ACS TECHNICAL PRODUCTS

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Epoxol® CA118
PLASTICIZER
Vs. Benzyl Butyl Phthalate

(C18 09-1153-1B TTS 0809)

Introduction/Background

Epoxol® CA118 would be evaluated as a plasticizer versus Benzyl Butyl Phthalate[2] (BBP) in a caulking compound formulation[3] using acrylic latex[4].

Conclusions

Epoxol® CA118 showed better plasticizing property than Benzyl Butyl Phthalate. Amount of Epoxol® CA118 could be reduced by about 35% to 50% to be comparable with BBP.

To completely evaluate performance of Epoxol® CA118 in a caulking compound, the right mixing equipment should be used in preparing the samples, and various testing procedures based on ASTM standards should be performed.

Results and Discussion

Epoxol® CA118 showed better plasticizing property as shown by its low glass transition (Figure 1) than BBP at standard dosage of 40% as recommended on the caulk formulation[3]. To be comparable with 40% BBP, it would need about 27% Epoxol® CA118 to achieve at least similar glass transition. Similarly, in a caulking compound formulation, as shown in Figure 3, it would need only about 30% Epoxol® CA118 to achieve a glass transition similar to BBP at 40%.

The film formation by low temperature coalescing (LTC) method at 20% plasticizer was complete for Epoxol® CA118 while BBP showed a small crack (Figure 3, as shown by arrow). BBP and Epoxol® CA118 were comparable at 30% and 40% (Figures 4 and 5).

Figure 1. Glass Transition of Ucar 163S (below)

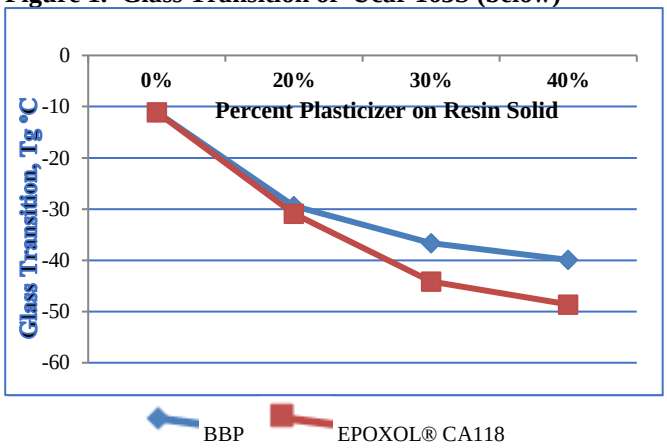
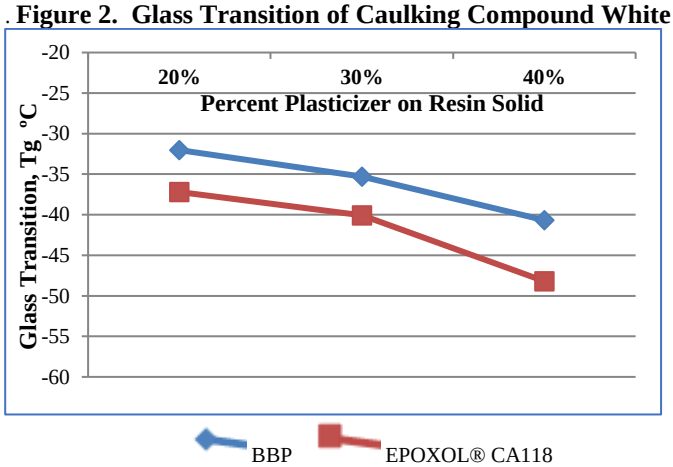


Figure 2. Glass Transition of Caulking Compound White



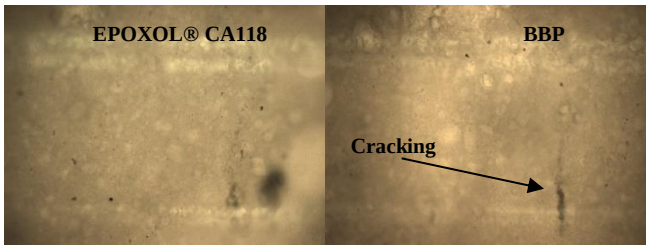


Figure 3. LTC Micrograph of Caulk at 20% Plasticizer on Resin Solid

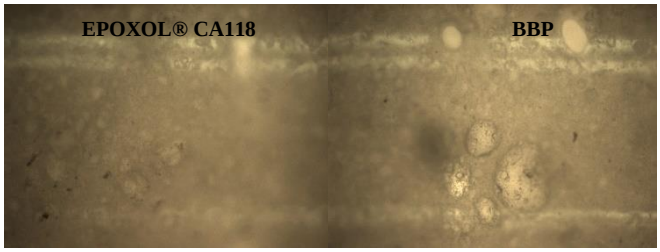


Figure 4. LTC Micrograph of Caulk at 30% Plasticizer on Resin Solid

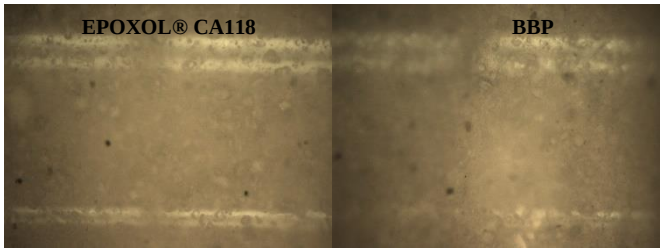


Figure 5. LTC Micrograph of Caulk at 40% Plasticizer on Resin Solid

Table 1. Formulation – Caulking Compound

Raw Materials	Function/Supplier	lbs per 100 gals
UCAR Latex 163S	Acrylic Latex -Dow	529.12
Santicizer 160[5] (40% on resin solid)	Benzyl Butyl Phthalate	122.80
Ethylene Glycol	Humectant	10.47
Triton X-405	Surfactant - Dow	3.91
Tamol 850	Dispersant – Dow	1.50
Kathon LX 1.5%	In-can preservative – Dow	2.01
Mineral Spirit	Carrier - Defoamer - Exxon	14.96
Silquest A-187	Adhesion promoter - Momentive	1.21
Drikalite	Extending Pigment	452.85
Titanium Dioxide	Hiding Pigment	7.48
Cellosize HEC ER15M	Cellulosic thickener - Dow	2.01
Ammonia Water 28%	Neutralizer	2.36
Total		**1150.68**

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Experimental

Caulking compound was prepared according to formulation, Table 1, from UCAR Emulsions using available mixer. Dosage of plasticizer was evaluated at 20%, 30% and 40%. Due to high shear of the caulking compound, the available mixer and paddle were not suitable to completely blend/disperse the total amount of pigment (Drikalite), hence, 1/3 of the remaining pigment was added while hand mixing but ensured that homogeneous mixture was obtained. The caulking compound was applied on release paper using 20 ml syringe (to simulate the caulk gun dispenser), dried under room temperature for 7 days and glass transition was determined using TA Q1000. Same caulk film was evaluated for elongation in a very crude way by pulling an 8 cm long caulk until the caulk breaks and the elongation was taken. Low temperature curing was also evaluated using 10 mils wet film thickness and dried in a 40 ^{0}F cabinet and evaluated for cracking/film formation under the microscope.

Latex was also blended with plasticizers at 20%, 30% and 40%. Mixtures were applied on release paper using 3 mils bird applicator, dried under normal laboratory condition. Low temperature curing was also evaluated using 10 mils wet film thickness and dried in the LTC cabinet (40^{0}F) and evaluated for cracking/film formation visually and under the microscope.

References

(1) ACS Technical Products, Lot # 12028; 4911-147
(2) Benzyl Butyl Phthalate
(3) ASTM C 920 Compliant (25%) Caulk Formulation Suggestion K-2224 – Dow Ucar Emulsions
(4) Ucar 163S – Dow Ucar – 58% solids, Tg = -11 ^{0}C
(5) Replaced with EPOXOL® CA118

Revised 11/28/2017