



KOREA RESEARCH INSTITUTE OF CHEMICAL TECHNOLOGY
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ANALYSIS REPORT

Report No.: KRICT-08C2011

Report Date: December 3, 2008

Approved by: _____



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* APPLICANT

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* SAMPLE IDENTIFICATION

Sample Description : HumiSafe™ Cobalt-free Humidity Indicator Card
Model (Item) Name : CF-033B (5, 10, 60%)
Name of Material : Paper
Report No. : KRICT-08C2011
Issued Date : Dec. 3, 2008

Sample received : Nov. 28, 2008
Testing Date : Nov. 29, 2008 ~ Dec. 2, 2008
Testing Laboratory : Chemical Process Engineering Center in KRICT
Test Method : IPC/JEDEC J-STD-033B.1(2007), Appendix A
Test Result : Please see the following page(s).

Apparatus : acrylic box, 700 x 300 x 250 (mm), 52.5m³(=1.86ft³)
with Colorimeter(CR-10, Konica-Minolta), Hygro-thermometer
(TESTO-625, Testo AG), desiccant, glycerin, and water

* Typical HIC Spot Compliance by JEDEC (IPC/JEDEC J-STD-033B.1)

	Indication at 2% RH Environment	Indication at 5% RH Environment	Indication at 10% RH Environment	Indication at 55% RH Environment	Indication at 60% RH Environment	Indication at 65% RH Environment
5% spot	Blue (dry)	Lavender (spot value) change \geq 7% hue	Pink (wet)	Pink (wet)	Pink (wet)	Pink (wet)
10% spot	Blue (dry)	Yellow (dry)	Lavender (spot value) change \geq 10% hue	Pink (wet)	Pink (wet)	Pink (wet)
60% spot	Blue (dry)	Blue (dry)	Blue (dry)	Blue (dry)	Lavender (spot value) change \geq 10% hue	Pink (wet)

Note: Other color schemes may be used.

* RESULTS

Table 1. Results of HUE change test at various RH

	Indication at 2% RH Environment	Indication at 5% RH Environment	Indication at 10% RH Environment	Indication at 55% RH Environment	Indication at 60% RH Environment	Indication at 65% RH Environment
5% spot	Yellow (dry)	Yellowish-green Change=9.8% HUE (PASS)	Green (wet)	Green (wet)	Green (wet)	Green (wet)
10% spot	Yellow (dry)	Yellow (dry)	Yellowish-green Change=11.9% HUE (PASS)	Green (wet)	Green (wet)	Green (wet)
60% spot	Yellow (dry)	Yellow (dry)	Yellow (dry)	Yellow (dry)	Yellowish-green Change=15.6% HUE (PASS)	Green (wet)

* Calculations of HUE value

1) Calculation Method of HUE value

a*	b*	HUE value
negative	negative	The absolute value of ARCTAN(b*/a*)
positive	positive	180 + ARCTAN(b*/a*)
positive	negative	
negative	positive	360 + ARCTAN(b*/a*)

2) 5% spot

Sample	Colorimeter Data			Calculations			Remarks	
	L*	a*	b*	b*/a*	arc(tan)	HUE		
#1	5% spot	83.2	-4.0	34.5	-8.63	-83.39	276.61	Humidity: 2%
#2		82.9	-4.2	34.1	-8.12	-82.98	277.02	
Average							276.82	

Sample	Colorimeter Data			Calculations			Remarks	
	L*	a*	b*	b*/a*	arc(tan)	HUE		
#1	5% spot	81.6	-12.6	18.8	-1.49	-56.17	303.83	Humidity: 5%
#2		81.5	-12.5	18.6	-1.49	-56.10	303.90	
Average							303.87	

$$\text{Change} = (303.87 - 276.82) / 276.82 * 100 = 9.77\%$$

3) 10% spot

Sample	Colorimeter Data			Calculations			Remarks	
	L*	a*	b*	b*/a*	arc(tan)	HUE		
#1	10% spot	81.6	-5.1	30.3	-5.94	-80.45	279.55	Humidity: 5%
#2		81.9	-5.4	29.7	-5.50	-79.70	280.30	
Average							279.93	

Sample	Colorimeter Data			Calculations			Remarks	
	L*	a*	b*	b*/a*	arc(tan)	HUE		
#1	10% spot	80.4	-13.8	14.8	-1.07	-47.00	313.00	Humidity: 10%
#2		80.1	-14.0	14.8	-1.06	-46.59	313.41	
Average							313.20	

$$\text{Change} = (313.20 - 279.93) / 279.93 * 100 = 11.89\%$$

4) 60% spot

Sample		Colorimeter Data			Calculations			Remarks
		L*	a*	b*	b*/a*	arc(tan)	HUE	
#1	60% spot	79.0	-6.2	29.8	-4.81	-78.25	281.75	Humidity: 55%
#2		78.9	-5.9	30.1	-5.10	-78.91	281.09	
Average							281.42	

Sample		Colorimeter Data			Calculations			Remarks
		L*	a*	b*	b*/a*	arc(tan)	HUE	
#1	60% spot	75.0	-18.5	12.8	-0.69	-34.68	325.32	Humidity: 60%
#2		75.4	-18.4	12.8	-0.70	-34.82	325.18	
Average							325.25	

$$\text{Change} = (325.25 - 281.42) / 281.42 * 100 = 15.57\%$$



Figure 1. A photograph of apparatus and sample