

IMPROVED PLASTICIZERS FOR POLYSULFIDES

We would like to present candidates for polysulfide sealants. We have used as a control the chlorinated biphenyls.

A. AUTOMOTIVE

The two most commonly used chlorinated biphenyls are Aroclor® 1248 and 1254. We suggest the following candidates for evaluation:

1. Santicizer® 679
2. Santicizer® 213
3. Aroclor 5442/5460 (30%) plus Santicizer 261 (70%) for Aroclor 1248 replacement.
4. Aroclor 5442/5460 (52%) plus Santicizer 261 (48%) for Aroclor 1254 replacement.

These products should have minimal softening or marring effect on acrylic enamels. The use of chlorinated terphenyls (Aroclor 5442/5460) will stabilize the physical properties of the sealant over a temperature range up to 70°C, thicken the plasticizer to give non-sag properties and provide the excellent adhesion characteristics of Aroclor plasticizers.

On a per pound basis, Santicizer 679 is cheaper than Aroclor 1248 or 1254. Santicizer 213 is cheaper than Aroclor 1248 or 1254 on a pound-volume basis. Santicizer 261/solid Aroclor blends compare favorably with Aroclor 1248 or 1254 on a pound-volume basis.

Aroclor 5442 and 5460 can be very readily dissolved in Santicizer 261.

B. LIGHT CONSTRUCTION

The most commonly used Aroclor plasticizers in building sealants are: Aroclor 1248, 1254, 1260 and 1262.

Monsanto suggestions for replacements are:

1. Santicizer 261
2. Santicizer 148
3. Aroclor 5442 or 5460 blends with Santicizer 160 or 261.

Santicizer 261

An evaluation of Santicizer 261 versus Aroclor 1254 in polysulfide is shown in Tables 1 and 2.

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Table 1

SANTICIZER® 261

VERSUS

AROCLOR® 1254

	Santicizer® 261	Aroclor® 1254
Molecular Weight	368	326
Vap. Press. (200° C)	1.00 mm. Hg.	9.00 mm. Hg.
Viscosity (centistokes)	78.3 (25° C)	7.5-10.0 (100° C)
Weight/Gallon (LB 25° C)	8.9	12.8
A1 25 PHR (A) in LP.32/SRF at 30 PHR Wt. Loss (7 days at 100° C)	< 15%	~ 25%
A1 40 PHR (B) in LP.32/CaCO ₃ at 40 PHR Shore A	12	21
% Wt. Loss (7 days at 70° C)	1.9%	2.1%
100% Modulus (psi)	40	41
100% Modulus (7 days in H ₂ O at 70° C) (psi)	33	38
Tensile Strength (psi)	104	99
Tensile Strength (7 days in H ₂ O at 70° C) (psi)	102	157
% Elongation	365	475
% Elongation (7 days in H ₂ O at 70° C) (psi)	665	835

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Table 2
COMPARISON OF SANTICIZER 261
VERSUS
AROCLOR 1254

FORMULATION	PHR	^A WEIGHT	PHR	^B WEIGHT
Polysulfide ⁽¹⁾	100		100	
SRF Carbon Black	30	100	-	
Uncoated CaCO ₃	-		40	100
Plasticizer	25		40	
CATALYST SYSTEM				
Lead Dioxide	50		50	
Stearic Acid	5	15	5	15
Plasticizer	45		45	
Sulfur	-	-	-	0.1

⁽¹⁾ Thiokol's LP-32

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Santicizer 148

Santicizer 148 should give lower volatility in polysulfides than Aroclor 1254. It is lower in viscosity.

	Vapor Pressure mm. Hg. (200° C)	Viscosity Centistokes (25° C)
Santicizer 148	0.54	22.0
Santicizer 261	1.00	78.3

Santicizer 148 (iso decyl diphenyl phosphate) has excellent resistance to U. V. and outdoor weathering. This factor could lead to improved performance in sealants requiring good adhesion to glass. Evaluations so far indicate that Santicizer 148 performs favorably in comparison to Santicizer 278 in insulated glass sealants. Santicizer 148 is appreciably cheaper than Santicizer 278.

Aroclor 5442/5460 Blends in Santicizer 160/261

Aroclor 5460 in blends with Santicizer 160 and 261 has been screened in a polysulfide formulation. Results are shown in Table 3.

By using Aroclor 5442 or 5460 blends with Santicizer 160 or 261, a formulator can have much greater versatility in obtaining an equivalent to or a compromise between Aroclor 1248, 1254, 1260, 1262. Ways to do this are shown in Table 4.

The solid Aroclor can be easily dissolved in Santicizer 160 or 261 by heating the blend. In the case of Aroclor 5442, a temperature of 50° C (122° F) should be adequate.

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Table 3

Polysulfide ⁽¹⁾	:	100	)	
			)	
Filler	:	30	)	100
			)	
Plasticizer	:	25	)	
			)	
Lead Dioxide	:	50	)	
			)	
Santicizer 160	:	45	)	15
			)	
Stearic Acid	:	5	)	

Plasticizer	Initial Hardness (24 Hour Cure) Shore A	Volatility % Plasticizer Lost (1 Day/ 87° C) (2)
Aroclor 1254	28	7.5
Aroclor 1260	30	4.7
Aroclor 5460/Santicizer 160 (2/1)	30	4.5
Aroclor 5460/Santicizer 261 (2/1)	29-30	4.0
Aroclor 5460/Santicizer 261 (1/1)	26-27	4.5

(1) Thiokol's L.P.-32

(2) Activated carbon method

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Table 4

Viscosity (Centipoises)

#6 HAT Brookfield at 23⁰ C

% Aroclor 5460 By Weight

	33-1/3	50	67-2/3
Santicizer 261	~ 670	~ 9,700	~ 458,000
Santicizer 160	~ 440	~ 4,000	~ 375,000
(Aroclor 1248	:	300-400 cps)	
(		)	
(Aroclor 1254	:	~ 12,000 cps)	

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