



*E*astman SAIB

Sucrose Acetate
Isobutyrate



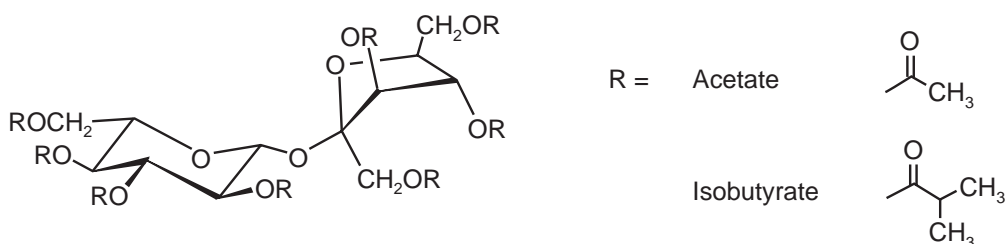
EASTMAN

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Eastman SAIB offers these formulating advantages:

- Increased nonvolatile content at application viscosity
- Increased modification of film-former without appreciable loss of film hardness
- Low volatility and low color at temperatures up to 170°C (340°F)
- Nondiscoloring in ultraviolet radiation
- Good stability in presence of metallic pigments
- Excellent solubility and compatibility with polymers and modifiers
- Good pigment dispersion medium and/or dispersion aid



Sucrose acetate isobutyrate (SAIB) is useful in lacquers, printing inks, hot melts, and similar protective and decorative coatings. Eastman produces SAIB commercially by the controlled esterification of sucrose, a natural sugar, with acetic and isobutyric anhydrides.

Eastman SAIB is characterized as a modifying extender for film-formers and extrudable plastics. At levels up to 15% in some polymers, SAIB has minimal effect on surface hardness. High levels of SAIB provide flexibility and reduction in thermal softening temperatures.

Physical Properties

Very light color (less than 1, *Gardner* color scale), low volatility, and good thermal stability are basic features of *Eastman* SAIB. Its color stability to heat and ultraviolet light is also good. For example, after heating at 171°C (340°F) for 6 days, it changed only 8 points in *Gardner* color. The thermal stability, low volatility (see Figure 1), and low odor of SAIB suggest its use in high temperature applications [up to 171°C (340°F)]. Hydrolytic stability is also excellent—less than 0.3% hydrolyzed after 4 days in boiling water.

The electrical properties of SAIB are equal to or better than those of many widely-used plasticizers, and it possesses an especially high volume resistivity. Because of these properties and its good thermal hydrolytic stability, SAIB is useful in surface coatings for electrical insulation.

An unusual property of SAIB is its abrupt change in viscosity with temperature variation or with the addition of solvents. For example, SAIB has a viscosity of about 100,000 cP (mPa·s) at 30°C (86°F). An increase in temperature of only 20°C (68°F) reduces the viscosity to approximately 8,000 cP (mPa·s) as shown in Figures 2 and 3. At 90% nonvolatile in toluene, it has a viscosity of 1,100 cP (mPa·s) at 25°C (77°F) (see Figure 7, p. 8). At 90% nonvolatile in *Tecsol C* special industrial solvent, SAIB has a viscosity of 700 cP (mPa·s) at 25°C (77°F) (see Figure 8, p. 8).

Benefits

Eastman SAIB can yield lacquers and printing inks of higher nonvolatile content, resulting in lower solvent requirements and greater coverage (increased film deposition per lacquer coat). In many cases, film adhesion and gloss are improved. SAIB can also be emulsified.

In hot melt formulations, SAIB exhibits good color retention and stability on heat aging. For example, in melts composed of DOP (di-2-ethylhexyl phthalate) and resin, volatilization losses may be 8% of the total weight in 24 hours at 171°C (340°F). When DOP is replaced with SAIB, losses are less than 1% for a similar period. At elevated temperatures, SAIB is an active solvent for a variety of thermoplastic resins. The use of SAIB can simplify many conventional hot melt formulas by replacing various combinations of ingredients, both resins and plasticizers.

Figure 1

Relative Volatility of Eastman SAIB

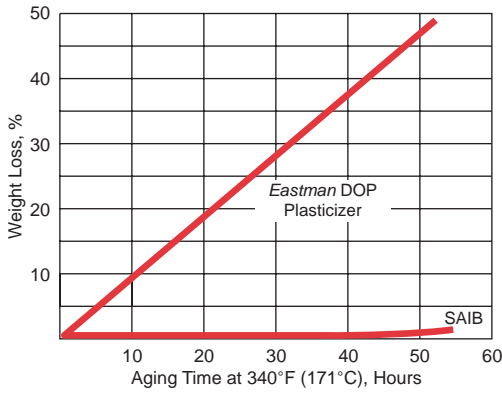


Figure 4

Volume Resistivity of Eastman SAIB at Various Temperatures

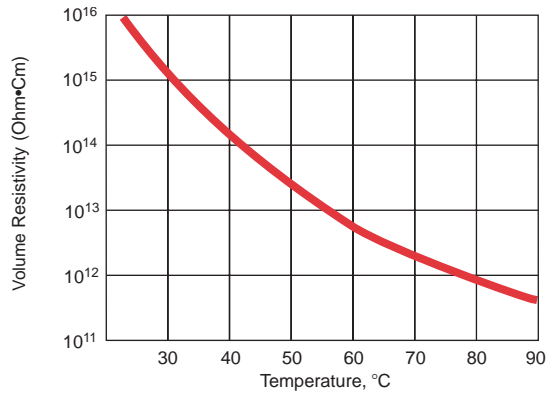


Figure 2

Viscosity of Eastman SAIB as Influenced by Temperature

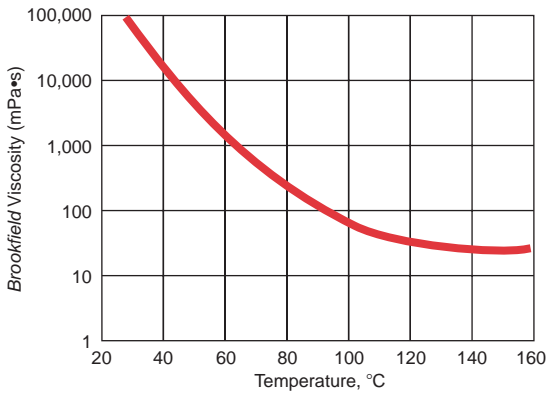


Figure 5

Dissipation Factor of Eastman SAIB at Various Temperatures

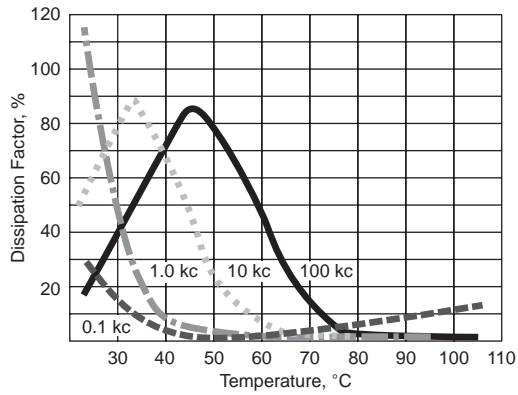


Figure 3

Viscosity of Eastman SAIB-90 as Influenced by Temperature

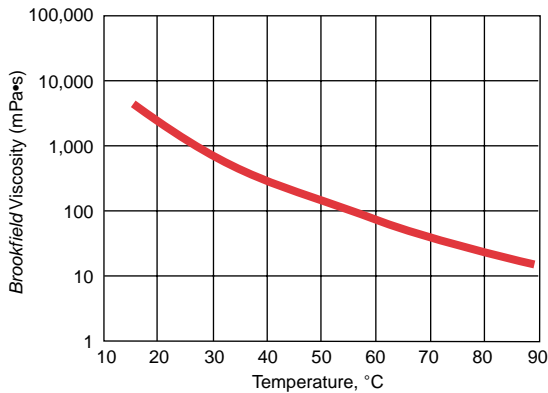
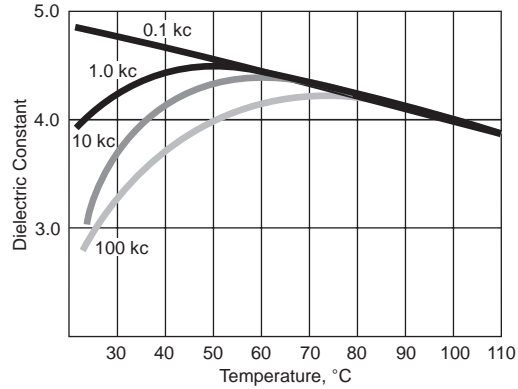


Figure 6

Dielectric Constant of Eastman SAIB at Various Temperatures



Typical Properties

Table 1
Typical Properties^a

	<i>Eastman SAIB</i>	
Molecular weight (actual)	832–856	
Specific gravity @ 25°C/25°C	1.146	
Weight per volume		
kg/L	1.14	
lb/Imperial gal	11.46	
lb/U.S. gal	9.55	
Flash point, <i>Cleveland</i> Open Cup, °C (°F)	260 (500)	
Solubility in water @ 25°C, wt %	0.1	
Appearance	Free from insoluble matter or haze	
Color (Pt-Co scale), max.	200	
Color (<i>Gardner</i> scale)	1	
Heat test color after 24 h @ 177°C, <i>Gardner</i> scale	10 max.	
Onset of decomposition @ 760 mm, °C (°F) ^b	215 (419)	
Haze, ppm (Pt-Co standard)	1	
Refractive index, n 20/D	1.454	
Acid number, max.	0.20	
Volume resistivity ^c (ASTM D257), ohm-cm	6.4×10^{13}	
Dissipation factor @ 1 MHz ^d (ASTM D150), %	1.46	
Dielectric constant @ 1 MHz ^e (ASTM D150)	3.2	
Dielectric strength (ASTM D149)		
kv/mil	0.35	
kv/mm	13.8	
Saponification equivalent	104.0–107.0	
Coefficient of thermal expansion (30°–60°C), (cm ³ /cm ³ /°C)	8.6×10^{-4}	
Surface tension at 19°C, dynes/cm ²	28	
Specific heat, cal/g/°C		
@ 75°C	0.38	
100°C	0.40	
125°C	0.42	
150°C	0.43	
175°C	0.44	
Hydrolysis stability refluxed in water for 96 hr @ 100°C (212°F), wt % hydrolyzed	0.3	
<i>Brookfield</i> viscosity, ^f approx. cP (mPa·s)		
@ 30°C	100,000	
100°C	105	
160°C	16	
	SAIB 90	SAIB 90EA
Nonvolatile matter, %	89.5–90.5	89.5–90.5
Acid number, max.	0.20	0.20
Weight per volume		
kg/L	1.10	1.11
lb/Imperial gal	10.98	11.11
lb/U.S. gal	9.15	9.24
Viscosity @ 25°C, cP (mPa·s)	770	935
Flash point, Tag Closed Cup, °C (°F)	18 (64)	22 (71)
Color (Pt-Co scale), max.	200	200
Color (<i>Gardner</i> scale)	1	1

^aProperties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform to the listed properties.

^bDetermined by differential scanning calorimetry in oxygen.

^cSee Figure 4.

^dSee Figure 5.

^eSee Figure 6.

^fSee Figure 2, p. 4.

Solubility

The low solution viscosities listed in Table 2 indicate the excellent solubility of *Eastman* SAIB in many common solvents. The solubility of SAIB in some widely used aerosol propellants suggests a possible use in pressurized packaging. Although SAIB will not dissolve in mineral spirits, it is soluble in hexane and *VM&P* naphtha. Figures 7, 8, 9, 10, and 11 show the effect of several commonly used lacquer solvents on the solution viscosity of SAIB.

Table 2
Solution Viscosity of *Eastman* SAIB

(50% Concentration,
Brookfield Viscosity at 25°C)

Solvent	Viscosity cP (mPa·s)
Alcohols and Glycol Ethers	
Methyl alcohol	8
<i>Eastman</i> PM solvent	11
Ethyl alcohol	12
n-Propyl alcohol	14
Isopropyl alcohol	14
n-Butyl alcohol	15
Isobutyl alcohol	20
<i>Eastman</i> EB solvent	21
Diacetone alcohol	23
Methyl isobutyl carbinol	24
Esters and Glycol Ether Esters	
Ethyl acetate	8
Isopropyl acetate	8
<i>Eastman</i> PM acetate	8
n-Butyl acetate	9
Isobutyl acetate	9
Amyl acetate	10
<i>Eastman</i> EEP solvent	10
Ethyl lactate	21
Hydrocarbons	
Hexane	6
Toluene	9
Xylene	9
<i>VM&P</i> naphtha	10
Aromatic 100 solvent	12
Ketones	
Acetone	6
Methyl ethyl ketone	6
Methyl isobutyl ketone	8
Methyl isoamyl ketone	10
Cyclohexanone	22
Isophorone	27
Other Solvents	
Diethyl ether	4
Methylene chloride	9
Nitromethane	10
Dimethylformamide	10
Ethylene chloride	15

Figure 7

**Solution Viscosity of Eastman SAIB in Toluene
(Brookfield Viscosity at 25°C)**

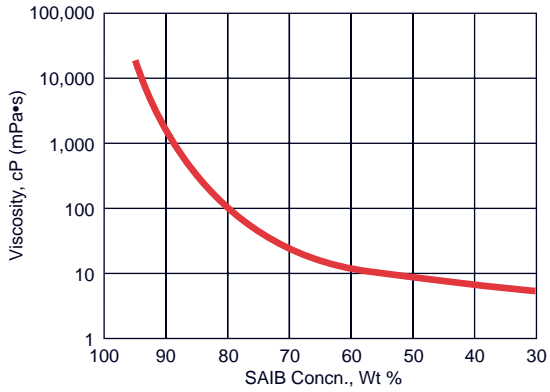


Figure 10

**Solution Viscosity of Eastman SAIB
in Methyl Ethyl Ketone
(Brookfield Viscosity at 25°C)**

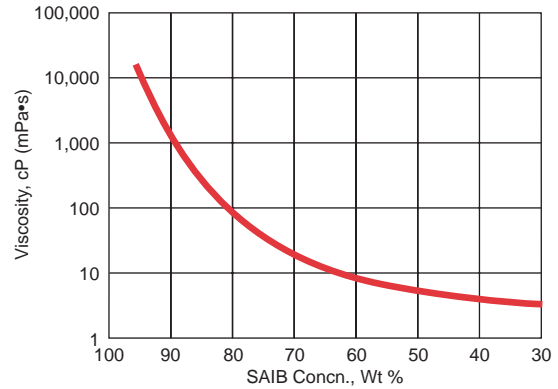


Figure 8

**Solution Viscosity of Eastman SAIB
in Tecsol Solvent
(Brookfield Viscosity at 25°C)**

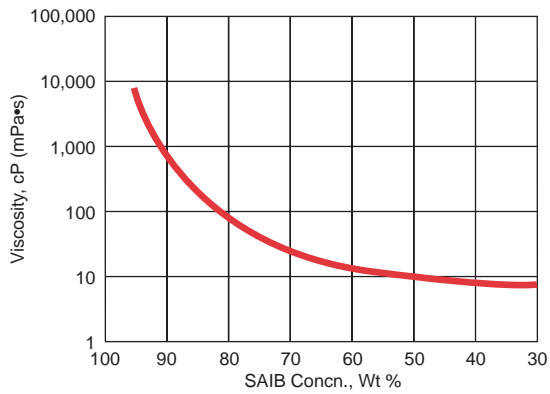


Figure 11

**Solution Viscosity of Eastman SAIB in Acetone
(Brookfield Viscosity at 25°C)**

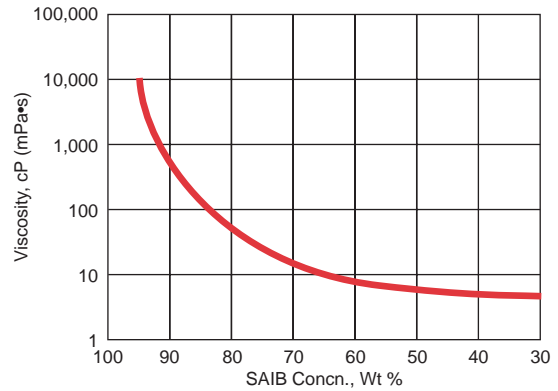
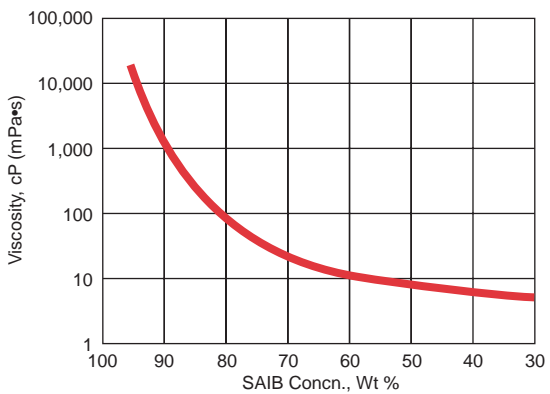


Figure 9

**Solution Viscosity of Eastman SAIB
in Ethyl Acetate (99%)
(Brookfield Viscosity at 25°C)**



Compatibility

A large number of resins, plasticizers, oils, and waxes are compatible with *Eastman* SAIB, as shown in Table 3, but rubber compounds are generally incompatible with SAIB. Because it is compatible with most major film-formers, SAIB may be used in such diversified applications as polystyrene molding formulas and polyvinyl alcohol solutions. For the compatibility data in Table 3, solutions of SAIB with the resin, oil, or plasticizer were prepared in appropriate solvents, and films were cast. All films were conditioned for 48 hours at 23°C (73°F) and then examined under a strong light for evidence of incompatibility. The SAIB/wax compositions were prepared as melts and examined after cooling. Because SAIB is soluble in practically all commonly used lacquer solvents and flexographic and gravure ink solvents, solvent selection was based on the solubility of the individual resin or film-former.

Table 3
Compatibility of Various Resins With Eastman SAIB^a

Resin ^b	SAIB:Resin			Type
	1:4	1:2	2:1	
AYAC	C	C	C	Polyvinyl acetate
Paraloid A-101	C	C	C	Acrylic
Paraloid B-66	C	C	C	Acrylic
Paraloid B-82	C	C	C	Acrylic
Aroplaz 2477	C	C	SI	Alkyd-castor
Beckamine 21-511	C	I	I	Urea-formaldehyde
Cymel 216-8	C	I	I	Urea-formaldehyde
Eastman CA-398-3	SI ^c	SI	I	Cellulose acetate
Eastman CA-435-85S	C	C	C	Cellulose triacetate
Eastman CAB-381-0.5	C	C	C	Cellulose acetate butyrate
Eastman CAP-482-0.5	C	C	C	Cellulose acetate propionate
Eastman CAP-504-0.2	C	C	C	Cellulose acetate propionate
Epon 1001	C	I	I	Epoxy (bisphenol A type)
Ethylcellulose N-4	C	C	C	Ethylcellulose
Elvacite 2010	C	C	C	Acrylic
Elvacite 2013	C	C	C	Acrylic
Shellac	C	SI	I	Natural
RCI 12-808	C	C	C	Alkyd
RCI 21-805	C	I	I	Urea-formaldehyde
RCI 27-803	I	I	I	Melamine-formaldehyde
RCI 27-809	I	I	I	Triazine
RS ½-sec	C	C	C	Cellulose nitrate
Versamid 125	C	SI	I	Polyamide
VYHH	C	C	SI	Polyvinyl acetate-chloride

Plasticizer ^b	SAIB:Plasticizer		Type
	1:2	2:1	
Butyl stearate	C	C	Epoxy
Camphor	C	C	Natural
Castor oil	C	C	Monomeric
Diisobutyl adipate	C	C	Monomeric
Diocetyl sebacate	C	C	Monomeric
Eastman DBP	C	C	Dibutyl phthalate
Eastman DOA	C	C	Diocetyl adipate
Eastman DOP	C	C	Diocetyl phthalate
Eastman 168	C	C	Bis(ethylhexyl)terephthalate
Eastman triacetin	C	C	Glycerol triacetate
Eastman TEG-EH	C	C	Triethylene glycol bis(2-ethylhexanoate)
Paraplex G-62	C	C	Epoxy-type plasticizer
Plasthall 200	C	C	Dibutoxyethyl phthalate
Plasthall 207	C	C	Monomeric
Santicizer 160	C	C	Monomeric
Triphenyl phosphate	C	C	Monomeric

Oil ^b	SAIB:Oil		Type
	1:3		
Castor	C		Nondrying
Chinawood	SI		Drying
Corn	C		Nondrying
Cottonseed	C		Nondrying
Linseed, raw	C		Drying
Linseed, crystal boiled	C		Drying
Peanut	C		Drying
Soya	C		Drying

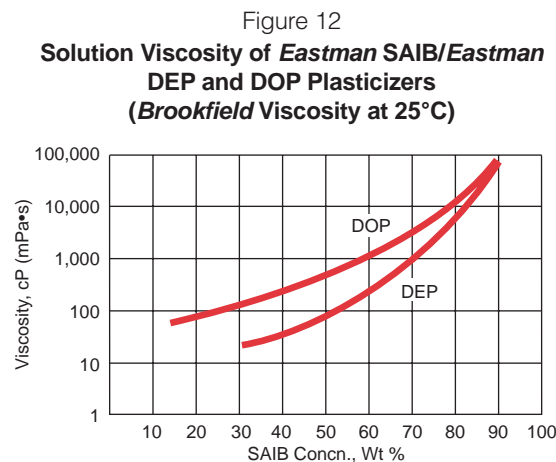
^a C = Compatible
VSI = Very slightly incompatible
SI = Slightly incompatible
I = Incompatible

^b Suppliers listed on page 20.

^c Compatible at 15 wt % SAIB.

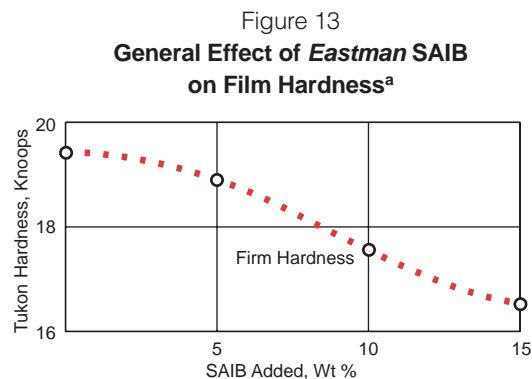
Plasticization

For some applications, further plasticization of *Eastman* SAIB-modified compositions may be required. In laboratory evaluations, several plasticizers have produced good film properties when used with SAIB. Among these are *Eastman* DMP, *Eastman* DOP, *Eastman* DEP, and *Eastman* DBP. The effect of SAIB concentration on the viscosity of representative plasticizers is shown in Figure 12.



Effect of *Eastman* SAIB on Film Properties

Examination of the effects of *Eastman* SAIB on the film properties of various polymers indicates the description “modifying extender” is appropriate for this unique compound. SAIB often exhibits very little plasticizing action on films, even at relatively high concentrations. This characteristic allows for modification of many film-formers with SAIB without a significant change in physical properties, but with a beneficial increase in the nonvolatile content. The general effect which SAIB addition might have on the film properties of a polymer is shown in Figure 13. A nitrocellulose lacquer serves as the example; changes in film hardness indicate the influence of increasing the SAIB concentration.



^aLacquer composition: 3/2/1 RS nitrocellulose/maleic resin/*Eastman* DOP Plasticizer

Water-Vapor-Transmission

Inclusion of *Eastman* SAIB in a lacquer formulation has only a very slight effect on the water-vapor-transmission rate of the films produced. The influence of SAIB on the specific permeability of a nitrocellulose film is indicated by the data in Table 4.

Table 4
Effect of *Eastman* SAIB on Film Permeability

Components	A	B	C	D	E
RS ½-sec nitrocellulose	100	75	50	25	41.6
<i>Eastman</i> SAIB	—	25	50	75	41.6
<i>Paraplex</i> G-62 plasticizer	—	—	—	—	16.8
	100	100	100	100	100.0
Specific permeability ^a	1.06	0.97	0.89	1.42	0.70

^amg H₂O/cm²/mm thickness/24 hr at 23°C

Applications

Wood Lacquers

The performance of *Eastman* SAIB in various lacquer, ink, hot melt, peelable plastics and related formulations has been studied. In most of the following examples, SAIB replaced one or more of the modifying ingredients in a standard formulation, and any resulting changes in the characteristics of the formulation were noted.

■ Cellulose Acetate Butyrate:Acrylic

The effect of replacing part of an acrylic resin with SAIB in a cellulose acetate butyrate:acrylic wood lacquer is shown in Table 5. As illustrated by Formula B, the replacement of 20% of the acrylic resin with SAIB resulted in a lower solution viscosity and better flow properties.

Table 5
Eastman SAIB in Butyrate:Acrylic Wood Lacquers

Ingredients	A	B	C
<i>Eastman CAB-381-0.5</i>	8.50	8.50	8.30
<i>Paraloid B-66 (100%) resin</i>	8.50	6.90	8.30
<i>Santicizer 160 plasticizer</i>	3.00	3.00	3.00
<i>BYK300</i>	0.01	0.01	0.01
Toluene	44.99	44.81	43.38
<i>Tecsol C solvent, 95%</i>	10.00	10.00	9.70
Ethyl acetate	5.00	5.00	4.80
Isobutyl acetate	10.00	10.00	9.70
Methyl isoamyl ketone	10.00	10.00	9.70
<i>Eastman SAIB 90</i>	—	1.78	3.11
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
Lacquer Properties			
Nonvolatile, wt %	20.0	20.0	22.4
<i>Brookfield</i> viscosity @ 25°C, cP (mPa•s)	50	40	50
Weight/volume			
kg/L	0.903	0.903	0.903
lb/Imperial gal	9.05	9.05	9.05
lb/U.S. gal	7.54	7.54	7.54
Coating Properties			
Cold check cycles passed	20+	20+	20+
Sandability	Good	Good	Good
Print Resistance			
2 h @ 14 kPa at 52°C (2 h @ 2 psi at 125°F)	VSP ^a	VSP ^a	SP ^a
Mar resistance	Good	Good	Good
UV resistance (72 h accelerated exposure)	Good	Good	Good
Resistance to 12-h contact with			
ink	Excellent	Excellent	Excellent
lipstick	Good	Good	Good
mustard	Good	Good	Good
alcohol	Fair	Fair	Fair
boiling water	Fair+	Good-	Fair+

^aVSP = *Very slight printing*

In Formula C the nonvolatile content of the lacquer was increased 2.5% by the addition of SAIB with no sacrifice in performance. At greater increases, however, some sacrifice in sandability and print resistance was evident.

■ Polyesters

One major difficulty in spraying polyester wood coatings is flow control. *Eastman SAIB* does not replace flow-control agents such as *Eastman CAB-381-0.5*, but it does help improve flow-out and depth of finish and reduces surface imperfections. Table 6 illustrates the use of SAIB in an unsaturated polyester wood coating.

Table 6
Eastman SAIB in Unsaturated Polyester Wood Coatings

Ingredients	A	B	C
PART A			
Unsaturated polyester resin	60.0	54.0	51.0
Styrene monomer	34.7	34.7	34.7
Cobalt naphthenate	0.3	0.3	0.3
<i>Eastman CAB-381-0.5</i>	4.0	4.0	4.0
<i>Eastman SAIB</i>	—	6.0	9.0
PART B			
MEK peroxide	1.0	1.0	1.0
	100.0	100.0	100.0
Lacquer Properties			
Nonvolatile, wt % (cured)	100	100	100
<i>Brookfield</i> viscosity @ 25°C, cP (mPa•s)	175	170	170
Weight/volume			
kg/L	1.031	1.039	1.041
lb/Imperial gal	10.33	10.40	10.49
lb/U.S. gal	8.61	8.67	8.69
Coating Properties			
Adhesion to unfilled wood	Fair	Fair	Fair
Mar resistance	Excellent	Excellent	Excellent
Print resistance			
2 h @ 14 kPa and 52°C (2 h @ 2 psi, 125°F)	No Printing	No Printing	No Printing
Impact resistance			
in.-lb	7.0	6.0	6.0
cm-kg	8.1	6.9	6.9
Gloss at 60°	85	87	87
Depth of finish	Good	Excellent	Excellent
Tukon hardness, Knoop	16.6	—	15.8
Resistance to 12-h contact with			
ethyl alcohol	Good	Good	Good
boiling water	Excellent	Excellent	Excellent
mustard	Good	Good	Good
ink	Excellent	Excellent	Excellent
lipstick	Good	Good	Good
iodine	Fair	Fair	Fair

The use of *Eastman* SAIB in a more flexible unsaturated polyester system has also been evaluated, and the test results are noted in Table 7. At a 10% replacement of the polyester resins with SAIB, there was no noticeable difference in performance. When the two formulas were sprayed on maple panels, the coating containing SAIB appeared to have a better depth of finish. The maximum amount of SAIB tolerated by these systems varies with the unsaturated polyester used; in most systems evaluated, however, the modification must be less than 25% to avoid exudation and incompatibility.

Table 7
***Eastman* SAIB in Flexible Unsaturated Polyester Wood Coatings**

Ingredients	A	B
PART A		
<i>Polylite</i> 32-702 resin	40.0	36.0
<i>Polylite</i> 32-703 resin	20.0	18.0
Styrene monomer	35.0	35.0
Cobalt naphthenate	0.3	0.3
<i>Eastman</i> CAB-381-0.5	4.0	4.0
<i>Eastman</i> SAIB	—	6.0
PART B		
MEK peroxide	0.7	0.7
	<u>100.0</u>	<u>100.0</u>
Lacquer Properties		
Nonvolatile, wt % (cured)	100.0	100.0
Weight/volume		
lb/U.S. gal	8.50	8.52
kg/L	1.018	1.021
lb/Imperial gal	10.20	10.22
Coating Properties		
Adhesion to wood	Fair	Fair
Mar resistance	Good	Good
Print resistance		
2 h @ 14 kPa, 52°C	No printing	No printing
(2 h @ 2 psi, 125°F)		
Impact resistance		
in.-lb	8	7
cm-kg	9.2	8.1
Depth of finish	Good	Excellent
Tukon hardness, Knoop	11.6	11.6
Resistance to 24-h contact with		
ethyl alcohol	Good	Good
boiling water	Good	Good
lipstick	Good	Good
ink	Fair	Good
mustard	Fair	Fair
iodine	Poor	Fair

Cloth Lacquers

Application of an *Eastman* SAIB-modified lacquer can improve the durability and appearance of fabrics. Typical cloth lacquers containing *Eastman* SAIB have good flexibility at room temperature and as low as -3°C (26°F). With proper formulation, a combination of good flexibility and film hardness is possible.

A metallic pigment is often incorporated into cloth coatings to improve heat-reflective properties or to impart interesting decorative effects. Certain lacquers containing bronze powders as the pigment have a tendency to discolor or “green” on aging. The formulation in Table 8 illustrates a typical cellulose acetate butyrate bronze lacquer containing SAIB which does not “green” or gel.

Table 8
***Eastman* SAIB in Bronze Lacquer for Cloth**

Ingredients	Weight %
<i>Eastman</i> CAB-381-0.5	20.0
<i>Aroplaz</i> 2477 (80%) resin	20.9
<i>Eastman</i> SAIB-90	10.0
Bronze powder	21.0
Acetone	15.0
Toluene	10.2
<i>Tecsol</i> C solvent, anhydrous	2.9
	<hr/> 100.0
Lacquer Properties	
Nonvolatile, wt %	64.6
<i>Brookfield</i> viscosity @ 25°C , cP (mPa•s)	>100,000
Weight/volume @ 25°C	
kg/L	1.196
lb/Imperial gal	11.98
lb/U.S. gal	9.98
Coating Properties	
Application method	Knife
Adhesion to cloth	Excellent

Printing Inks

Compatibility with a range of ink resins and solubility in solvents typically used in inks are features which make *Eastman SAIB* especially useful in the formulation of flexographic, rotogravure and other solvent-based printing inks and overprints. The inclusion of 10%–20% *Eastman SAIB* (based on total binder solids) in fluid inks and overprints has resulted in improvements in gloss and adhesion.

The formulations in Table 9 are typical cellulose acetate propionate metallic inks containing SAIB.

Table 9
***Eastman SAIB* in Metallic Inks**

Ingredients	A	B
PART A		
<i>Eastman CAP-482-0.5</i>	7.60	14.0
<i>Paraloid B-72 (100%)</i>	3.80	—
Citric acid	0.05	0.05
<i>Tecsol C</i> solvent, anhydrous	40.55	38.35
Ethyl acetate 99%	17.40	16.50
<i>Eastman SAIB-90</i>	2.60	3.10
PART B		
Metallic pigment	28.00	28.00
	<u>100.00</u>	<u>100.00</u>
Ink Properties		
Nonvolatile, wt %	41.80	44.80
<i>Brookfield</i> viscosity @ 25°C, cP (mPa·s)	240	410
Application method	Gravure	Gravure
Adhesion to paper	Good	Good

Paper Lacquers

Very high gloss and good adhesion are typical characteristics of paper coatings modified with *Eastman* SAIB. These coatings are hard and scuff-resistant.

■ Nitrocellulose

Incorporation of *Eastman* SAIB in the formulas improves the gloss and depth of finish but slightly lowers the scuff resistance. SAIB appears to have no effect on the grease penetration resistance of nitrocellulose coatings.

■ Cellulose Acetate Butyrate:Amino

As much as 25%–30% SAIB (on total nonvolatile) has been added to cellulose acetate butyrate:amino combinations without any detrimental effect on film properties.

■ Heat-Sealing Adhesives

Eastman SAIB may be used in the preparation of heat-sealing formulas. Modification of film-formers such as nitrocellulose, ethylcellulose, and cellulose acetate butyrate with SAIB produces paper lacquers which have low sealing temperatures and which form strong bonds.

Pressure-sensitive adhesives of the resealable type are produced by blending 33%–75% SAIB (on nonvolatile) with *Elvax* 150 resin (ethylene/vinyl acetate copolymer). These blends show good resealability and adhesive properties for cellophane, *Mylar* film,¹ polyethylene, polypropylene, aluminum foil, and porous paper. However, these adhesives must be applied from a solvent system since the components are immiscible in the melt phase. The solvent system may be either perchloroethylene, xylene, or 90/10 toluene/*Tecsol C* solvent.

An interesting feature of these adhesives is the wide composition range which may be used without a significant loss in adhesive strength or resealability. However, higher concentrations of SAIB produce tackier films.

Modification of these SAIB/*Elvax* 150 resin blends with CAB-381-0.1 produces an excellent heat-seal adhesive. When applied to most substrates, the formulation (a 3/1/1 blend of SAIB/CAB-381-0.1/*Elvax* 150 resin) dries almost tack-free. Conditions necessary for heat sealing are 210 kPa·s at 66°C for 1.5 sec (30 psi at 150°F for 1.5 sec).

Lacquers for Plastics

Good protective and decorative coatings for plastics have been prepared with *Eastman SAIB*, *Eastman CAB 381-0.5*, and suitable solvents. The very low color of SAIB is advantageous in such formulations.

Plastic coatings such as the one in Table 10 have shown very good adhesion to *Tenite* acetate, *Tenite* butyrate, *Mylar* film, nylon, acrylic plastics, and cellophane. The high nonvolatile content has particular significance because a low solution viscosity is necessary to obtain the proper degree of flow on plastic surfaces.

Table 10
Eastman SAIB in Lacquer for Plastics

Ingredients	Weight %
<i>Eastman CAB-381-0.5</i>	16.6
<i>Eastman SAIB-90</i>	18.4
Toluene	33.4
<i>Tecsol C</i> solvent, 95%	4.8
Ethyl acetate	13.4
Isobutyl acetate	13.4
	<hr/> 100.0
Lacquer Properties	
Nonvolatile, wt %	33.2
<i>Brookfield</i> viscosity @ 25°C, cP (mPa•s)	370
Weight/volume @ 25°C	
kg/L	0.949
lb/Imperial gal	9.50
lb/U.S. gal	7.92
Coating Properties	
Application method	Roll coat
Adhesion	Excellent to many types of plastic

Hot-Melt Coatings

Formulations prepared from *Eastman SAIB* and *Eastman CAB-381-0.5* with selected plasticizers show excellent promise as hot-melt coatings. These tough coatings are very flexible at 24°C (75°F), have good adhesion to paper, and are not tacky.

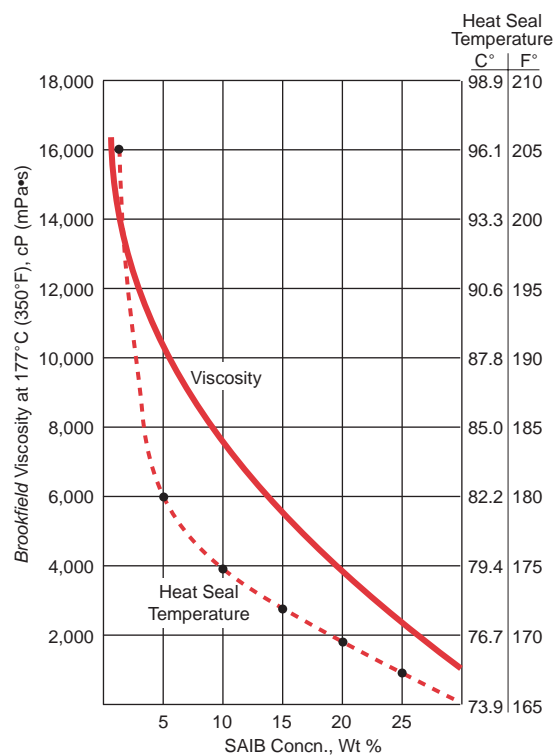
Eastman SAIB has good color stability on heat-aging and appears to have a stabilizing influence on the total hot-melt coating. The discoloration of hot melts is accelerated, however, by metal ions and by extended heating at temperatures above 171°C (340°F). To retain the light color of SAIB, operating temperatures should not exceed 171°C (340°F); and a suitable stabilizer should be incorporated in any hot melt which is heated over an extended period of time.

Modification with SAIB lowers the coating temperature of hot melts. For example, 177°C (350°F) is the usual application temperature for conventional cellulose acetate butyrate (CAB) hot melts, but with high SAIB modification the optimum coating temperature may be as low as 135°C (275°F). Figure 14 illustrates the effect of increasing SAIB concentration on the viscosity and heat-seal temperature of a CAB hot melt.

Peelable plastic coatings are used to package items such as table flatware, tools, machine parts, and hardware. SAIB can be used as an extender in strippable cellulose acetate butyrate melts. These coatings possess properties which are desirable in stop-off coatings for electroplating operations.

Figure 14

Effect of *Eastman SAIB* on Properties of Butyrate Hot Melt (Composition: 60/40 CAB-381-0.5/*Eastman DOP* Plasticizer)



Other Uses

■ Additive for Waterbased Coatings

The introduction of water-based coatings has generated interest in emulsifying *Eastman* SAIB.

Table 11
***Eastman* SAIB Emulsion**

Components	Weight %
<i>Eastman</i> SAIB (100%) ^a	45.0
2/1 <i>Tween</i> 20/ <i>Span</i> 20 surfactant	5.0
Demineralized water ^b	40.0
Toluene or n-propyl acetate	10.0
	<hr/> 100.0

^aFifty parts may be used with five parts less toluene. A 90/10 solids ratio SAIB/surfactant must be maintained.

^bIn most cases ordinary tap water appears to be satisfactory; however, water containing ionic contaminants may reduce the stability of the emulsion.

Procedure: Dissolve the *Eastman* SAIB in toluene or n-propyl acetate and combine with the surfactant mixture in a mixer such as a Cowles dissolver. Heat the mixture to 66°C (150°F), and slowly add the warm water over a 10 minute period, maintaining good agitation until the inversion point is reached. The “inversion point” is defined as that point in the emulsification procedure when water becomes the continuous phase of the emulsion. It is easily detected by a characteristic and sudden reduction in viscosity of the emulsion as it inverts. After the emulsion inverts, the remaining water should be added immediately. This inversion technique produces an emulsion having a particle size of more than 2 m and excellent stability.

■ Transparentizing Agent for Paper

SAIB is used as a transparentizing agent for paper in reprographic products. Less volatile than many other materials being used for this purpose, SAIB also exhibits good light stability, a prime requisite in this application.

■ Pigment Dispersions

Eastman SAIB shows promise as a dispersing medium for pigments. Dispersions have been prepared on three-roll mills including a small amount of a high-boiling solvent such as MIAK (methyl isoamyl ketone) or heat for ease of handling during pigment dispersion. Subsequent thinning of the dispersion eases its addition to the lacquer, printing ink, or other system.

SAIB may also be used as the replacement medium in the flushing of wet pigment cakes. Its high viscosity and pigment wetting properties reduce the time required to replace the water in presscakes with a hydrophobic medium.

Versatility of application is one unique feature of these SAIB pigment dispersions. They may be used in various systems including lacquers, inks, enamels, and polyesters. The versatility means that one SAIB-pigment dispersion may replace several different dispersions, thus simplifying inventory.

FDA Status

Eastman SAIB is lawful for use as a component of food-packaging adhesives under U.S. Federal Food Additive Regulation 21 CFR 175.105.

Raw Material Suppliers

Acetone	Ashland
Aromatic 100 solvent	Exxon
<i>Eastman</i> n-Butyl acetate	Eastman
<i>Eastman</i> n-Butyl alcohol	Eastman
<i>Eastman</i> Cellulose acetate	Eastman
<i>Eastman</i> Cellulose acetate butyrate	Eastman
<i>Eastman</i> Cellulose acetate propionate	Eastman
<i>Eastman</i> EEP solvent	Eastman
<i>Eastman</i> glycol ethers and ether esters	Eastman
<i>Eastman</i> Ethyl acetate	Eastman
<i>Eastman</i> Isobutyl acetate	Eastman
<i>Eastman</i> Isobutyl alcohol	Eastman
<i>Eastman</i> Isopropyl acetate	Eastman
<i>Eastman</i> Isopropyl alcohol	Eastman
<i>Eastman</i> plasticizers	Eastman
<i>Eastman</i> Methyl isoamyl ketone	Eastman
<i>Eastman</i> Methyl isobutyl ketone	Eastman
<i>Eastman</i> n-Propyl alcohol	Eastman
<i>Eastman</i> SAIB Sucrose acetate isobutyrate	Eastman
<i>Tecsol</i> special industrial solvent	Eastman
<i>Arochem</i> resins	Arizona Chemical
<i>Aroplaz</i> resins	Reichhold
<i>Beckamine</i> 21-511 resin	Cytec
<i>BYK</i> 300 modifier	BYK-Chemie
<i>Cymel</i> 216-8 resin	Cytec
<i>Elvax</i> 150 resin	Du Pont
<i>Elvacite</i> resins	Du Pont
<i>Epon</i> 1001 resin	Resituation
<i>Mylar</i> film	Dupont
<i>Paraloid</i>	Rohm and Haas
<i>Paraplex</i> G-62 plasticizer	C. P. Hall
<i>Plasthall</i> plasticizers	C. P. Hall
<i>Polylite</i> resins	Reichhold
<i>RCI</i> resins	Reichhold
<i>RS</i> ½-sec nitrocellulose	Greentree Industries
<i>Santicizer</i> 160 plasticizer	Ferro
<i>Span/Tween</i> surfactant	ICI
<i>Versamid</i> 125 resin	Henkle



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