastic

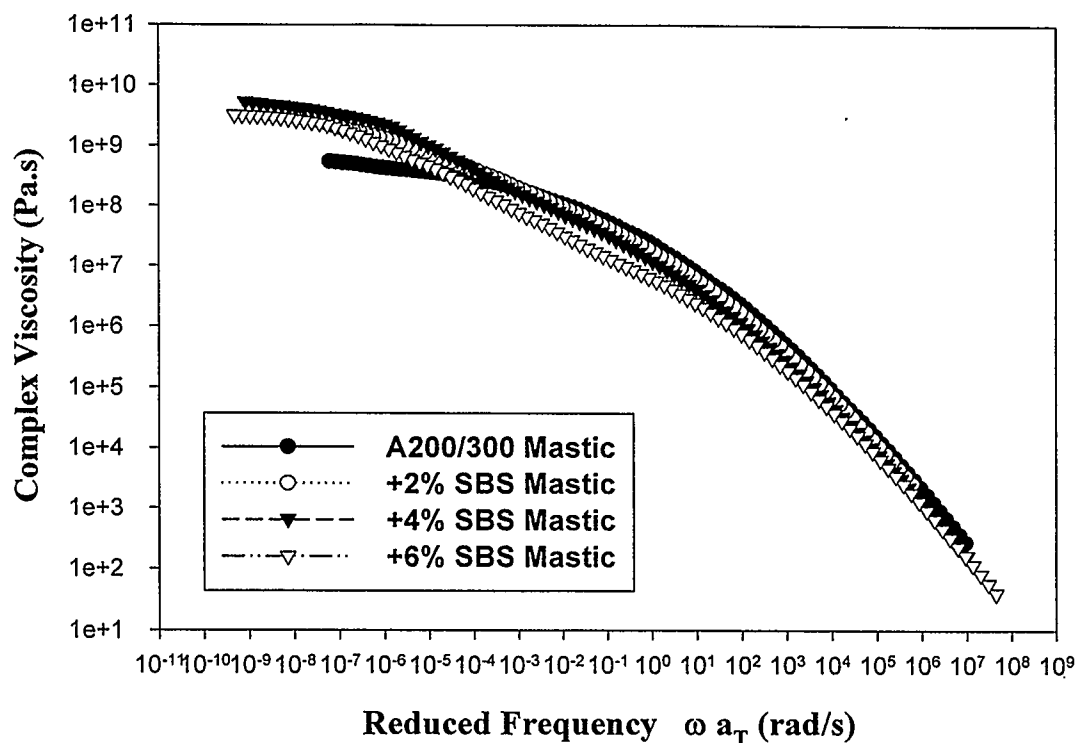


Figure B 41 Complex viscosity, Mastic A200/300 Pen grade and Mastic 2, 4, 6 % SBS radial

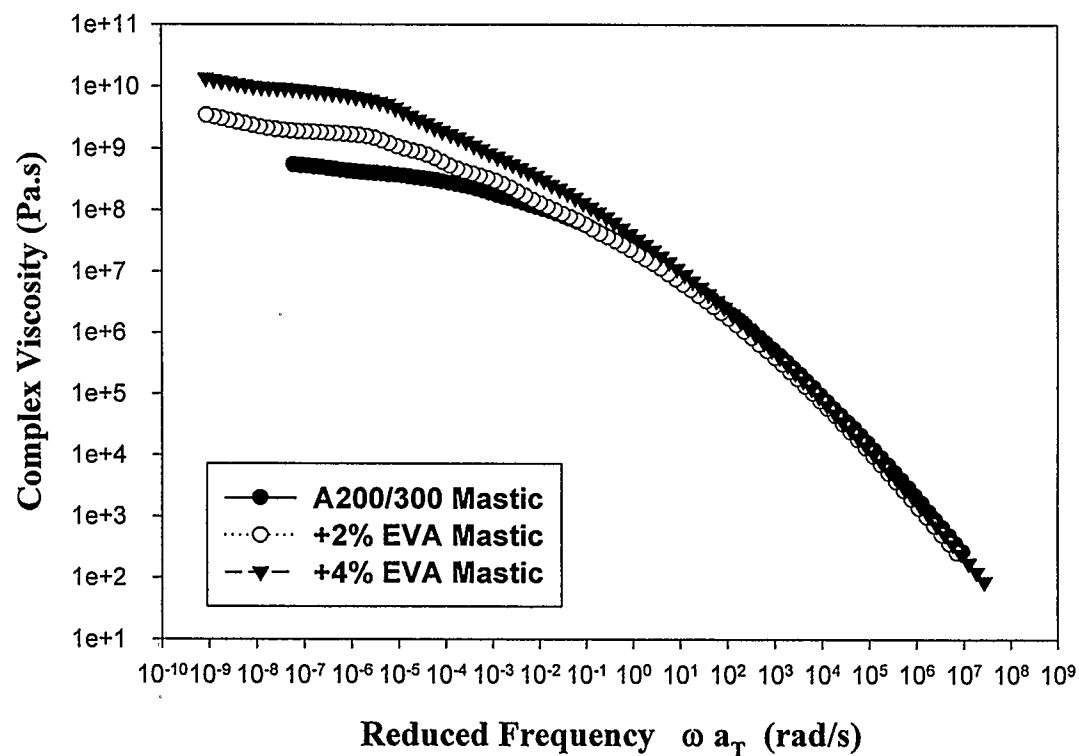


Figure B 42 Complex viscosity, A200/300 Pen grade and Mastic 2, 4 % EVA

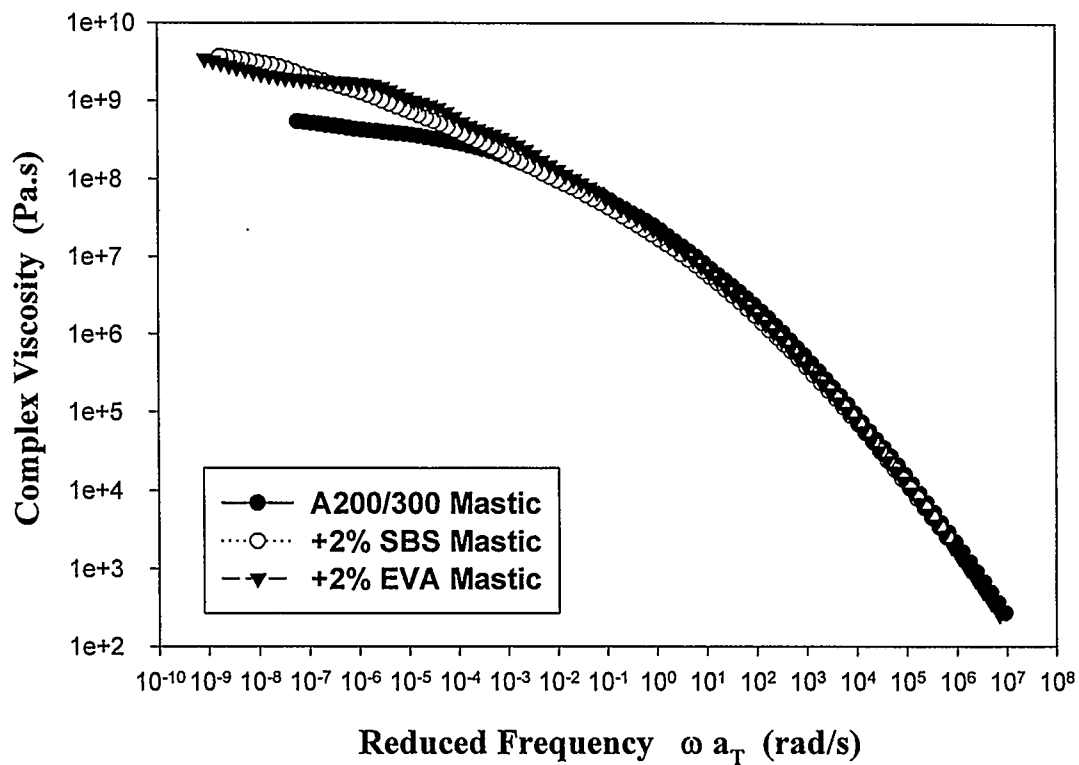


Figure B 43 Complex viscosity, Mastic A200/300 Pen grade and Mastic 2 % SBS radial, EVA

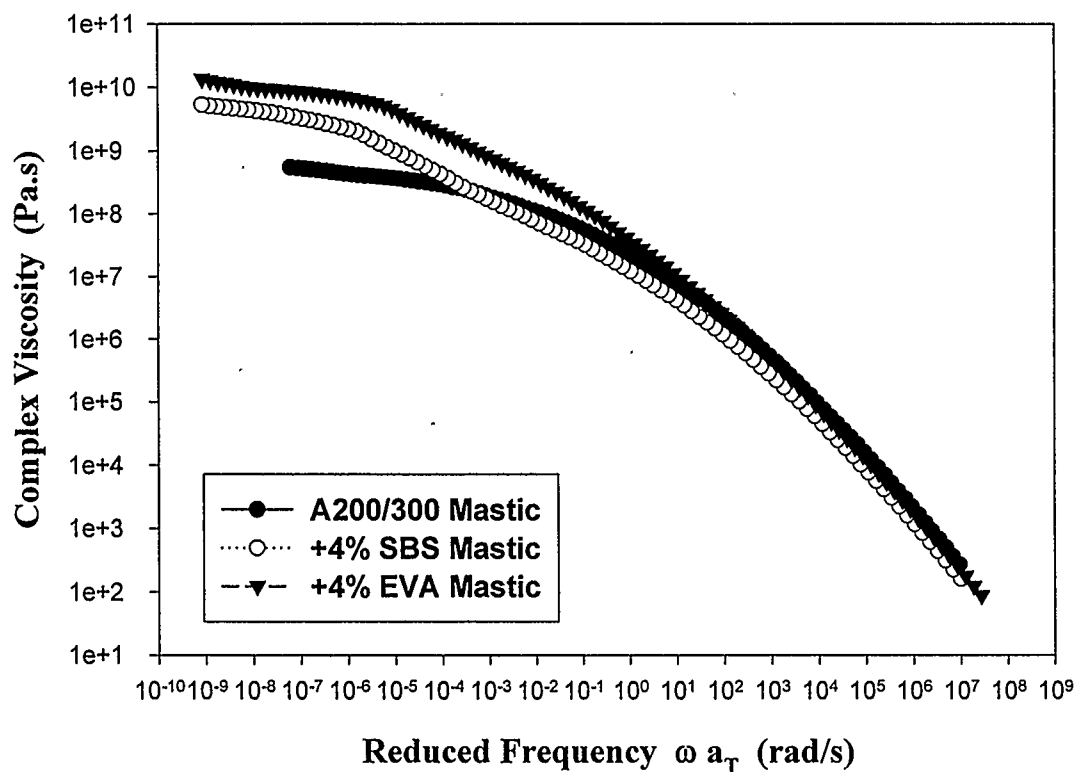


Figure B 44 Complex viscosity, Mastic A200/300 Pen grade and Mastic 4 % SBS radial, EVA

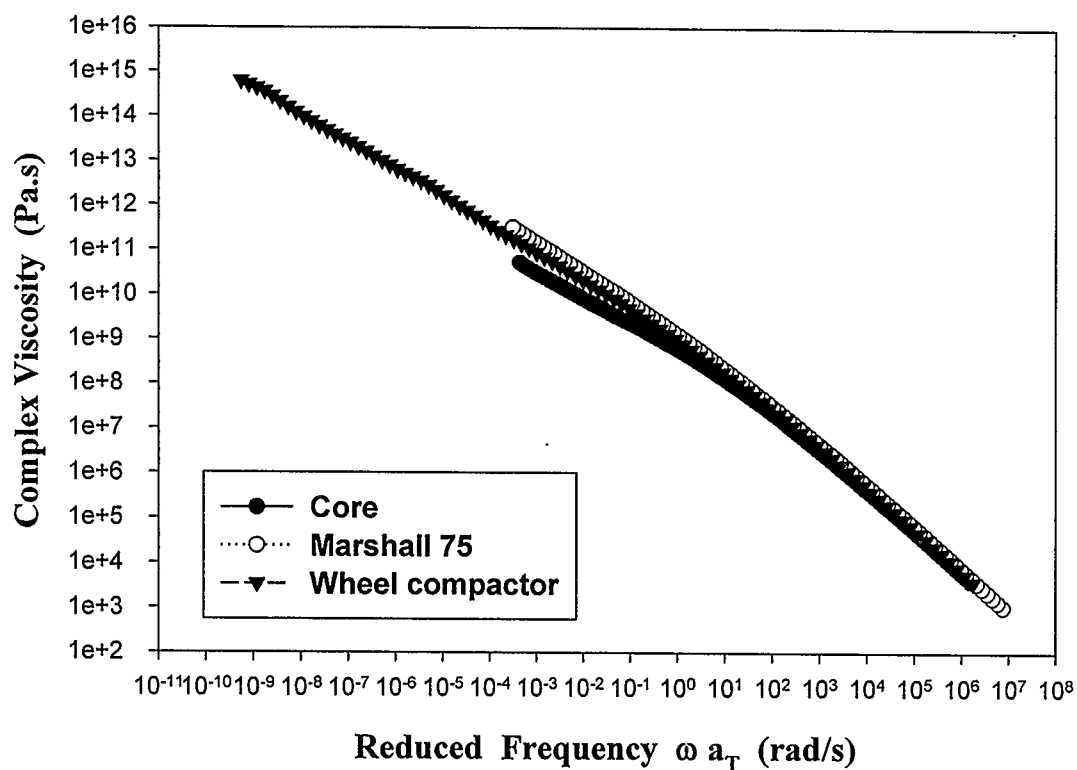


Figure B 45 Complex viscosity, HMA, three compaction methods

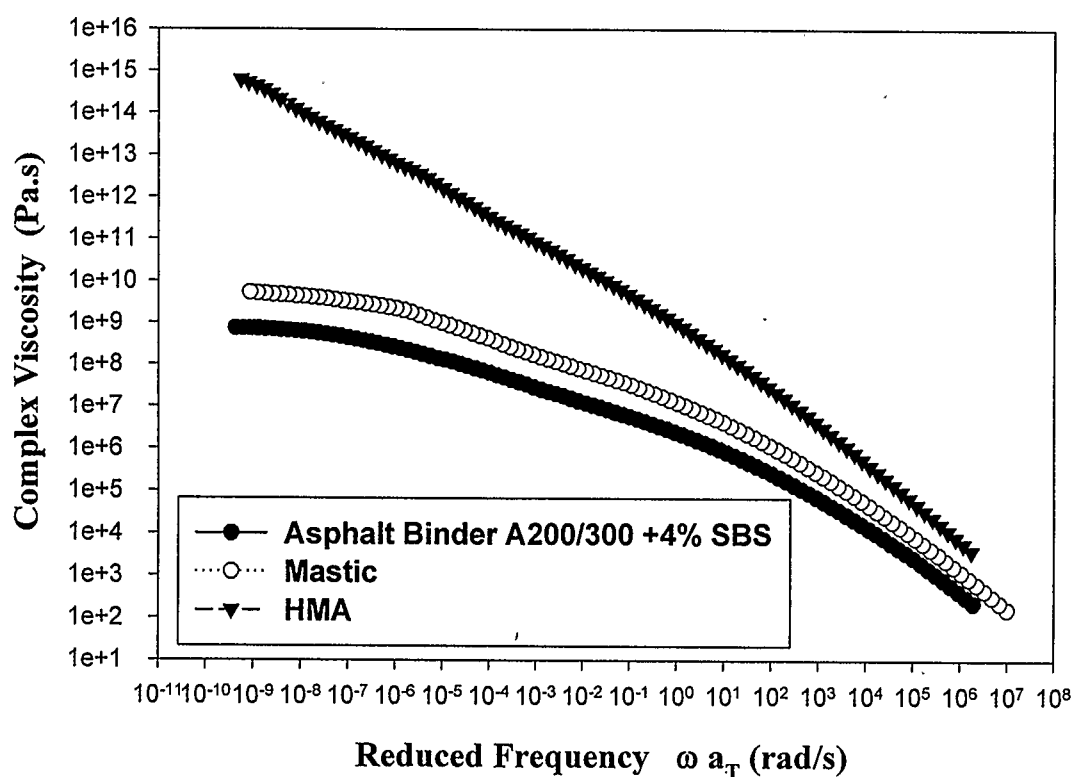


Figure B 46 Complex viscosity, A200/300 Pen grade + 4 % SBS radial, Mastic, HMA

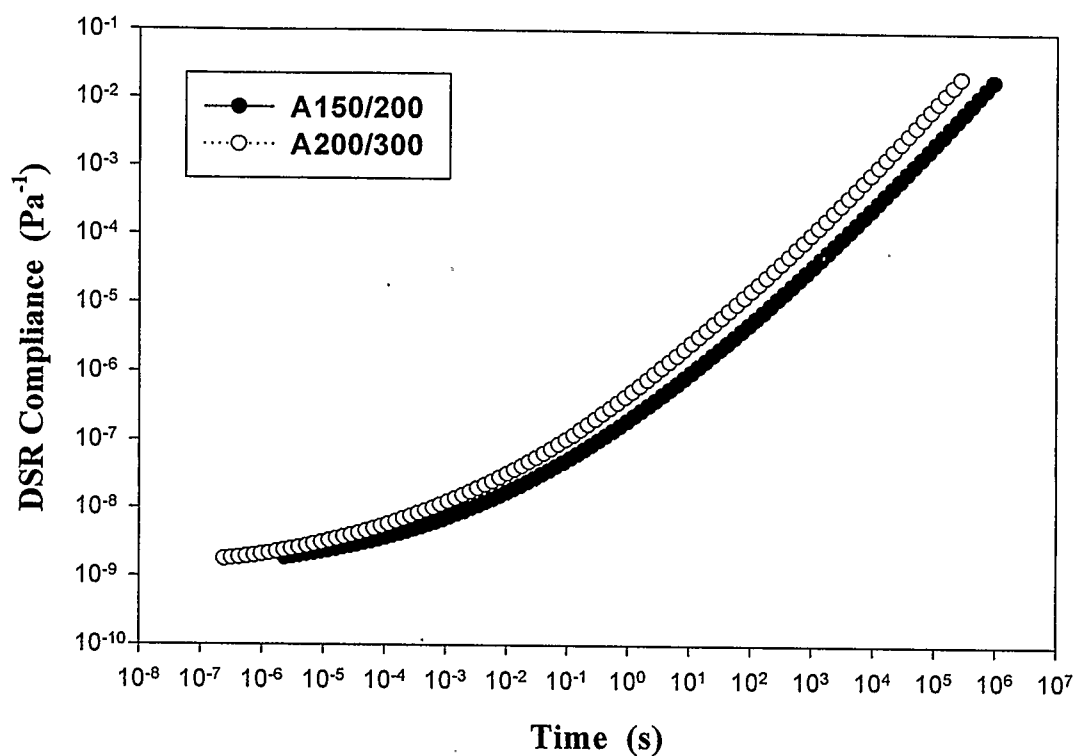


Figure B 47 Compliance, A150/200 Pen grade and A200/300 Pen grade

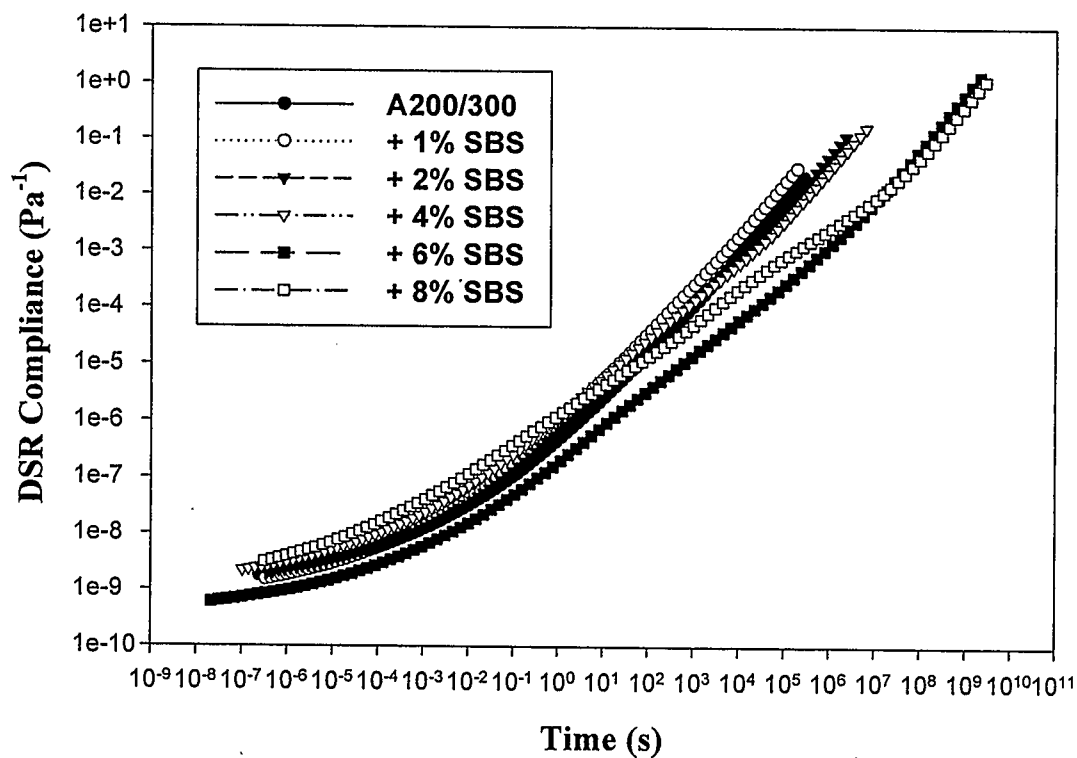


Figure B 48 Compliance, A200/300 Pen grade + 1, 2, 4, 6, 8 % SBS

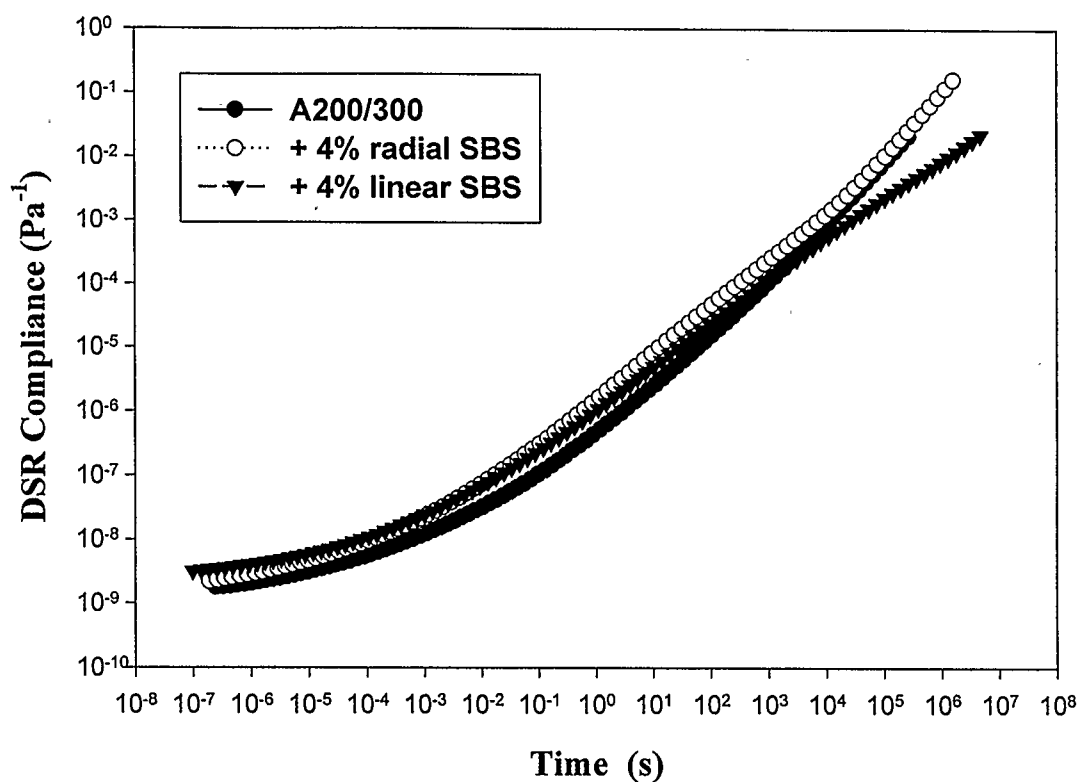


Figure B 49 Compliance, A200/300 Pen grade + 4 % radial and linear SBS

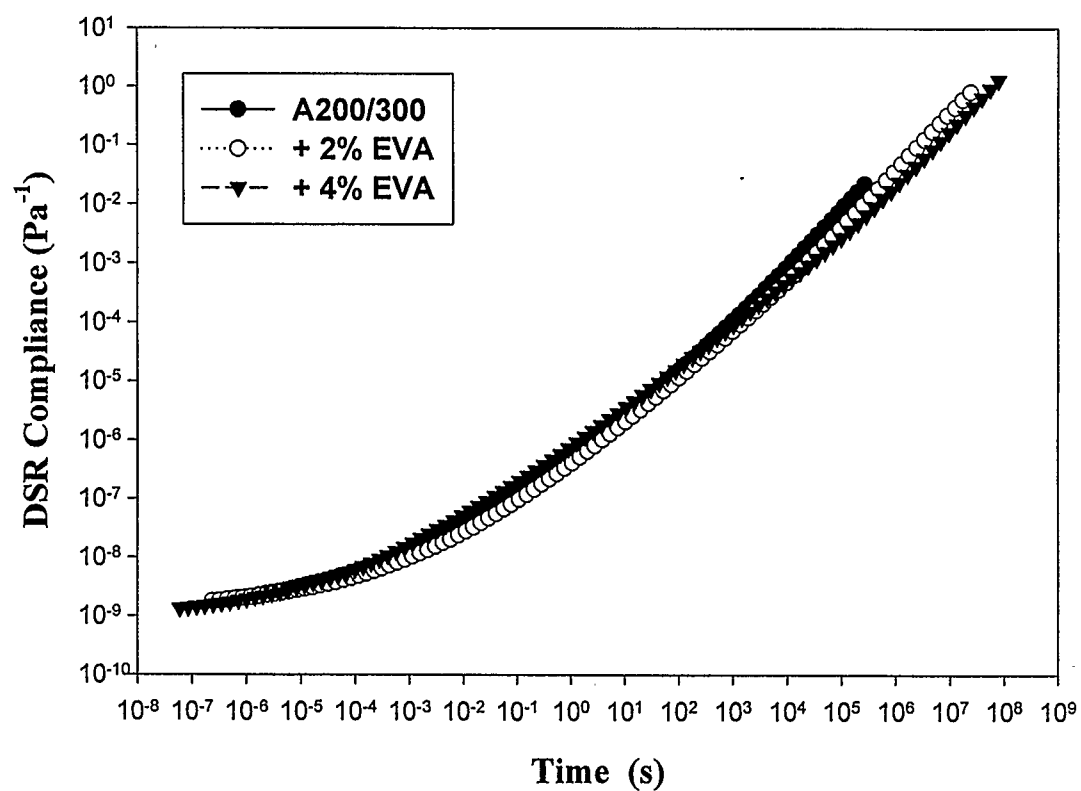


Figure B 50 Compliance, A200/300 Pen grade + 2, 4 % EVA

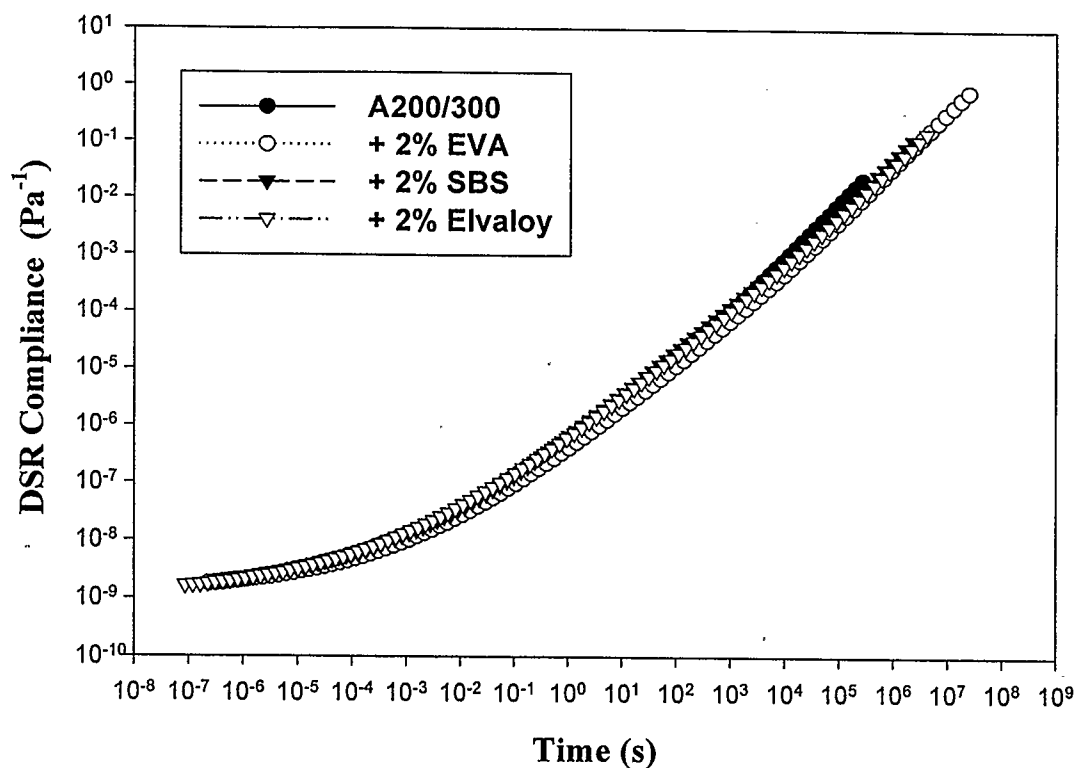


Figure B 51 Compliance, A200/300 Pen grade + 2 % radial SBS, EVA, EGA

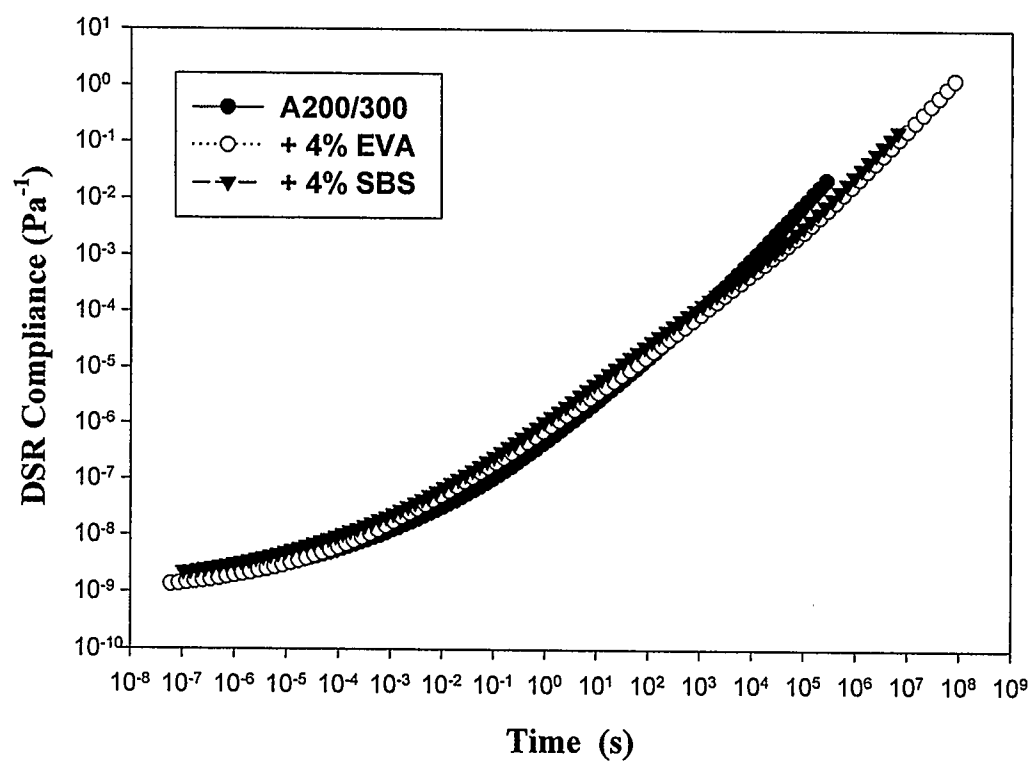


Figure B 52 Compliance, A200/300 Pen grade + 4 % radial SBS, EVA

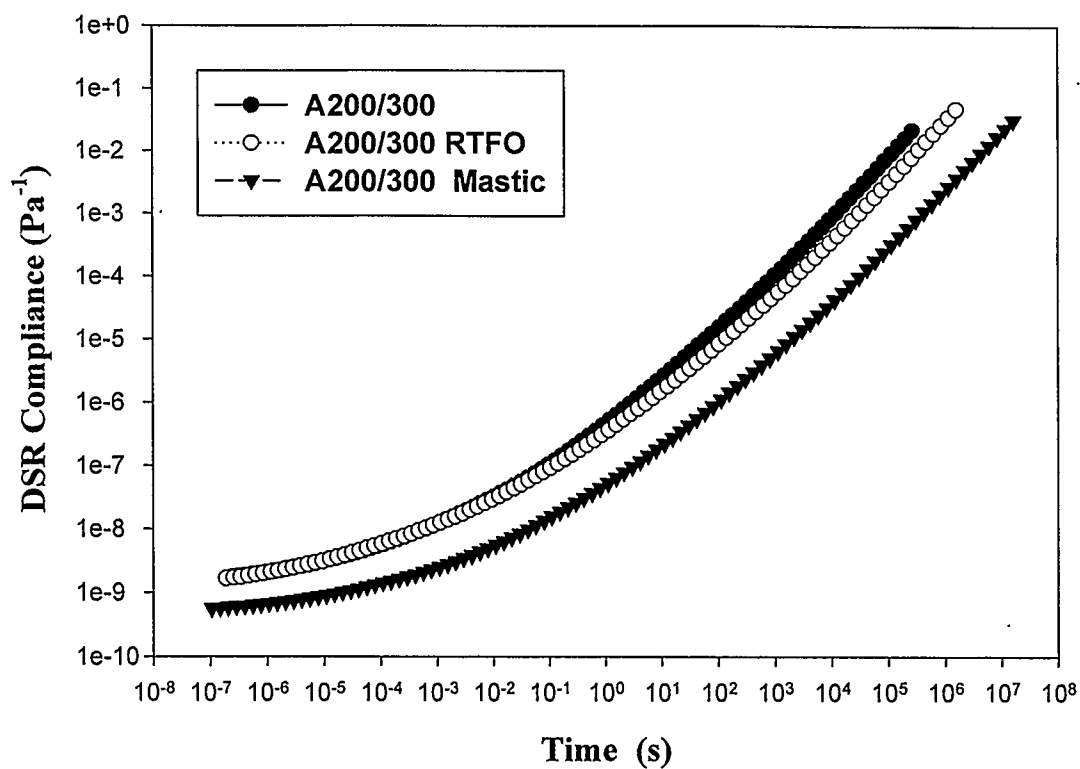


Figure B 53 Compliance, A200/300 Pen grade + RTFO aged and Mastic

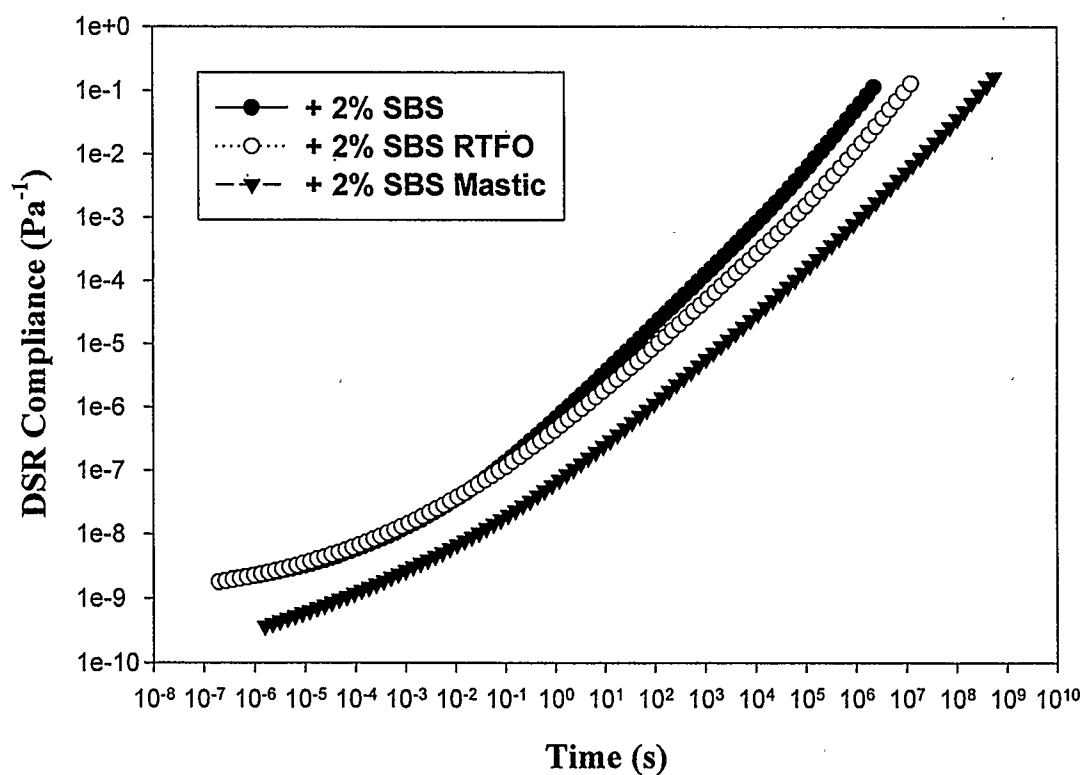


Figure B 54 Compliance, A200/300 Pen grade + 2 % radial SBS, 2 % radial SBS RTFO aged and Mastic

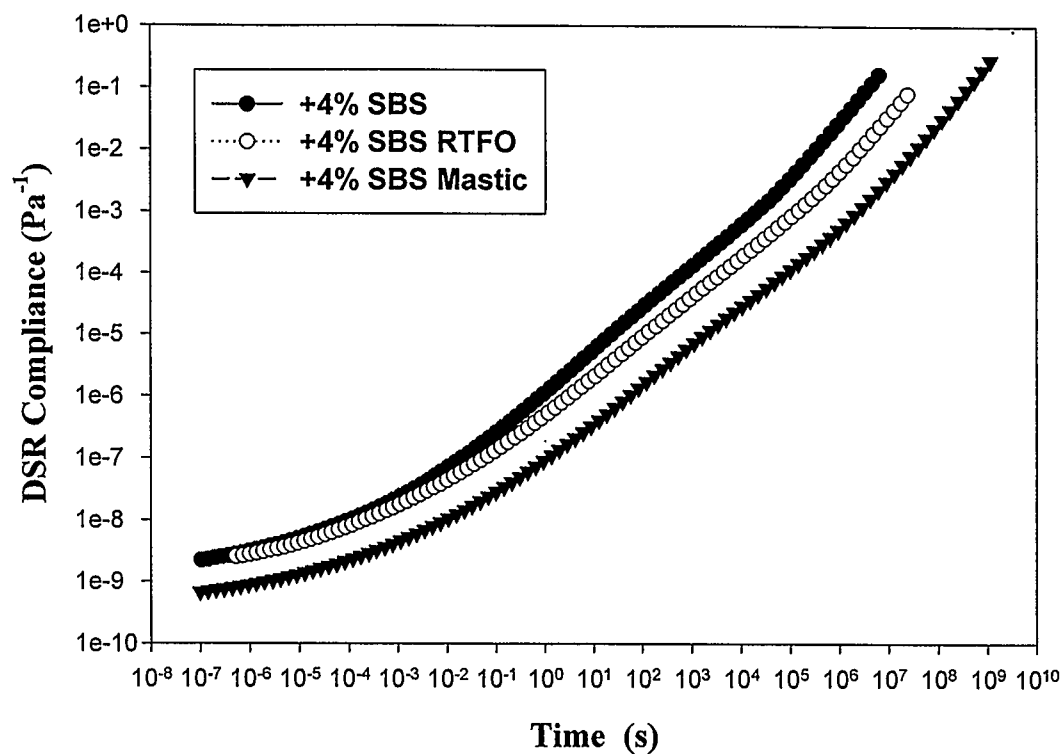


Figure B 55 Compliance, A200/300 Pen grade + 4 % radial SBS, 4 % radial SBS RTFO aged and Mastic

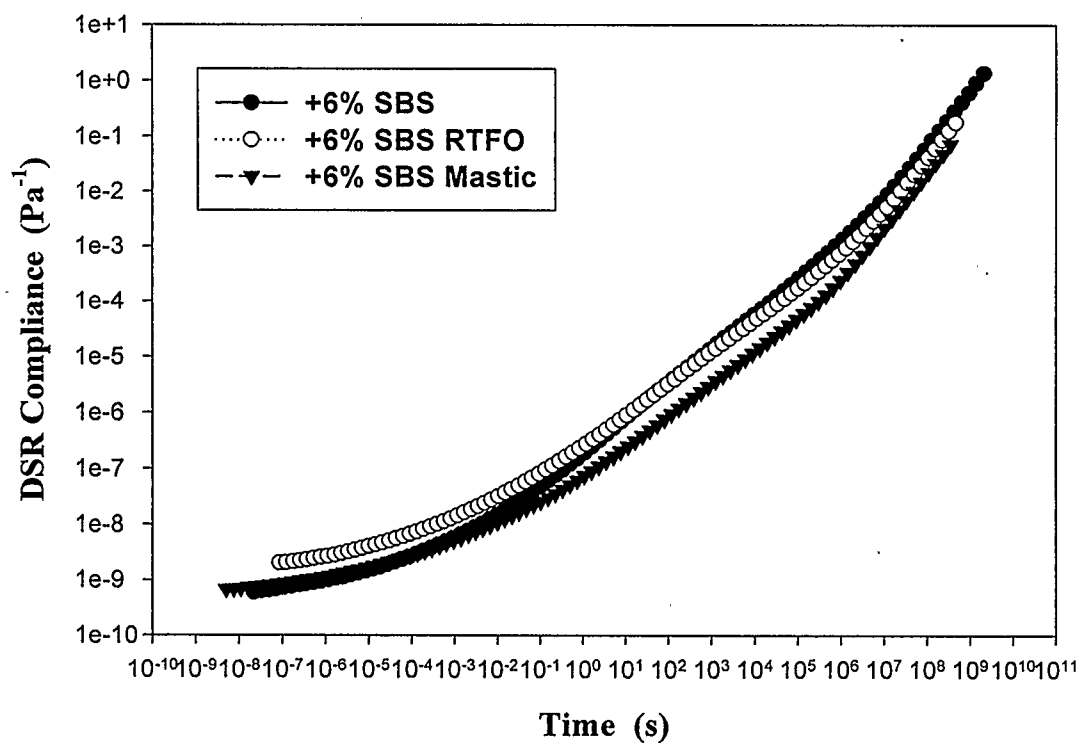


Figure B 56 Compliance, A200/300 Pen grade + 6 % radial SBS, 6 % radial SBS RTFO aged and Mastic

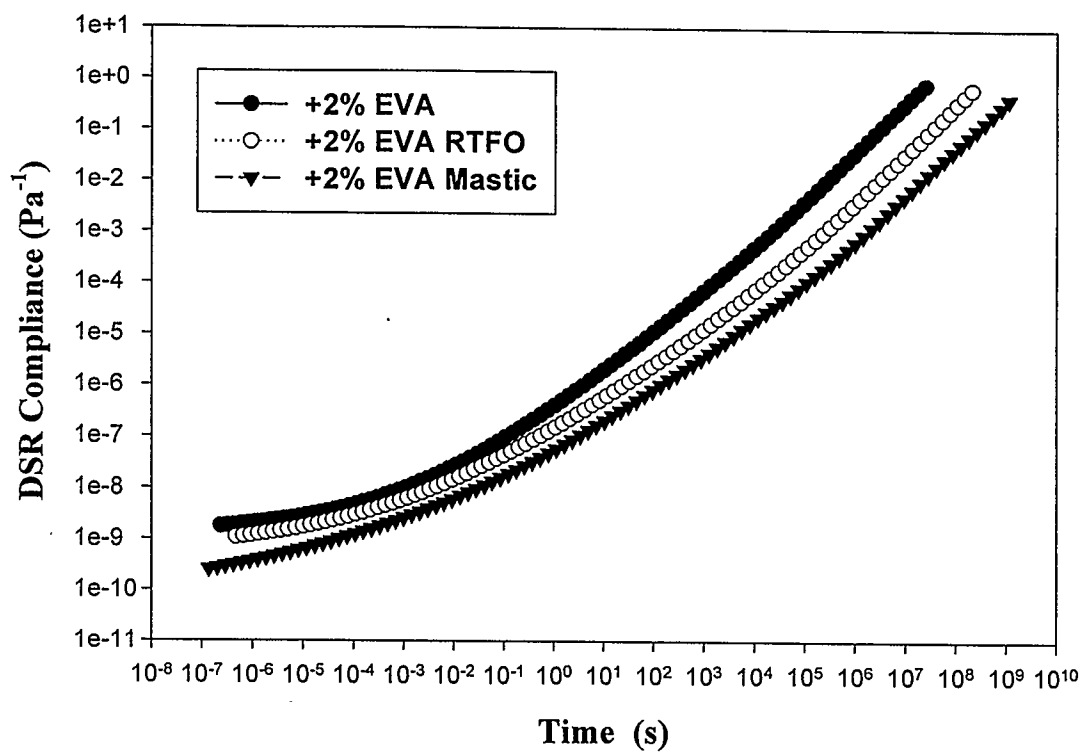


Figure B 57 Compliance, A200/300 Pen grade + 2 % EVA, 2 % EVA RTFO aged and Mastic

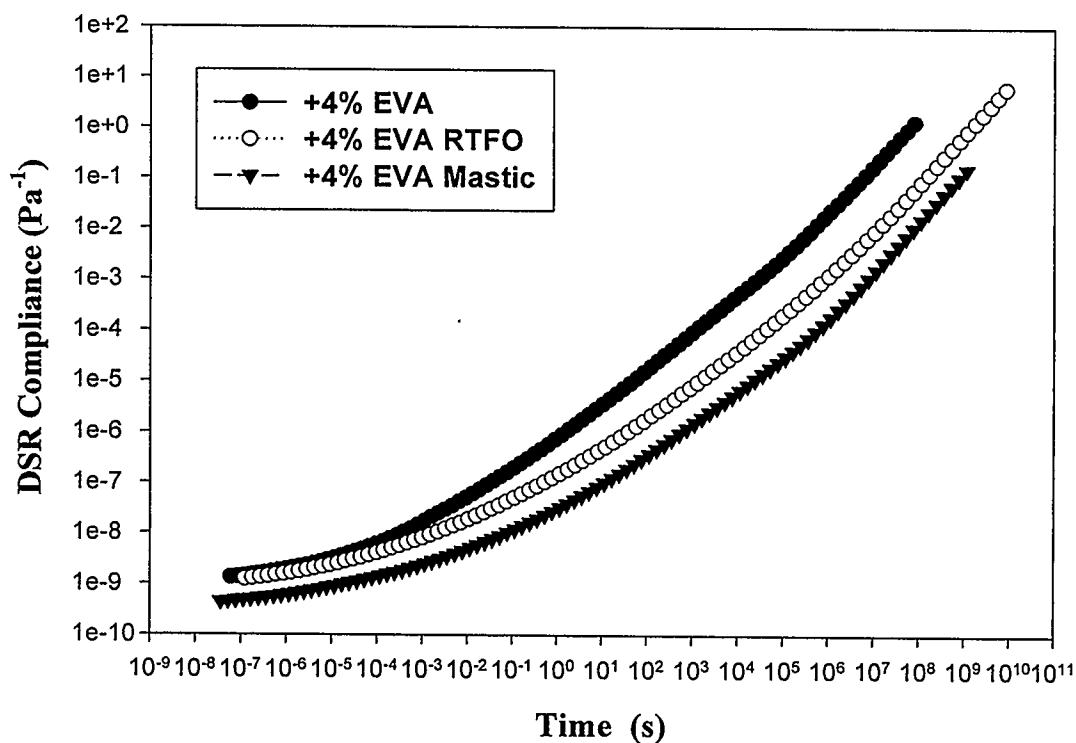


Figure B 58 Compliance, A200/300 Pen grade + 4 % EVA, 4 % EVA RTFO aged and Mastic

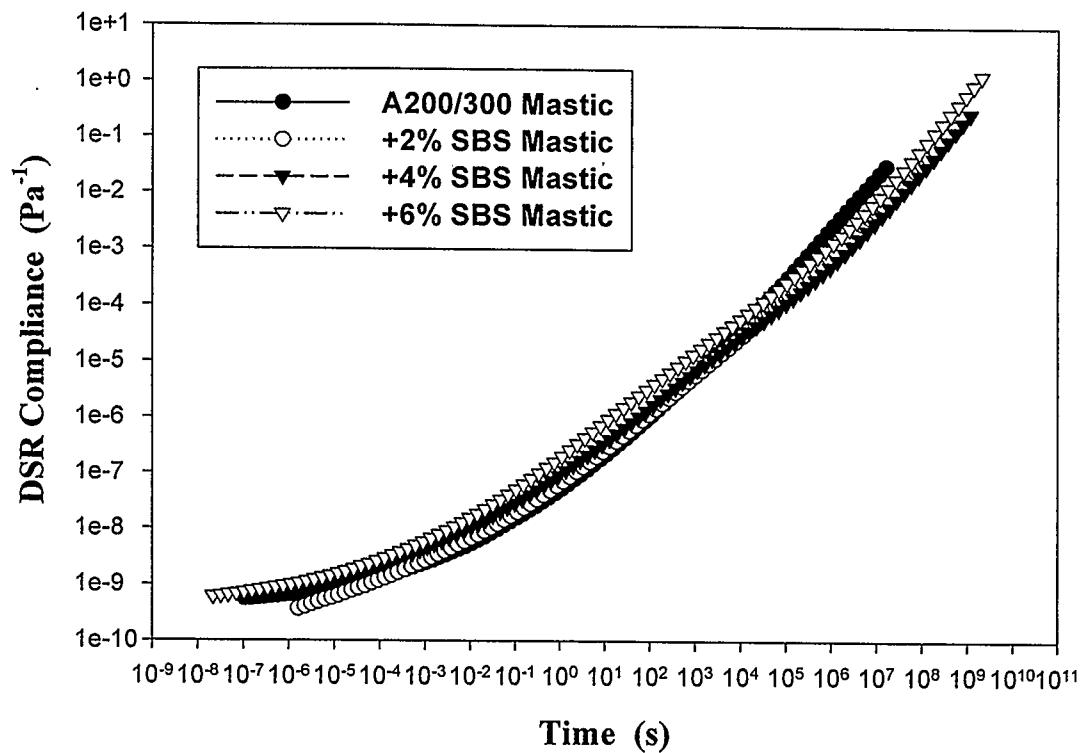


Figure B 59 Compliance, A200/300 Pen grade + 6 % radial SBS, 6 % radial SBS RTFO aged and Mastic

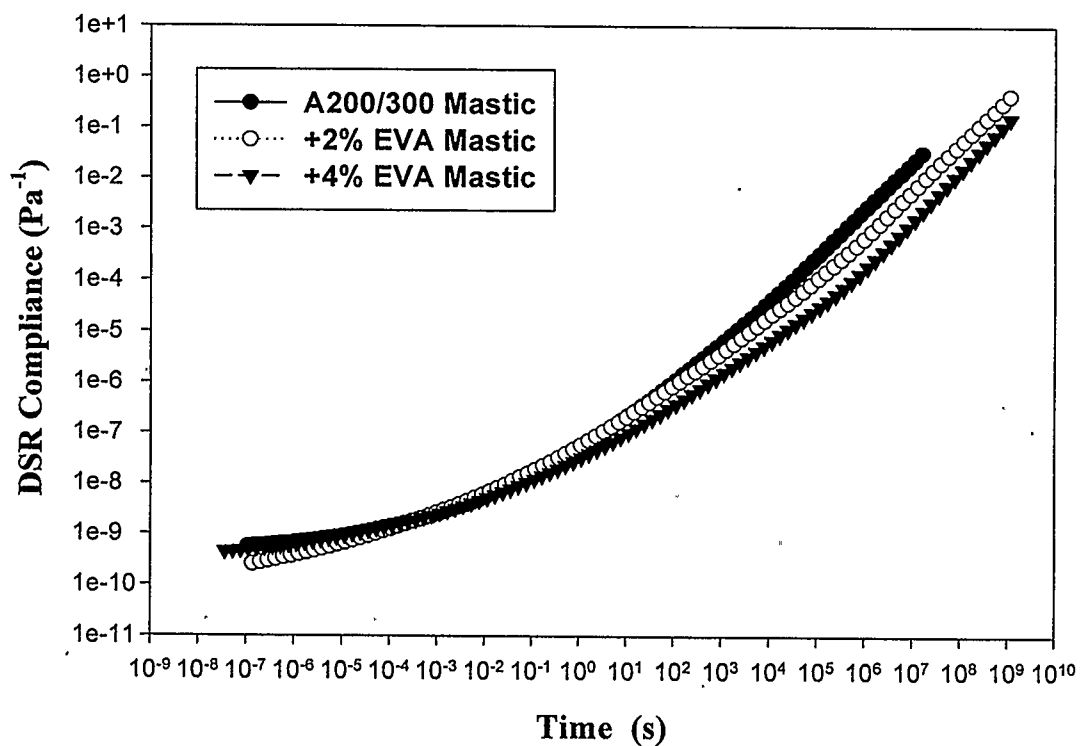


Figure B 60 Compliance, A200/300 Pen grade and Mastic 2, 4 % EVA

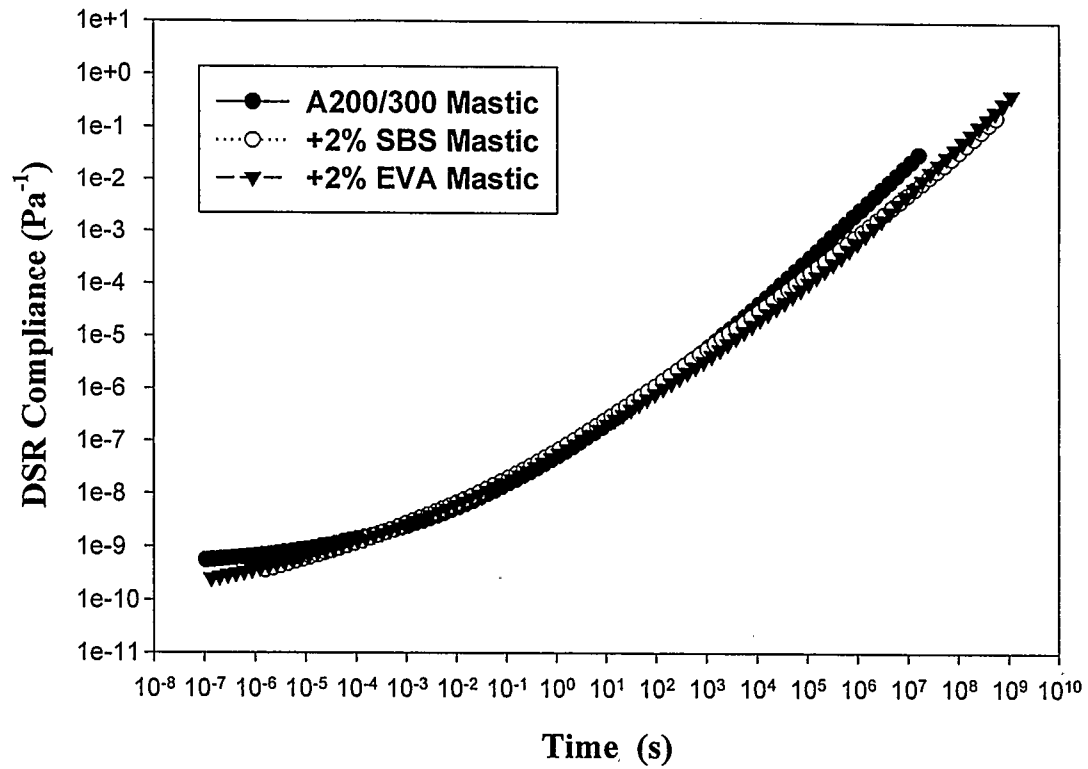


Figure B 61 Compliance, Mastic A200/300 Pen grade and Mastic 2 % SBS radial, EVA

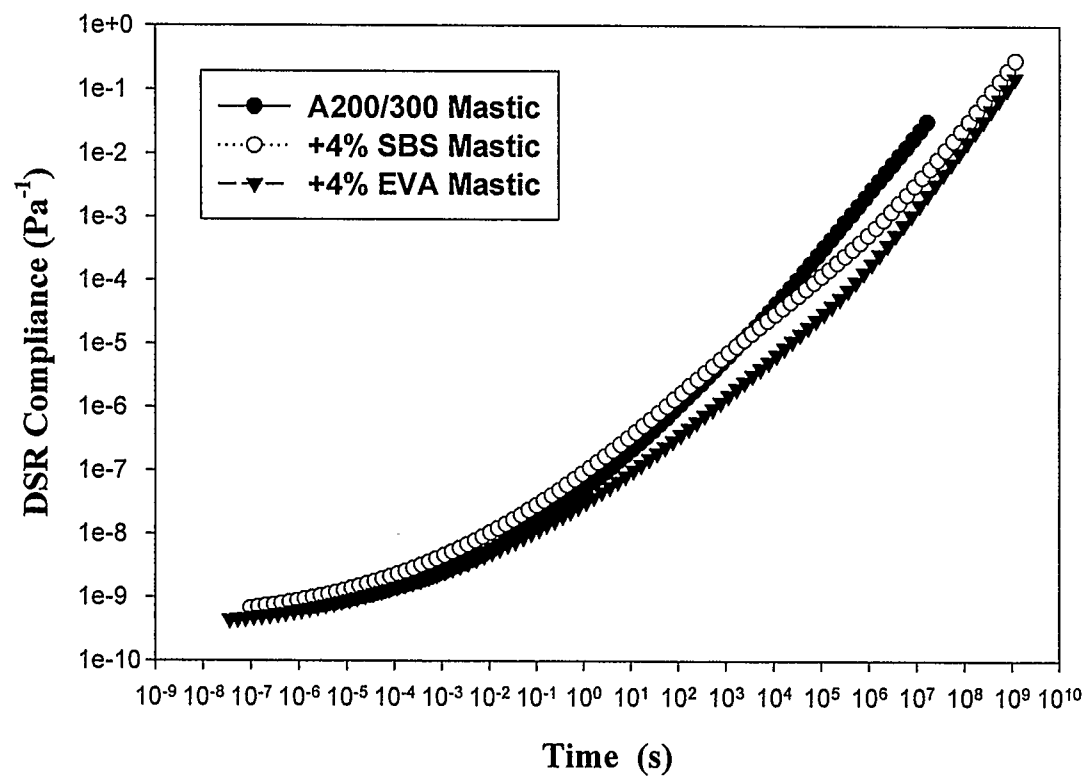


Figure B 62 Compliance, Mastic A200/300 Pen grade and Mastic 4 % SBS radial, EVA

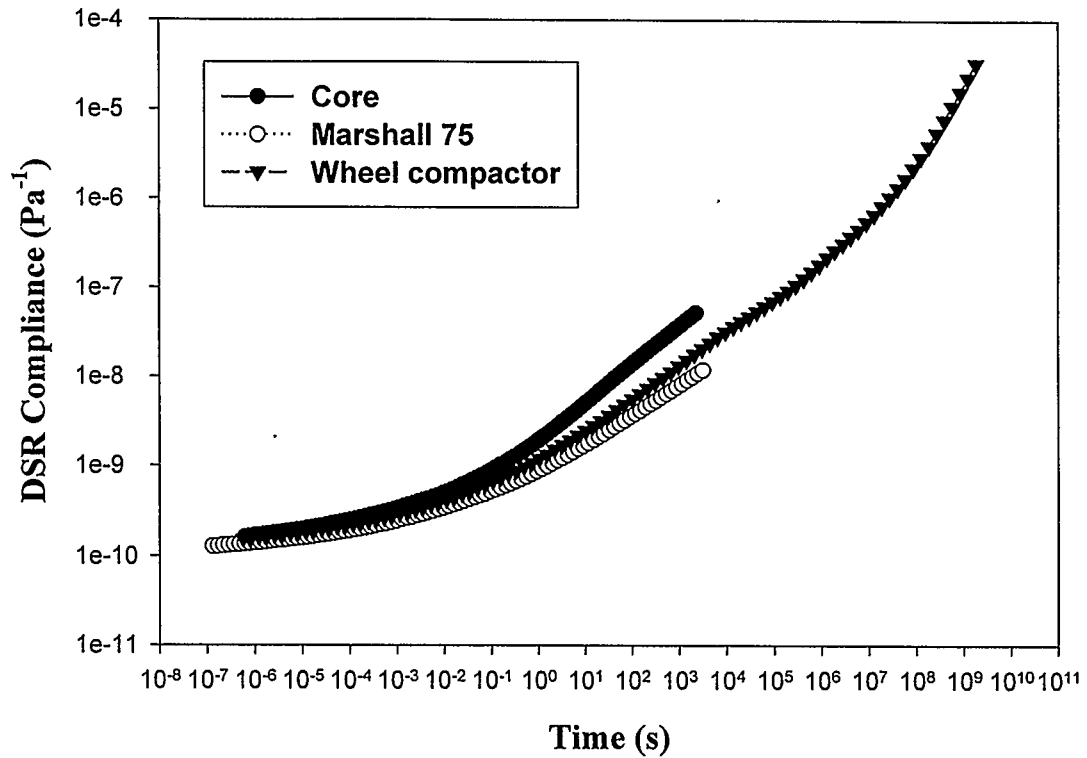


Figure B 63 Compliance, HMA, three compaction methods

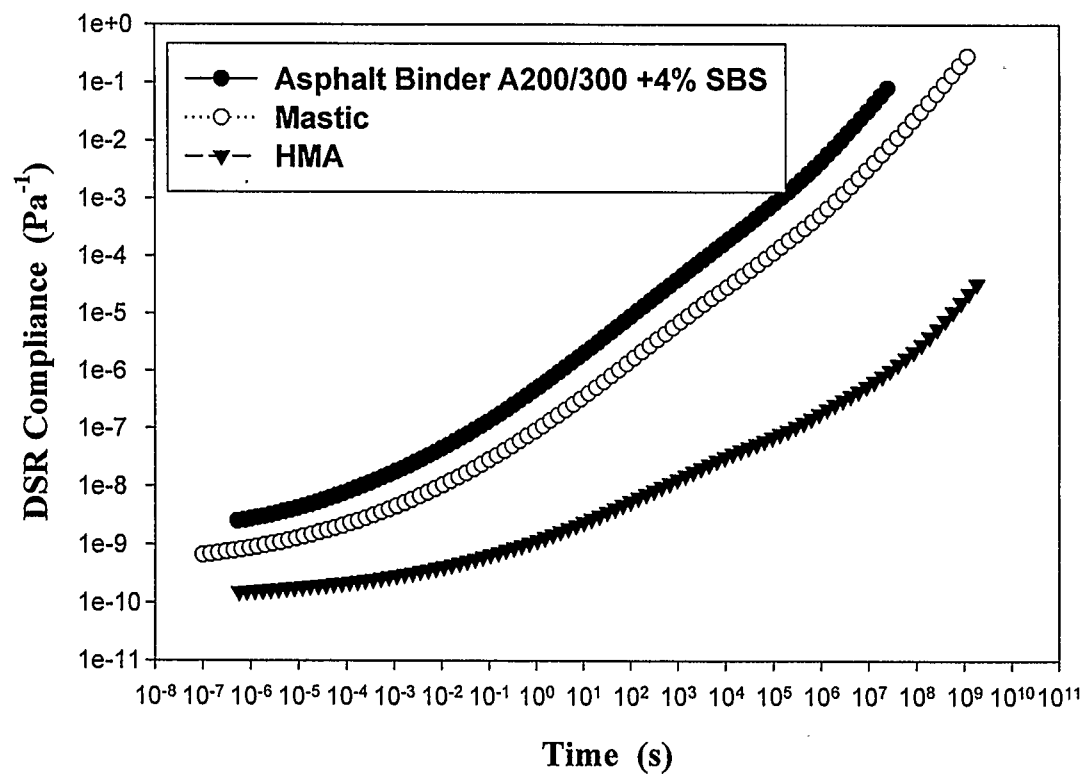


Figure B 64 Compliance, A200/300 Pen grade + 4 % SBS radial, Mastic, HMA

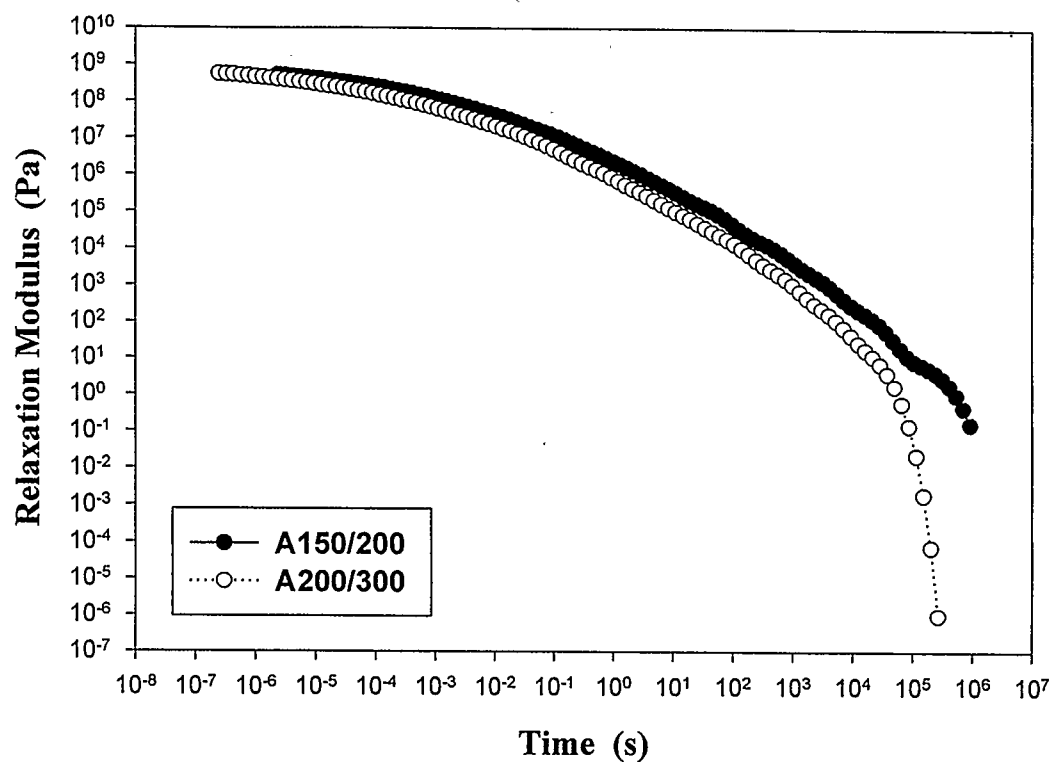


Figure B 65 Relaxation Modulus, A150/200 Pen grade and A200/300 Pen grade

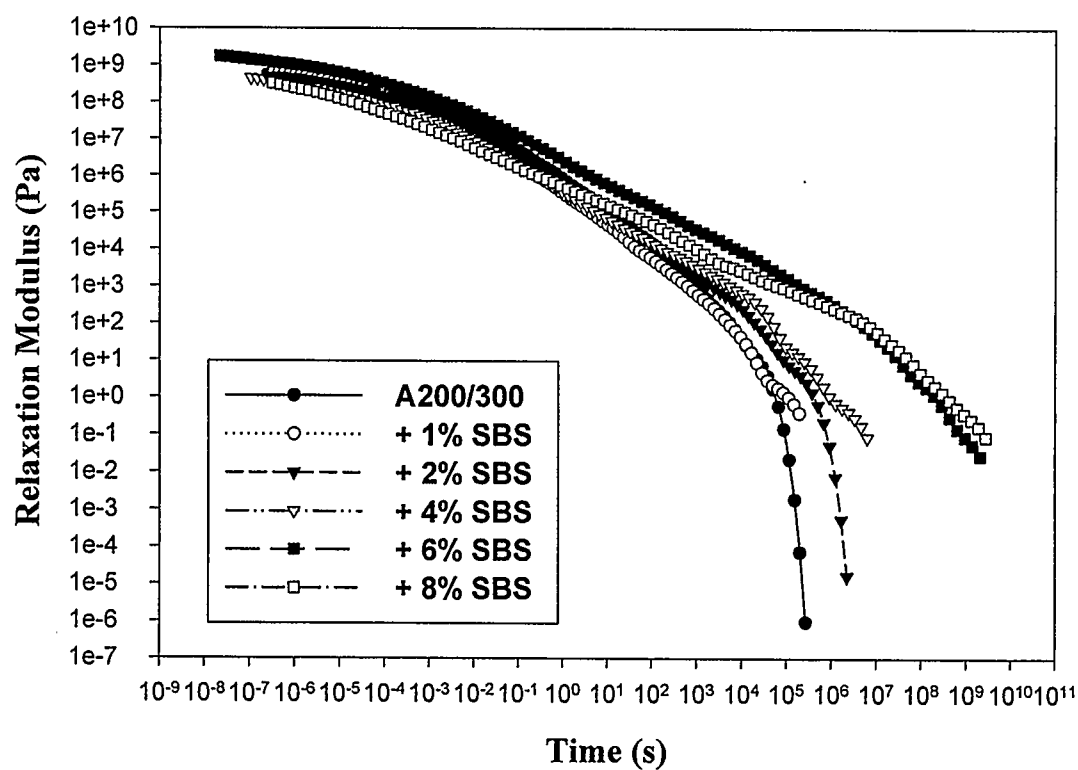


Figure B 66 Relaxation Modulus, A200/300 Pen grade + 1, 2, 4, 6, 8 % SBS

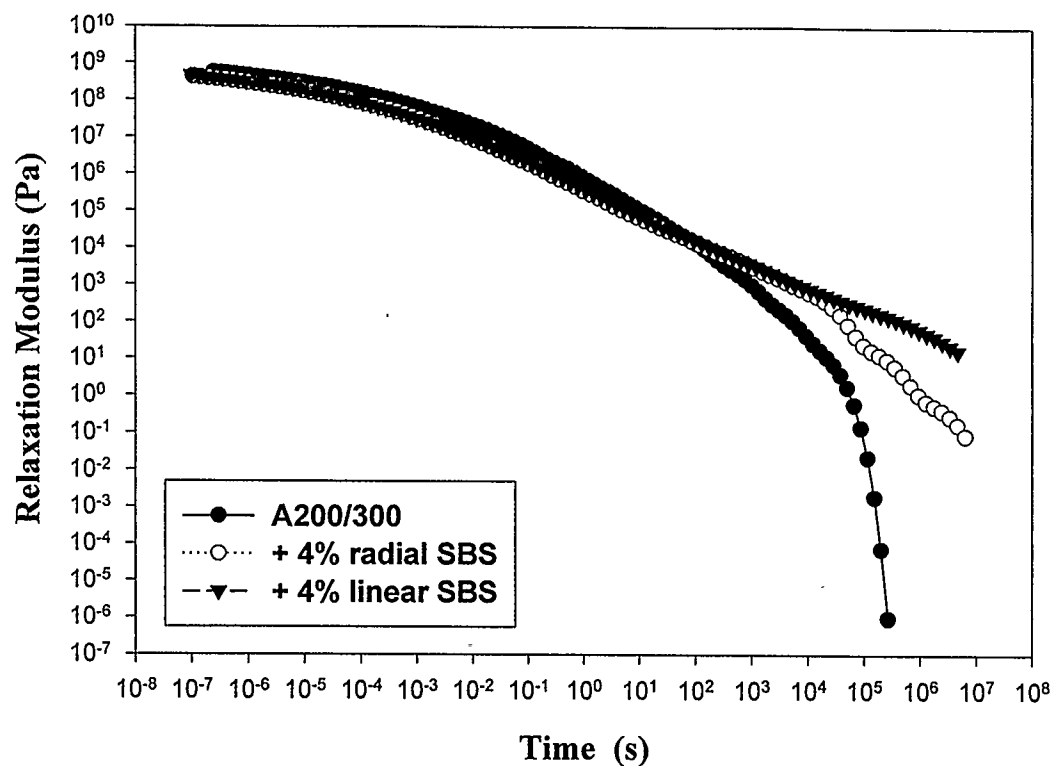


Figure B 67 Relaxation Modulus, A200/300 Pen grade + 4 % radial and linear SBS

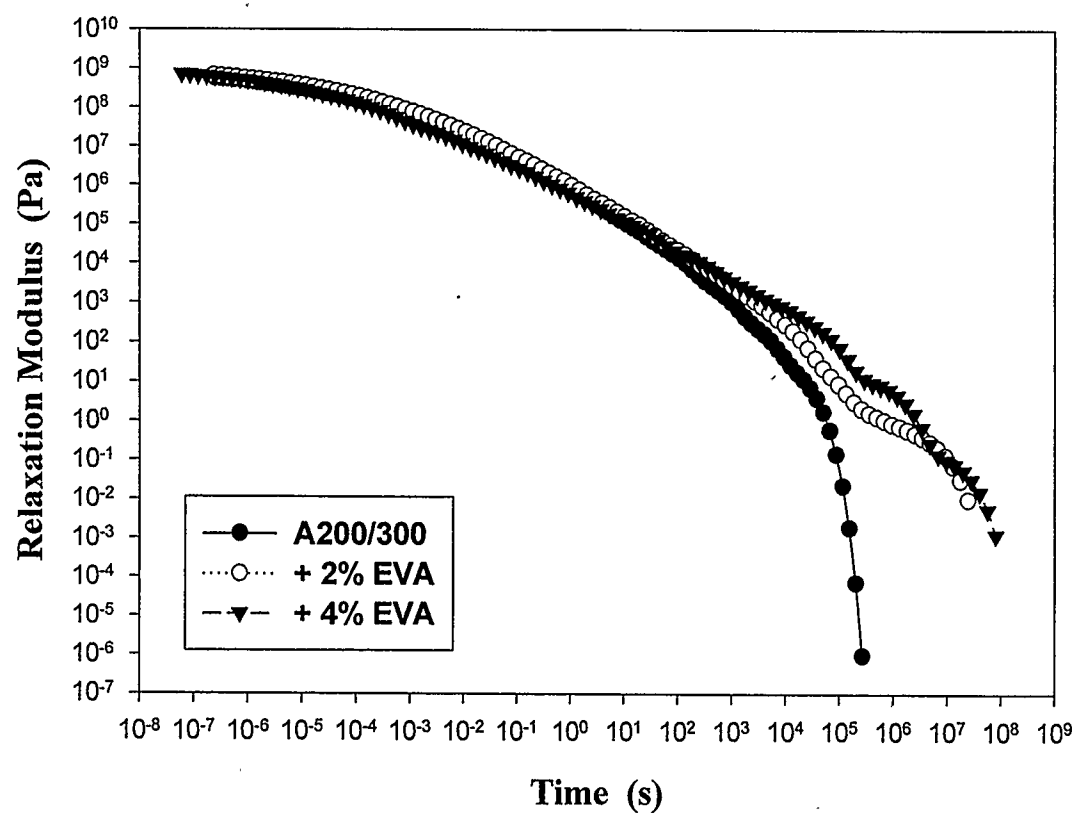


Figure B 68 Relaxation Modulus, A200/300 Pen grade + 2, 4 % EVA

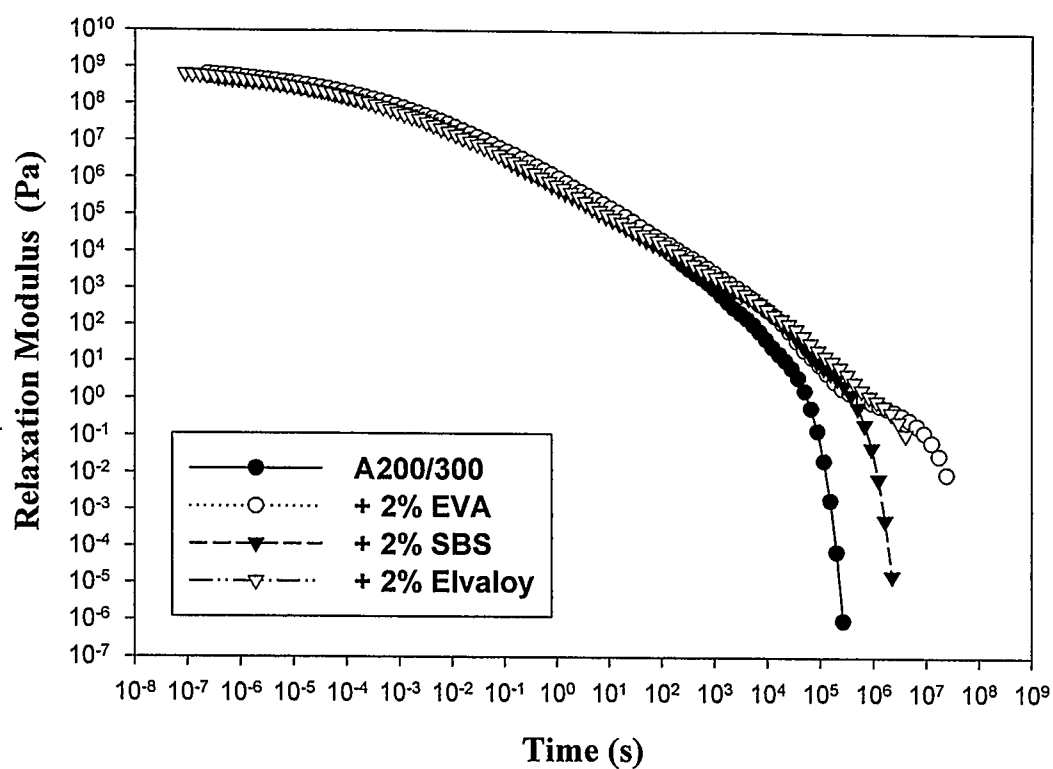


Figure B 69 Relaxation Modulus, A200/300 Pen grade + 2 % radial SBS, EVA, EGA

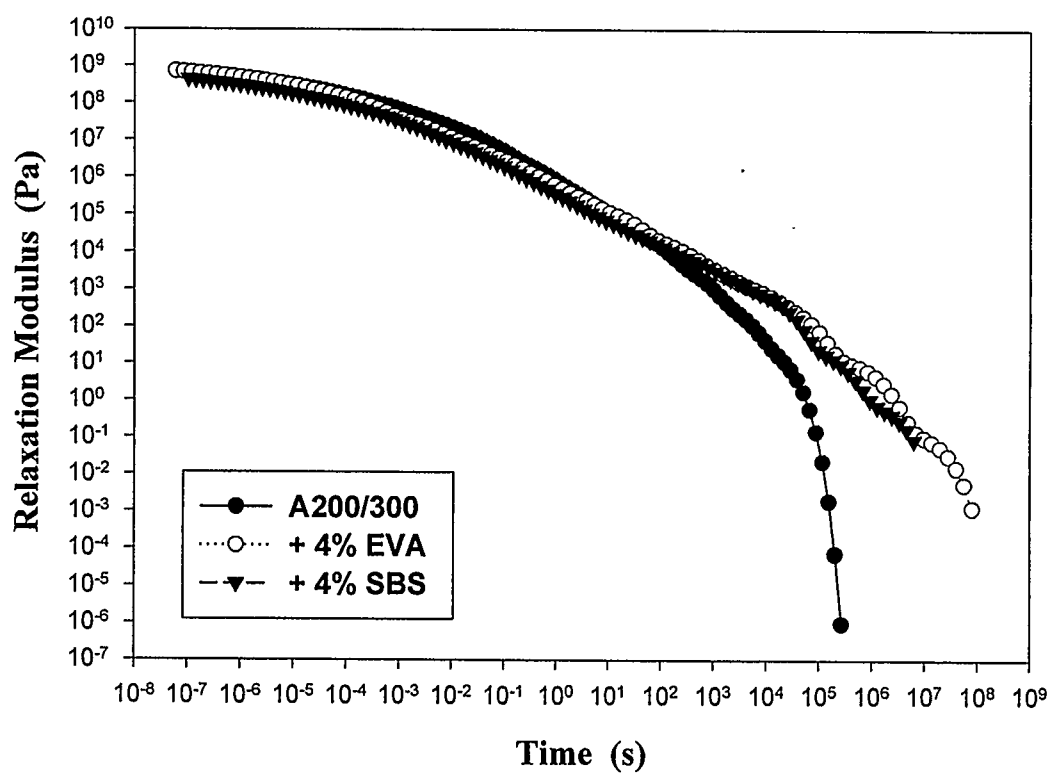


Figure B 70 Relaxation Modulus, A200/300 Pen grade + 4 % radial SBS, EVA

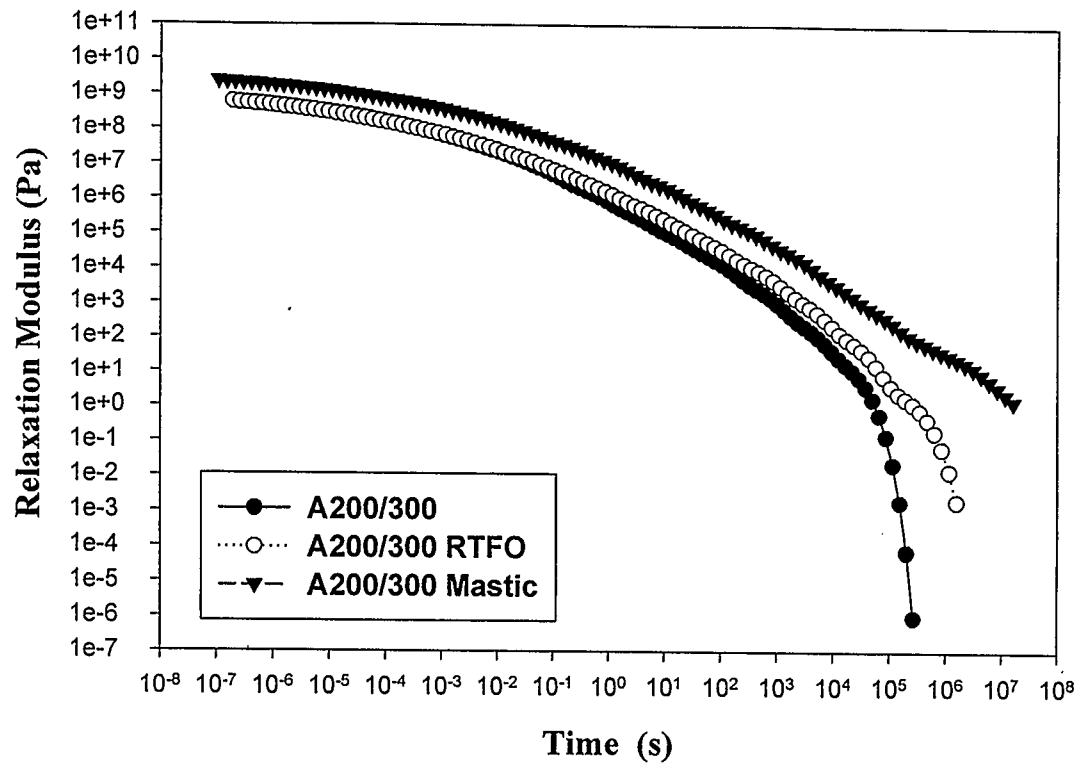


Figure B 71 Relaxation Modulus, A200/300 Pen grade + RTFO aged and Mastic

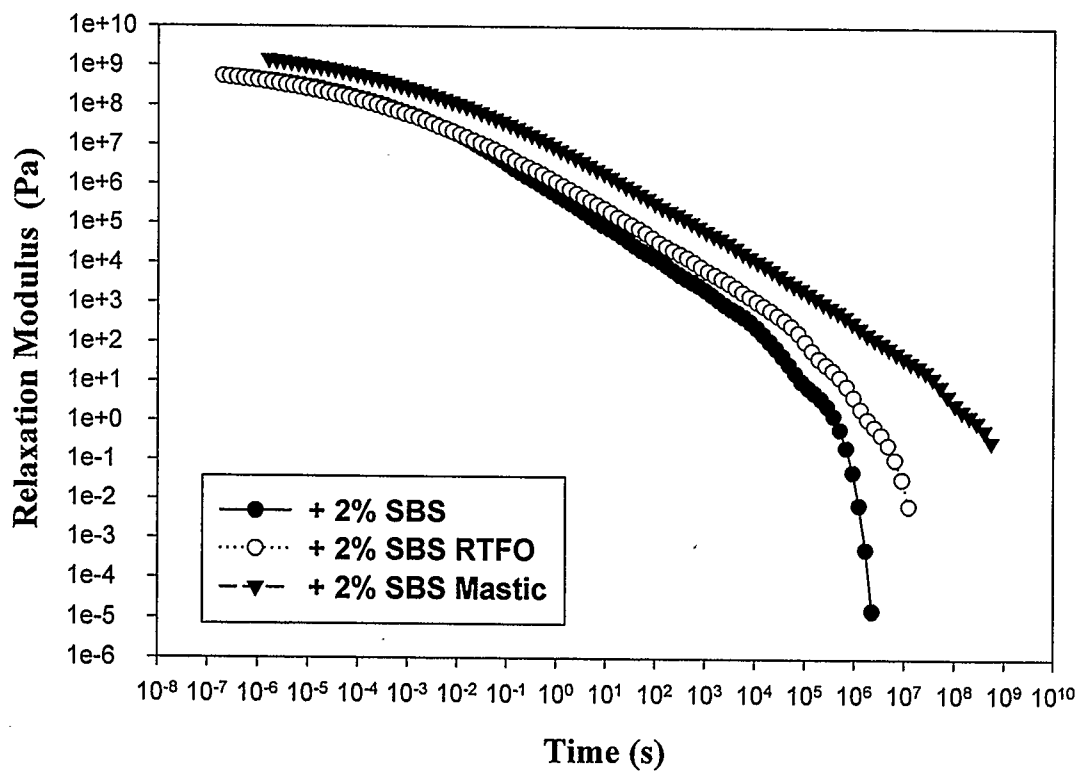


Figure B 72 Relaxation Modulus, A200/300 Pen grade + 2 % radial SBS, 2 % radial SBS RTFO aged and Mastic

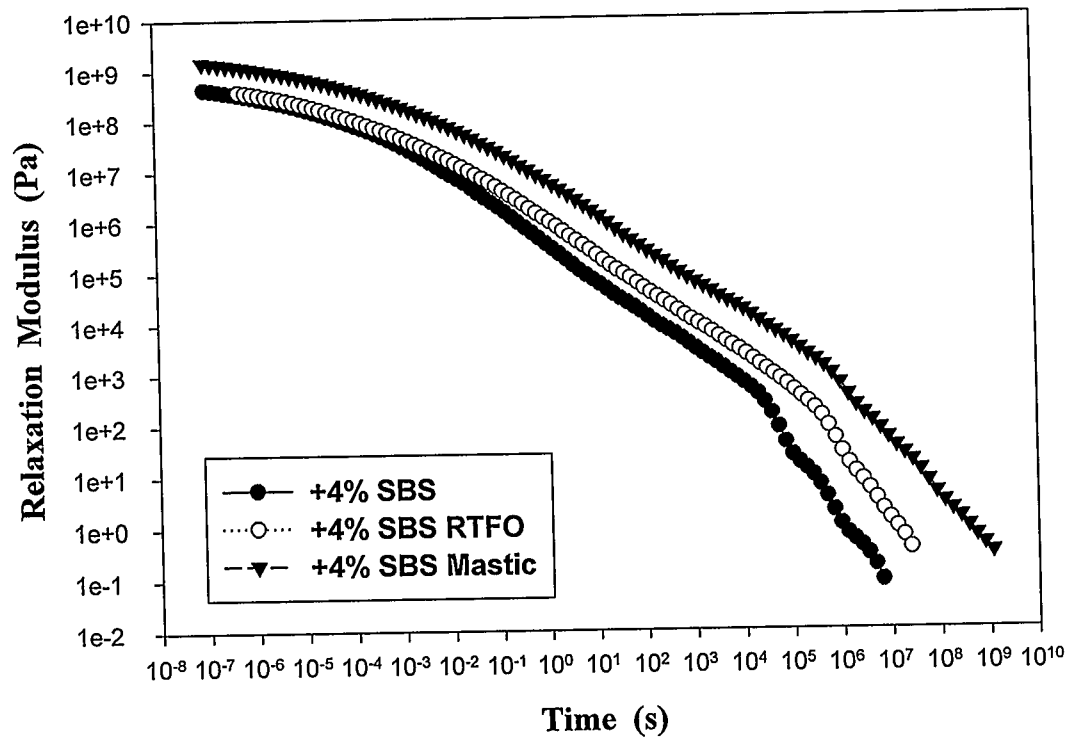


Figure B 73 Relaxation Modulus, , A200/300 Pen grade + 4 % radial SBS, 4 % radial SBS RTFO aged and Mastic

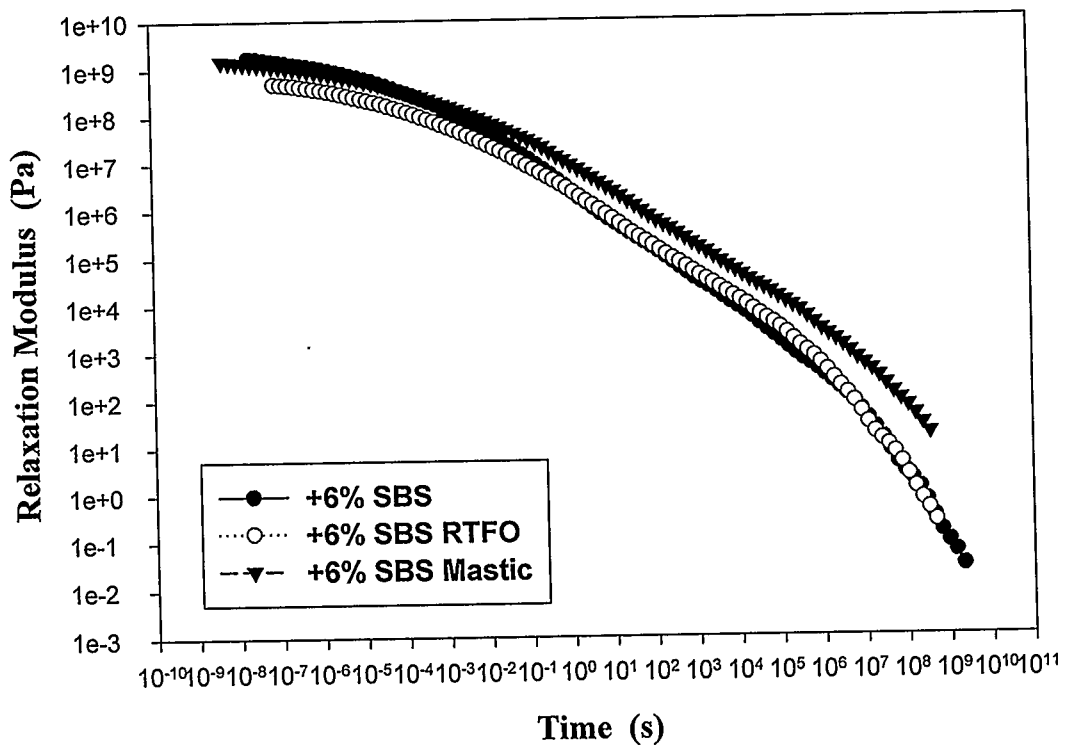


Figure B 74 Relaxation Modulus, A200/300 Pen grade + 6 % radial SBS, 6 % radial SBS RTFO aged and Mastic

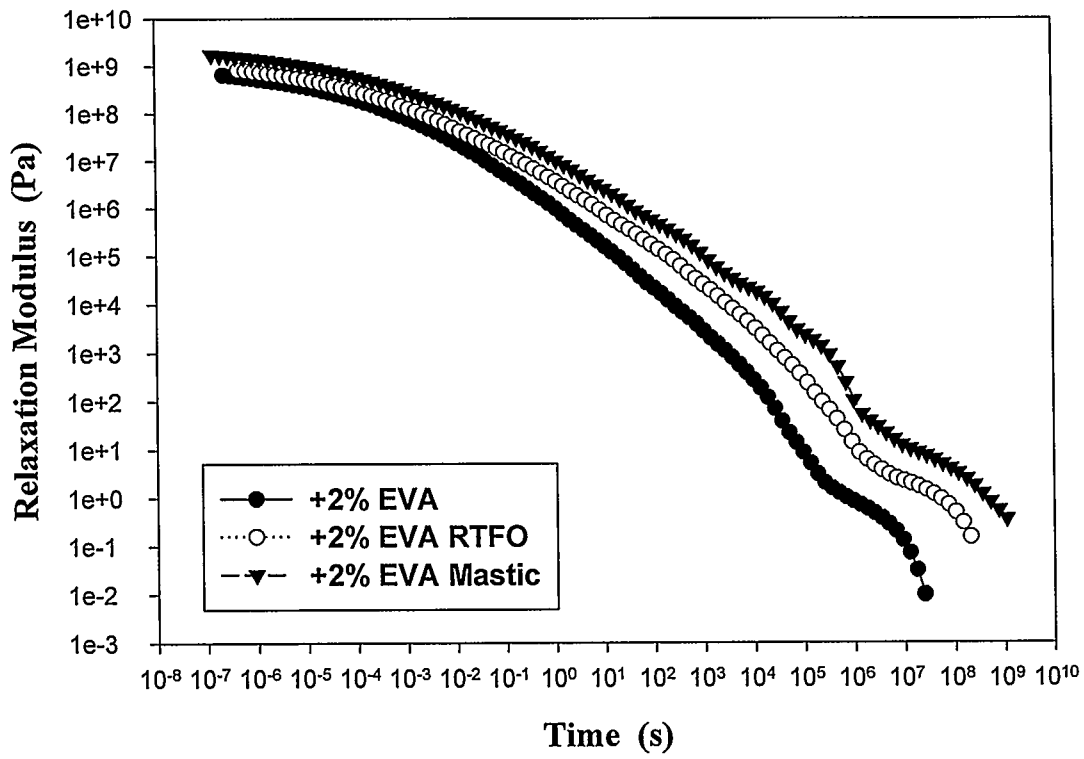


Figure B 75 Relaxation Modulus, A200/300 Pen grade + 2 % EVA, 2 % EVA RTFO aged and Mastic

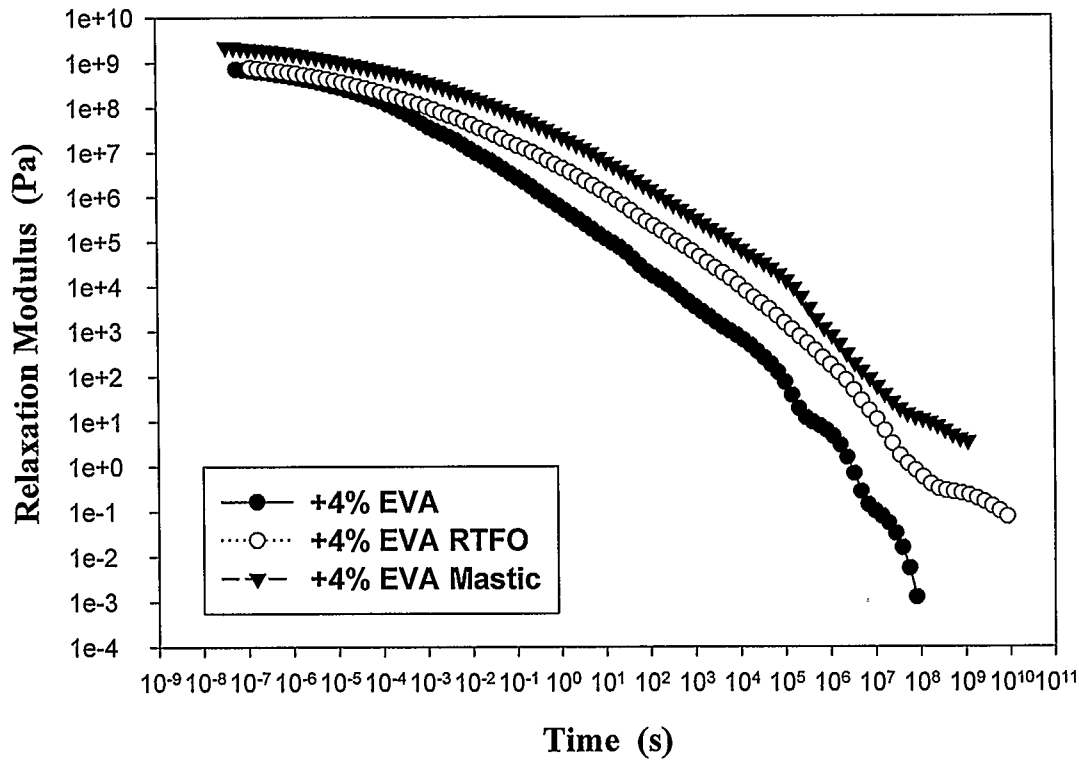


Figure B 76 Relaxation Modulus, A200/300 Pen grade + 4 % EVA, 4 % EVA RTFO aged

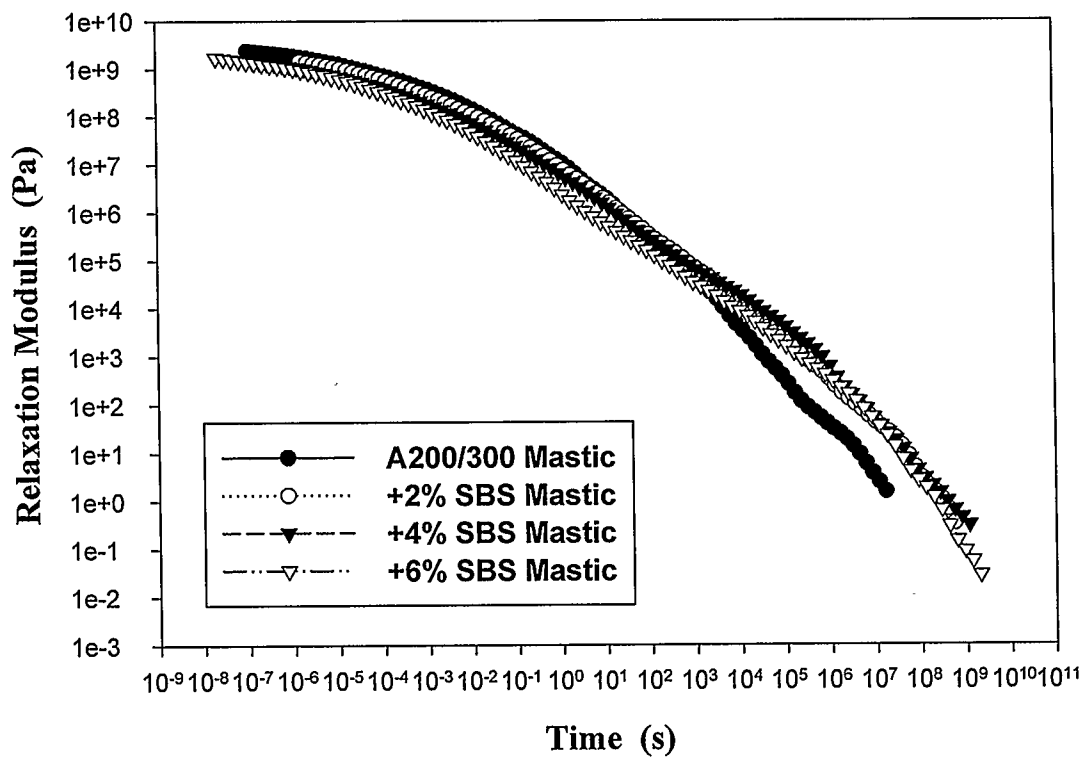


Figure B 77 Relaxation Modulus, Mastic A200/300 Pen grade and Mastic 2, 4, 6 % SBS radial

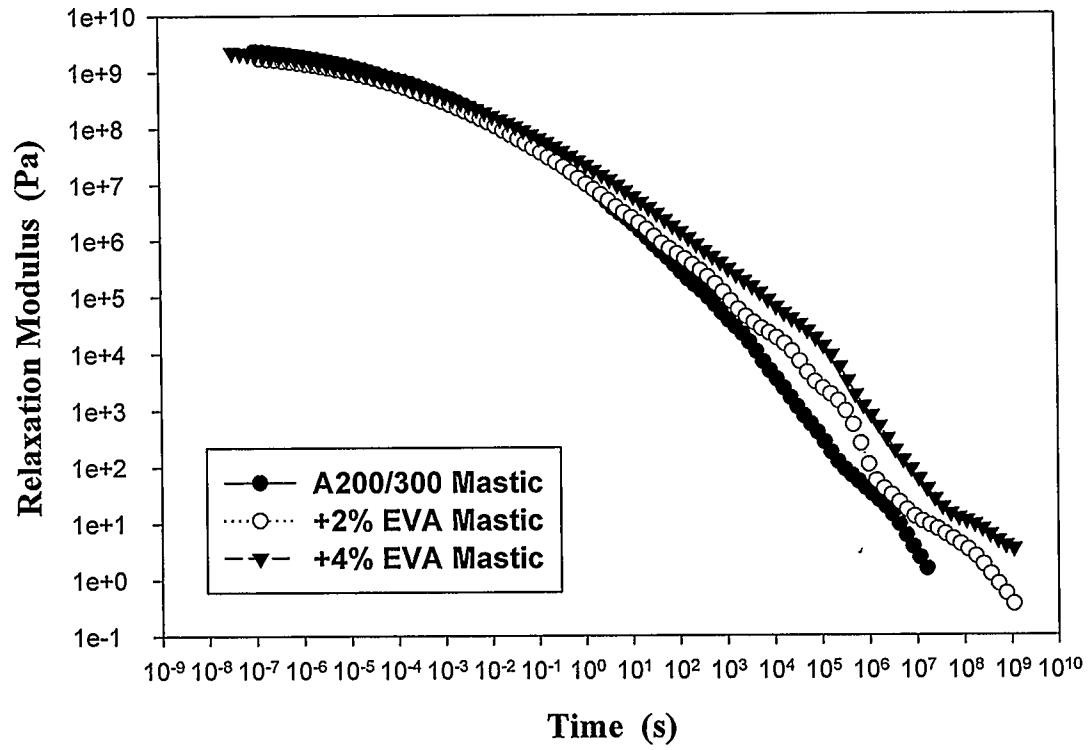


Figure B 78 Relaxation Modulus, A200/300 Pen grade and Mastic 2, 4 % EVA

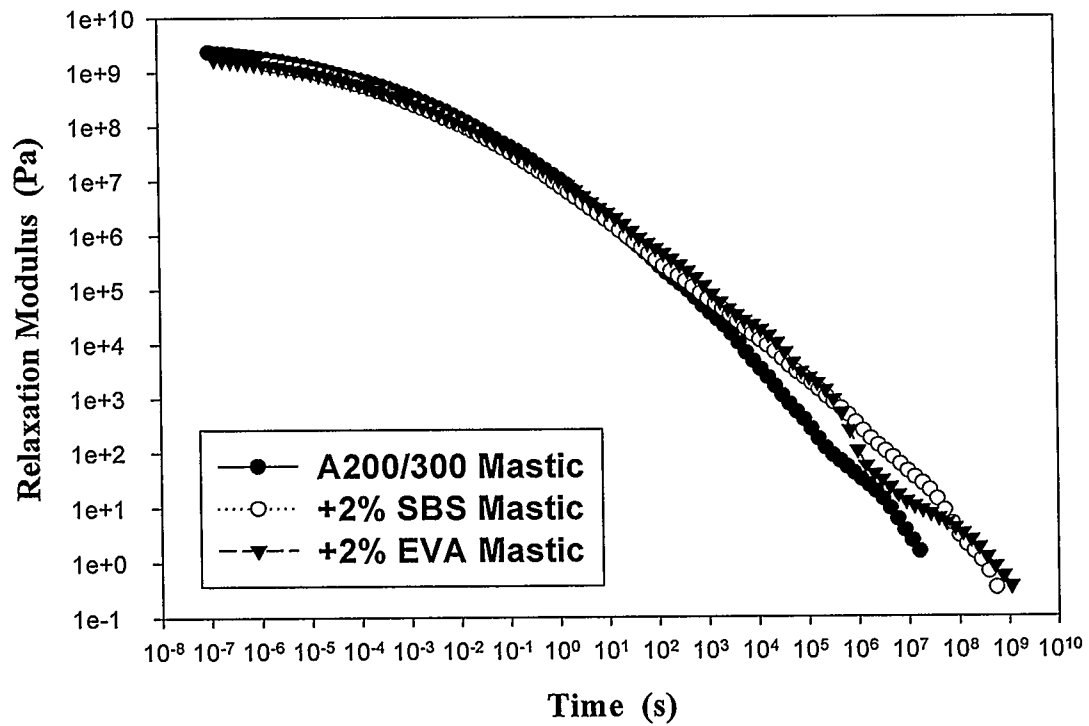


Figure B 79 Relaxation Modulus, Mastic A200/300 Pen grade and Mastic 2 % SBS radial, EVA

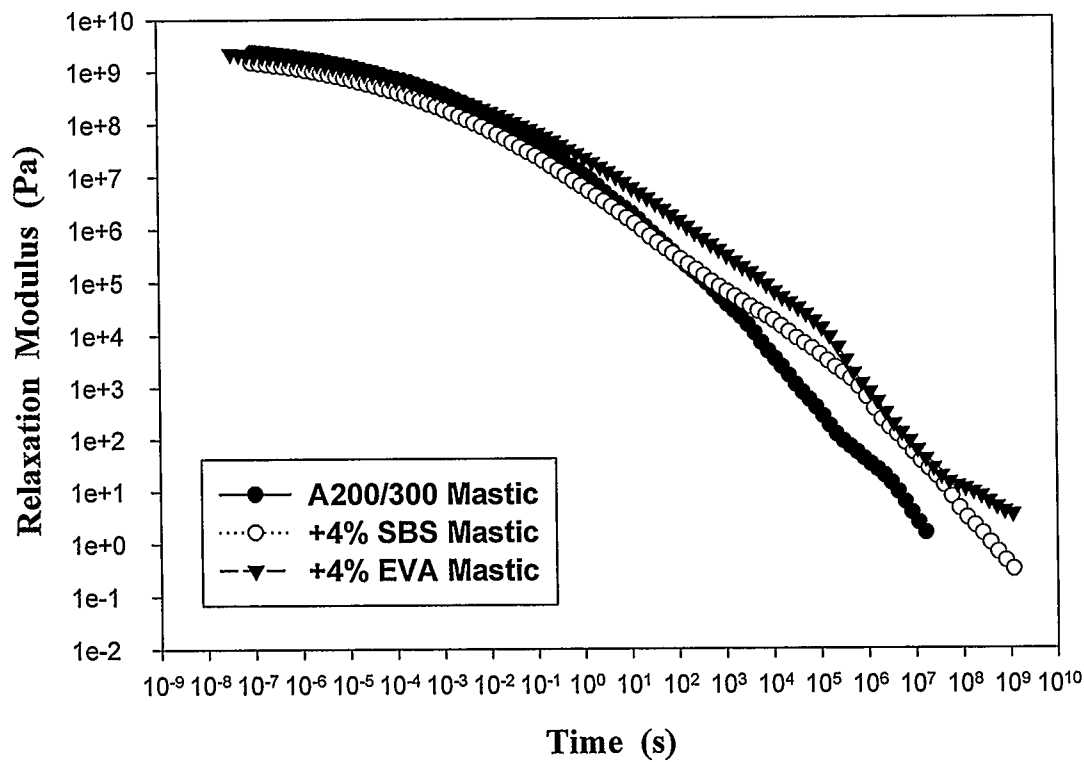


Figure B 80 Relaxation Modulus, Mastic A200/300 Pen grade and Mastic 4 % SBS radial, EVA

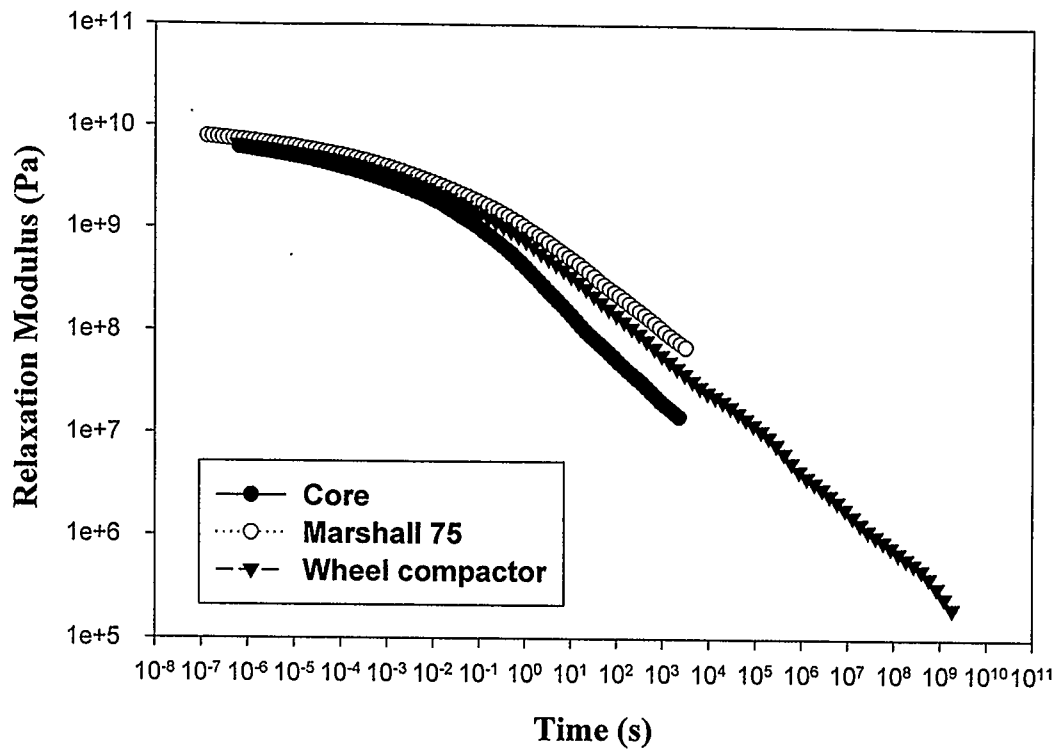


Figure B 81 Relaxation Modulus, HMA, three compaction methods

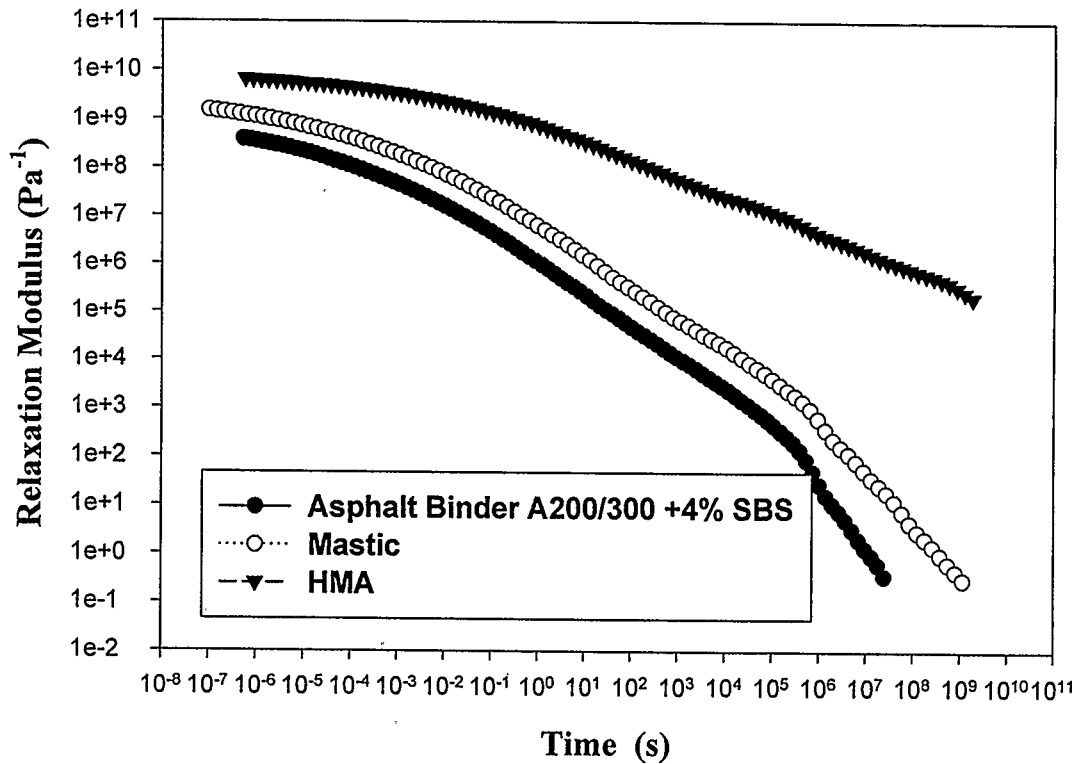


Figure B 82 Relaxation Modulus, A200/300 Pen grade + 4 % SBS radial, Mastic, HMA