



SHOWA DENKO CHLOROPRENE POLYCHLOROPRENE

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TECHNICAL INFORMATION

Showa Denko Chloroprene 115 for Road construction

Description

Showa Denko Chloroprene Liquid Dispersion (LD) 115 is Non-ionic grade which is suitable to modify cationic asphalt emulsions for road construction/repair application because asphalt emulsions made with 115 exhibit good phasing resistance, viscosity and storage stability. Modification of cationic asphalt emulsions with this non-ionic LD results in increased elasticity, Toughness/Tenacity and Ductility, reduced thermal softening and Durability(=aging stability) compared with modification by natural rubber (NR) latex, SBS or SBR as shown in Table 1.

As noted, the addition of zinc oxide can boost the toughness as a result of crosslink between carboxyl groups bridged by zinc atom(=ionic crosslink).

Table 1. Comparison of Modifiers used for Polymer Modified Asphalt Emulsion
Criteria: B(Bad) < F(Fair) < G(Good) < E(Excellent)

Modifier(Polymer)	NR	SBR		CR			
Physical Form	Latex (Liquid)	Latex (Liquid)		Latex (Liquid)			
Grade	HA	Sol	Gel	671A	115	115 *1)	SND57
PROCESSABILITY							
Availability in Emulsion Form	E	E	E	E	E	E	E
Stability against Cationic Addition	B	F	F	F	E	E	F
PROPERTIES OF MODIFIED ASPHALT							
Penetration at 25degC, 1/10mm	G	G	E	G~E	G	E	G~E
Softening point, degC	B	F (Low)	F (Low)	G	F (Low)	E	F (Low)
Ductility at Low temp.,degC, cm	G	G	G	E	E	E	E
Toughness, kgf·cm	F	F	E	E	F	E	G
Tenacity, kgf·cm	F	F	E	E	G	E	G
Elongation at RT.,cm	G~E	G~E	G~E	E	E	E	E
TFOT(Thin Film Oven Test) wt. loss, %	B	G	G	E	E	E	E
After aging a t163 degC for 5 hours.							

Note: 1) ZnO 0.5dry phr is added to 115 before blending with asphalt emulsion.

The typical procedure for cationic asphalt emulsion

#1.Modified emulsifier solution (A): Water is heated to 50degC, added to the acidified water, and mixed until the emulsifier is dissolved. (Best results have been obtained with tallow diamine emulsifiers, at 0.2-0.3 wt% of the finished emulsion.)

115 (at 3 - 6% wet weight of asphalt emulsion) is added at room temperature to the warm emulsifier solution and mixed until uniform. The mixture is maintained at 50degC.

NOTE: 115 shows excellent compatibility with all emulsifier systems evaluated so far, its compatibility should be evaluated with any particular emulsifier system in the laboratory before preparing large quantities.

#2.Molten asphalt (B): The asphalt cement is heated to approximately 160 -170degC.

#3.Asphalt emulsification: The modified emulsifier solution (A) is mixed with the molten asphalt(B) under high shear in a colloid mill.

Based on the above, following is the typical formulation, however, note that the properties of the modified emulsion (=mixture of A and B) are influenced by the level of LD115 used, and other factors such as the source of asphalt and the type of emulsifier. Therefore any product developed should be evaluated to ensure it meets end-use requirements.

Table2. Typical formulation for cationic asphalt emulsion

1. Modified emulsifier solution(A)	
Water	60 wet parts
Tallow diamine emulsifier	0.4
115	8
2. Molten asphalt(B)	100

Although above process initiates from make-up of cationic asphalt emulsion, 115 can be mixed to cationic asphalt emulsion if ready-made cationic asphalt emulsion is available.

Pretreatment of 115

When even higher modulus is required, be advised that the pretreatment of 115 with ZnO can enhance the modulus of the compound by its ionic crosslink between carboxyl groups intermediated by Zn atom.

The pretreatment reaction can proceed even at RT so quickly that there is no need to wait for the conversion of reaction once uniform mixing is attained.

The key point is to perform this step before 115's addition to either molten asphalt or cationic asphalt emulsion.

Table.3 Typical formulation for pretreatment of LD115

Showa Denko Chloroprene LD115	100 dry phr
ZnO dispersion *1)	0.5 -1

Note 1) Solid content is 60%.

Zinc oxide dispersion from RT Vanderbilt (Product code 19205)

For details, refer to

<http://www.rtvanderbilt.com/documents/psdocs/19205.pdf>

Too much addition of zinc oxide will deteriorate adhesion onto aggregates, while too little addition of zinc oxide will still offer low modulus. Therefore the optimization of addition level should be done depending on the case.

Application of the Modified Asphalt Emulsion

Spraying is the preferred method of application, where the asphalt emulsion is first sprayed on the road surface at about 60degC. Then an aggregate such as gravel is added and spread into the emulsion phase, followed by treatment of the spread gravel with a heavy roller. This combination of high mechanical shear, higher applied temperature and contact with gravel surfaces (charge transfer) brings about the required destabilization of the LD115 / bitumen surfactant system and a high degree of adhesion. This makes it possible for the cationic system to be used for surface dressing of road.

Depending on the case, such modified asphalt emulsion is used for Micro-surfacing, Chip seal, Crack seal after appropriately formulated and processed respectively..

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