Epoxy Plasticizer JE104 Performance Analysis

I. Specification

Sample: JE104

Item	Unit	Test Result	Test Method
Color	Pt-Co, #	105#	GB/T 1664-1995
Acid Value	Mg KOH/g	0.39	GB/T 1668-2008
Iodine Value	%	2.38	GB/T 1676-2008
Epoxy Value	%	6.6	ASTMD1652—04
Density(20°C)	g/cm^3	0.9836	GB/T 4472-2011
Flash Point	°C	230	GB/T 1671-2008
Moisture	%	0.079	GB/T 6283-2008
Viscosity(25°C)	mPa.s	171	-

II. Three Test Formulations

Sample	Dosage 1	Dosage 2	Dosage 3
PVC resin(S-65)	100	100	100
Plasticizer(JET004/JE104)	40	50	60
Ca-Zn Stabilizer(600B)	1	1	1

III. Sample Processing

PVC powder resin processing (simulating calendering formula)

1. Weigh all ingredients according to three formulations and cold-mix them evenly;
2. Calender PVC sheets by Double-roller (175°C front, 165°C rear), with 40-60PHR of plasticizers, mixing for 5min;
3. Vulcanization at 173°C, preheating(40s), exhaust(50s), cold pressing(2min);
4. Cut into strips for test.

IV. Hardness test in PVC powder resin system

Sample	Hardness (Shore A) 40 phr Plasticizers	Hardness (Shore A) 50 phr Plasticizers	Hardness (Shore A) 60 phr Plasticizers
ESBO(JET004)	94.8	91	85.3
JE104	93	88.5	81.5

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From the analysis of sample hardness data, at the same dosage, the Shore hardness of Sample with JE104 is lower than that of JET004, indicating that JE104 has better plasticizing efficiency than JET004.

V. Compatibility test

The test steps for indirectly evaluating the compatibility of plasticizers and PVC using the "Water Price Method" are: weigh 2.5 grams of plasticizer, add 25 milliliters of acetone, wait until they are completely dissolved and transparent, and then use distilled water to titrate. When turbidity begins to appear, it is the titration end point, and read the number of liters of distilled water consumed. The more distilled water is consumed, the better the compatibility of the plasticizer with the PVC resin is.

Plasticizer	ESBO(JET004)	JE104
2.5g plasticizer against consumption of distilled water (ml)	2.42	2.93

From the water price method values of the samples, it can be seen that the water price value of JE104 is larger than that of JET004, indicating that JE104 has better compatibility with PVC resin.

VI. Mechanical properties test

Sample	PHR	Tensile Strength(MPa)	Elongation at break (%)
ESBO(JET004)	50	22.78	321.81
JE104	50	22.77	329.85

From the analysis of the sample mechanical tensile data, at 50 PHR Plasticizer, the tensile strength data of JE104 and JET004 are almost same, and the elongation at break is quite similar, indicating that when using JE104 and JET004, the mechanical properties of PVC samples are quite similar.

VII. Hot-Pressing Precipitation Test

The samples were cut into small pieces of the same size and placed in an oven at 80℃ with oil-absorbing cotton as the medium and another oven at 40℃ with oil-absorbing blue film as the medium, both heated for 24 hours, and the precipitation was tested under hot pressing with a 5KG weight. The test simulation diagram is as follows:

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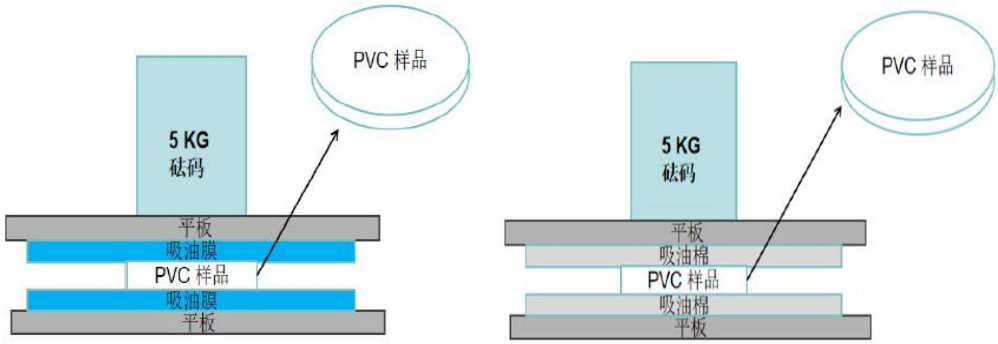


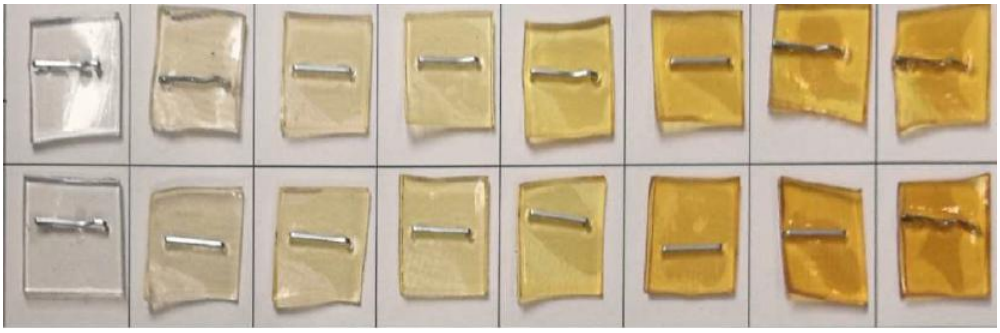
Sample	PHR	80°C Oil-absorbing cotton	40°C Oil-absorbing film
ESBO(JET004)	50	0.0643%	0.0857%
JE104	50	0.1007%	0.1186%

From the hot pressing precipitation data of oil-absorbing cotton and oil-absorbing film, the precipitation of JE104 seems slightly higher than that of JET004. However, JE104 is used at a very small dosage as an auxiliary plasticizer in real application, and its precipitation has very little effect on the final product. Only when the dosage getting much larger, might it increase certain precipitation risk. Of course, in the short-term, it cannot accurately reflect the actual precipitation of the product. It is recommended to observe the precipitation of the sample for a longer time to get the actual precipitation as reference.

VIII. Thermal aging performance test of PVC powder resin system

Test conditions:

Cut the vulcanized sample into small pieces, place in a 180°C oven, take out every once in a while to observe the color change. Before placing, the samples are all colorless and transparent.

	0 min	20min	40min	60min	80min	100min	120min	140min
ESBO (JET004)								
JE104								

From the static heat aging pictures at 180°C, we can see that both JE104 and JET004 have good heat aging resistance, and the difference in heat aging resistance is very slight.

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