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APPENDIX

APPENDIX A

RAW MATERIALS SPECIFICATION

Raw material : Pigment

Common name : Titanium dioxide

Trade name : Ti-Pure R-902

Source : Du Pont (Thailand) LTD.

Table A-1 Specification of Ti-Pure R-902

Specification	Unit	Method	Value
pH	-	DU P./T4400.280.03	7.3-9.5
resistance at 30 °C.	-	DU P./T4400.075.01	min.4.0
gloss at 20 °	-	DU P./T4400.010.02	min.60
oil absorption	g./100 g.	DU P./T4400.010.06	13-20
carbon black undertone	-	DU P./T4400.315.06	9-12
fineness	micron	-	5-7.5

Raw material : Resin

Common name : Acrylic resin

Trade name : Acrydic A-418

Source : Siam Chemical Industry Co., Ltd.

Table A-2 Specification of Acrydic A-418

Specification	Unit	Method	Value
non-volatile	%	JIS-K-5407-4.3.1	54-56
acid number	-	JIS-K-5407-11.1	3-5
viscosity	-	JIS-K-5407-4.5.1	y-z2
color	-	JIS-K-5400-4.3	1 max
solvent (for dilute)	-	-	Xylene, BuOH, BC

Raw material : Solvent

Common name : Butyl glycol ether

Trade name : Butyl cellosolve

Source : Lenso Asia Public Co., Ltd.

Table A-3 Specification of Butyl cellosolve

Specification	Unit	Method	Value
Apperance	-	Visual check	clear
Purity	wt%	-	99.97
Water content	ppm	-	292
Specific gravity 20 °C.	g./cm.^{3}	JIS-K-5400-4.6.1	0.9-0.906
Color	Pt-Co scale	ASTM D 1209	5

Common name : N-Buthanol

Trade name : N-Buthanol

Source : Lenso Asia Public Co., Ltd.

Table A-4 Specification of N-Buthanol

Specification	Unit	Method	Value
Apperance	-	Visual check	clear
Purity	wt%	GLC	99.8
Water content	wt%	ASTM D-1364	0.038
Specific gravity 15 °C.	g./cm.^{3}	ASTM D-4052	0.807-0.813
Color	Pt-Co scale	ASTM D-1209	5
Distillation	°C.	ASTM D-1078	118

Common name : Ethyl glycol acetate

Trade name : Cellosolve acetate

Source : Lenso Asia Public Co., Ltd.

Table A-5 Specification of Cellosolve acetate

Specification	Unit	Method	Value
Apperance	-	Visual check	clear
Water content	wt%	ASTM D-1364	0.007
Specific gravity 20 °C.	g./cm.^{3}	ASTM D-4052	0.973-0.976
Color	APHA	-	<5
Distillation	°C.	ASTM D-1078	156.1-157.2

Common name : Solvesso 150

Trade name : Solvesso 150

Source : Exxon Chemical Thailand LTD.

Table A-6 Specification of Solvesso 150

Specification	Unit	Method	Value
Apperance	-	Visual check	clear
density, 15 °C.	g./cm.^{3}	ASTM D-1928	0.8944
Color	Pt-Co scale	ASTM D-1209	1
Distillation	°C.	ASTM D-86	210

APPENDIX B

STANDARD TEST METHOD FOR FINENESS OF DISPERSION
JIS-K-5400-4.7.1

Distribution Chart Method

1. Summary

Pour the sample into a groove of fineness gauge, squeeze by using a scraper, make a sample layer continuos in thickness in the groove, read out the thickness of layer at a portion where tightly collected grainings began to appear, and take it as the target of pigment dispersibility of sample. This method applies to the paint of comparatively high pigment dispersibility.

2. Device Fineness Gauge

The measuring range of each gauge shall be as shown in Table B-1. The fineness gauge shall be constituted of a body and a scraper of the shape and dimensions shown in Figs. B-1 to B-7. The material quality should be quenched steel (1) finished according to Table B-2, the upper surface of body and the blade edge of scraper, be finished flatly, and when applying the blade of scraper to the upper surface of fineness gauge perpendicularly and sliding, there shall be generated no clearance on the parts other than grooves.

Further, relating to the sample of unknown dispersibility, carry out the preparatory test by using a fineness gauge (100 μm) and according to its result, select the type of applicable fineness gauge.

Table B-1 Type and measuring range of fineness gauge

Type of fineness gauge	Graduation interval (µm)	Measuring range (µm)
Fineness gauge (100 µm)	10	40 to 90
Fineness gauge (50 µm)	5	15 to 40
Fineness gauge (25 µm)	2.5	5 to 15

Note(1): SKS 2 or SKS 3 specified in JIS G 4404 or those applied with chromium plating or stainless steel, and the hardness of quenching and tempering, shall be not less than HrC 61. However, the hardness of scraper blade edge may be less than a certain degree.

Table B-2 Finishing degree of surface of fineness gauge

Applicable Standard JIS B 0659		
Division according to position of part	Roughness number	Triangle symbol
Groove of fineness gauge and scraper blade edge	SN 4	▽▽▽▽
Parts of fineness gauge and scraper other than the above mentioned part	SN 5	▽▽▽

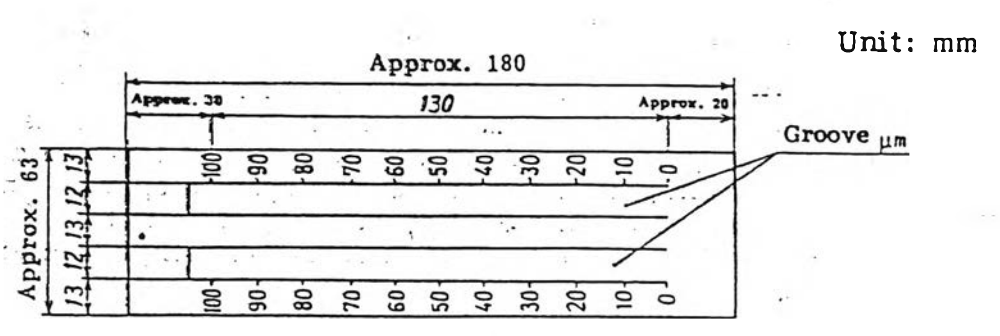

Figure B-1 Example of fineness gauge (100 µm)

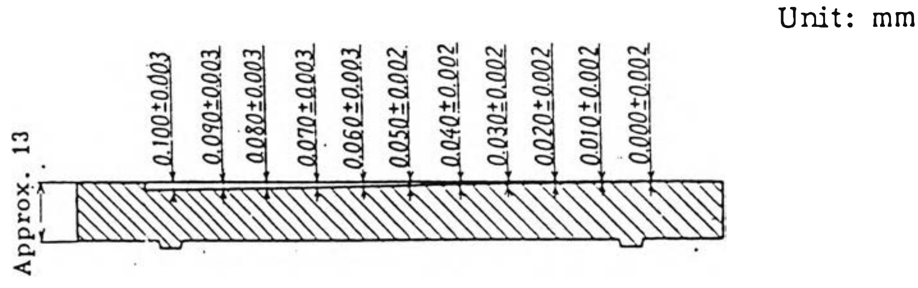

Figure B-2 Depth of grooves of fineness gauge (100 μm)

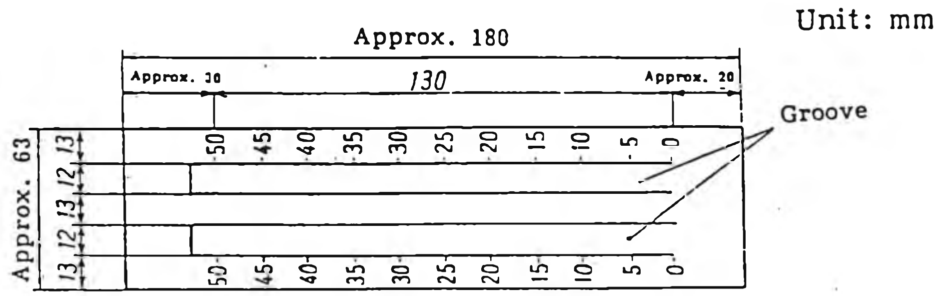

Figure B-3 Example of fineness gauge (50 μm)

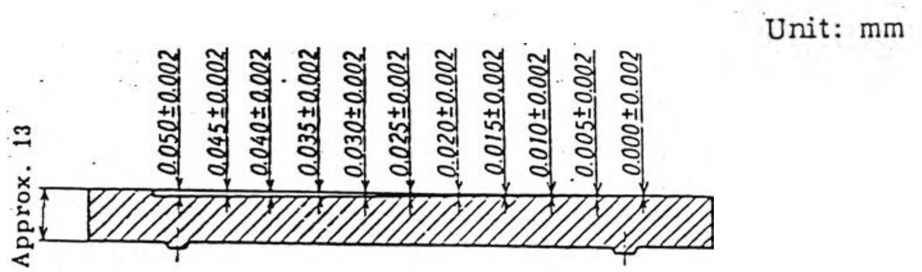

Figure B-4 Depth of grooves of fineness gauge (50 μm)

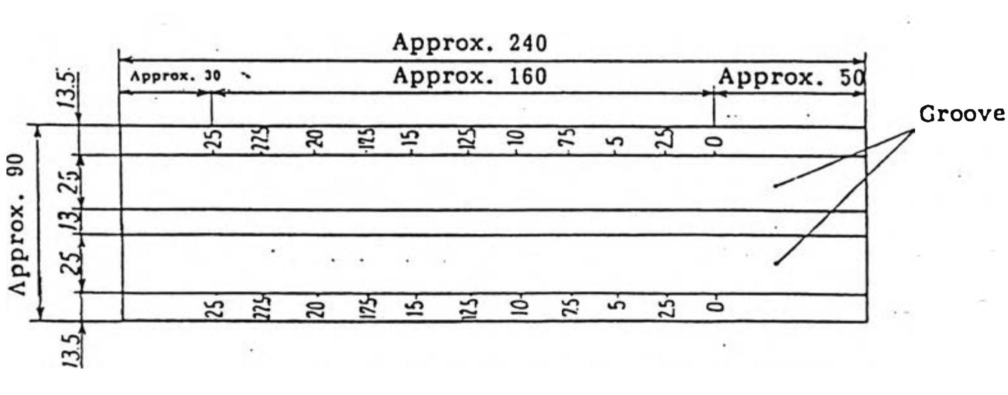

Figure B-5 Example of fineness gauge (25 μm)

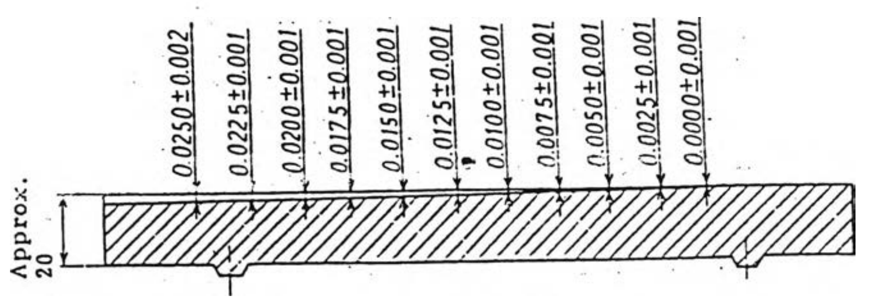

Figure B-6 Depth of grooves of fineness gauge (25 μm)

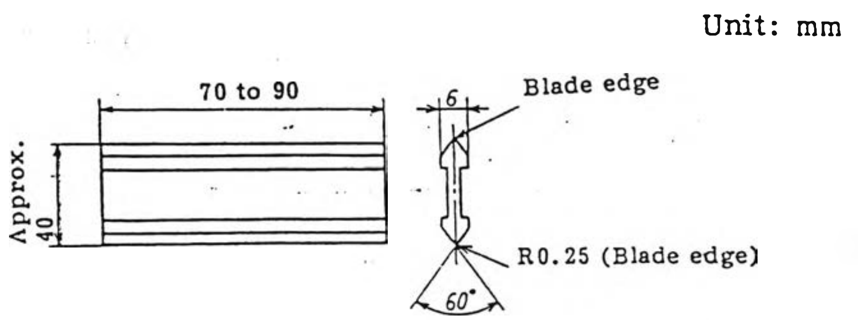

Figure B-7 Scraper (Common)

3. Operation

The operation shall be carried out as follows:

(a) Fix a cleaned (2) fineness gauge on a horizontal, rigid stand so as the maximum graduation to forward to the testing person and so as the graduation 0 to be this side.

(b) After mixing thoroughly the sample by stirring, immediately at the deepest position of groove of fineness gauge, flow-in to the degree so as slightly to spill out from the groove.

(c) Hold the end of long side of scraper with finger ends of both hands, apply so that the blade edge of opposite side at the maximum graduation of fineness gauge crosses at right angles with the long side of groove, the scraper becomes approximately vertically to the upper surface of fineness gauge and with pressing lightly the blade edge as it is, draw at once to graduation 0 direction (this side) at uniform speed approximately in 1 s.

(d) After completion of drawing of scraper, within 5 s, observe the graining distribution density attached on the sample surface squeezed to the groove at perpendicular direction to the long side of fineness gauge and from above by 20 to 30 degrees to the upper surface.

(e) After measuring, wash the upper surface of fineness gauge with reducer of sample by using a soft brush, and make clean.

(f) Repeat the above mentioned measurement three times.

Note(2): Because usually the surface of fineness gauge is coated with mineral oil for rust prevention, wipe off it by petroleum benzene or the like and remove to make clean.

4. Evaluation

For evaluation, observe the graining distribution density and read out the graduation at the portion where the collected-tightly grainings begin to appear. However, where the boundary line of collected tightly grainings has appeared at the intermediate of graduations, or when the numerical values of two grooves are different, read out the graduation by larger numerical value and take the median value of measured value of measured values of three times as the dispersibility of sample. An example of evaluation of graining according to distribution diagram is shown in fig. B-8.

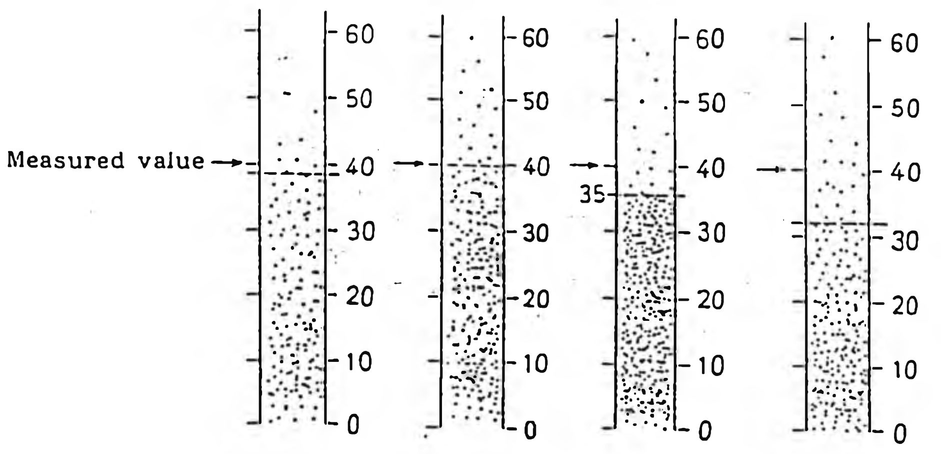

Figure B-8 Example of evaluation of graining according to distribution diagram

5. Specified Conditions of Product Standard

Types of fineness gauges.

APPENDIX C

DATA FROM EXPERIMENTS

Data were obtained by using measurement of grind gauge meter. All of data are shown as follows:

Table C-1 Data from experiments

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
60	70	16	3	13	15	50	50	FINENESS BEFORE GRINDING 68 MICRON
			4	12	13	45	40	
			5	10	10	30	30	
			6	9	9	20	20	
			7	9	9	15	15	
			8	9	9	10	10	
60	70	18	3	15	15	40	45	FINENESS BEFORE GRINDING 70 MICRON
			4	13	12	30	30	
			5	10	10	20	20	
			6	9	9	15	15	
			7	9	9	10	10	
			8	9	9	10	10	
60	70	20	3	15	15	50	45	FINENESS BEFORE GRINDING 70 MICRON
			4	13	13	45	30	
			5	10	12	30	25	
			6	9	10	25	20	
			7	9	9	15	15	
			8	9	9	10	10	
60	72	16	3	15	15	50	50	FINENESS BEFORE GRINDING 70 MICRON
			4	13	13	40	45	
			5	10	12	30	40	
			6	9	10	20	30	
			7	9	9	15	20	
			8	9	9	10	10	
60	72	18	3	15	15	50	55	FINENESS BEFORE GRINDING 72 MICRON
			4	13	12	40	45	
			5	10	10	25	30	
			6	9	9	15	25	
			7	9	9	10	15	
			8	9	9	10	10	
60	72	20	3	15	15	40	50	FINENESS BEFORE GRINDING 72 MICRON
			4	13	13	30	35	
			5	10	12	20	25	
			6	9	9	15	20	
			7	9	9	10	15	
			8	9	9	10	10	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
60	74	16	3	15	16	50	50	FINENESS BEFORE GRINDING 73 MICRON
			4	13	12	40	45	
			5	12	10	35	40	
			6	10	10	30	30	
			7	9	9	20	25	
			8	9	9	10	10	
60	74	18	3	15	15	50	50	FINENESS BEFORE GRINDING 74 MICRON
			4	13	12	50	45	
			5	12	12	40	40	
			6	10	10	30	30	
			7	9	9	20	20	
			8	9	9	10	10	
60	74	20	3	15	15	50	50	FINENESS BEFORE GRINDING 74 MICRON
			4	13	13	50	40	
			5	12	12	45	35	
			6	10	10	40	25	
			7	9	10	25	20	
			8	9	9	15	10	
60	76	16	3	13	15	50	50	FINENESS BEFORE GRINDING 74 MICRON
			4	12	13	45	40	
			5	12	12	35	35	
			6	10	10	25	25	
			7	9	9	20	20	
			8	9	9	15	15	
60	76	18	3	15	13	50	50	FINENESS BEFORE GRINDING 72 MICRON
			4	13	12	45	45	
			5	12	12	30	35	
			6	12	10	20	25	
			7	10	10	18	20	
			8	9	9	15	15	
60	76	20	3	15	14	50	50	FINENESS BEFORE GRINDING 72 MICRON
			4	13	13	45	45	
			5	12	12	35	35	
			6	10	10	30	25	
			7	9	9	25	20	
			8	9	9	20	15	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
60	85	16	3	15	15	50	50	FINENESS BEFORE GRINDING 75 MICRON
			4	14	13	50	50	
			5	13	12	40	45	
			6	10	10	35	40	
			7	9	10	30	30	
			8	9	9	25	25	
60	85	18	3	16	17	50	50	FINENESS BEFORE GRINDING 76 MICRON
			4	15	15	50	45	
			5	13	13	45	40	
			6	12	13	30	30	
			7	10	10	25	25	
			8	9	9	20	20	
60	85	20	3	20	25	50	55	FINENESS BEFORE GRINDING 75 MICRON
			4	18	20	45	50	
			5	15	18	40	45	
			6	13	15	30	35	
			7	10	12	25	30	
			8	9	10	20	25	
90	70	16	3	15	15	50	50	FINENESS BEFORE GRINDING 58 MICRON
			4	10	10	40	40	
			5	9	10	30	30	
			6	9	9	20	20	
			7	9	9	15	13	
			8	9	9	10	10	
90	70	18	3	15	15	40	45	FINENESS BEFORE GRINDING 58 MICRON
			4	13	12	30	35	
			5	10	10	20	25	
			6	9	9	15	20	
			7	9	9	10	12	
			8	9	9	10	10	
90	70	20	3	15	15	30	40	FINENESS BEFORE GRINDING 60 MICRON
			4	13	12	25	30	
			5	10	10	20	20	
			6	9	9	15	15	
			7	9	9	10	12	
			8	9	9	10	10	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
90	72	16	3	13	15	40	45	FINENESS BEFORE GRINDING 60 MICRON
			4	12	12	35	35	
			5	10	10	30	25	
			6	9	9	20	20	
			7	9	9	15	15	
			8	9	9	10	10	
90	72	18	3	15	15	35	50	FINENESS BEFORE GRINDING 60 MICRON
			4	13	13	30	40	
			5	10	10	20	30	
			6	9	9	15	20	
			7	9	9	10	15	
			8	9	9	10	10	
90	72	20	3	15	13	30	45	FINENESS BEFORE GRINDING 60 MICRON
			4	13	12	25	35	
			5	10	10	20	30	
			6	9	9	15	20	
			7	9	9	13	15	
			8	9	9	10	10	
90	74	16	3	13	15	50	50	FINENESS BEFORE GRINDING 61 MICRON
			4	12	12	45	40	
			5	10	10	30	35	
			6	9	9	25	20	
			7	9	9	20	15	
			8	9	9	10	10	
90	74	18	3	15	15	50	50	FINENESS BEFORE GRINDING 62 MICRON
			4	12	13	40	45	
			5	10	10	30	30	
			6	9	9	20	25	
			7	9	9	15	15	
			8	9	9	10	10	
90	74	20	3	15	15	50	50	FINENESS BEFORE GRINDING 62 MICRON
			4	12	13	35	40	
			5	10	10	30	30	
			6	9	10	20	25	
			7	9	9	15	20	
			8	9	9	10	10	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
90	76	16	3	15	14	50	35	FINENESS BEFORE GRINDING 63 MICRON
			4	13	12	40	30	
			5	12	11	35	25	
			6	10	10	30	20	
			7	9	9	25	15	
			8	9	9	20	10	
90	76	18	3	15	15	50	50	FINENESS BEFORE GRINDING 62 MICRON
			4	13	13	45	40	
			5	13	12	35	35	
			6	12	10	25	25	
			7	10	9	20	20	
			8	9	9	15	15	
90	76	20	3	18	15	50	50	FINENESS BEFORE GRINDING 63 MICRON
			4	15	13	45	45	
			5	13	13	35	35	
			6	12	12	30	30	
			7	10	10	25	25	
			8	9	9	20	20	
90	85	16	3	13	15	45	50	FINENESS BEFORE GRINDING 65 MICRON
			4	12	14	40	50	
			5	10	13	35	40	
			6	10	12	30	30	
			7	9	10	25	25	
			8	9	9	18	20	
90	85	18	3	15	16	50	50	FINENESS BEFORE GRINDING 65 MICRON
			4	15	14	50	50	
			5	14	13	45	40	
			6	12	13	35	30	
			7	10	10	25	25	
			8	9	9	20	20	
90	85	20	3	18	18	50	50	FINENESS BEFORE GRINDING 66 MICRON
			4	16	15	50	50	
			5	15	13	45	45	
			6	13	12	35	35	
			7	12	10	30	25	
			8	9	9	25	20	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
120	70	16	3	12	12	50	45	FINENESS BEFORE GRINDING 50 MICRON
			4	10	10	40	40	
			5	9	9	25	30	
			6	9	9	15	20	
			7	9	9	10	15	
			8	9	9	10	10	
120	70	18	3	13	12	50	50	FINENESS BEFORE GRINDING 50 MICRON
			4	10	10	45	40	
			5	9	9	30	35	
			6	9	9	15	25	
			7	9	9	10	15	
			8	9	9	10	10	
120	70	20	3	13	13	50	50	FINENESS BEFORE GRINDING 50 MICRON
			4	10	10	30	40	
			5	9	9	20	30	
			6	9	9	15	20	
			7	9	9	10	10	
			8	9	9	10	10	
120	72	16	3	13	13	50	45	FINENESS BEFORE GRINDING 52 MICRON
			4	12	12	40	40	
			5	10	10	35	30	
			6	9	9	30	25	
			7	9	9	20	15	
			8	9	9	10	10	
120	72	18	3	12	13	45	40	FINENESS BEFORE GRINDING 50 MICRON
			4	12	12	40	35	
			5	10	10	30	30	
			6	10	9	20	20	
			7	9	9	15	15	
			8	9	9	10	10	
120	72	20	3	13	13	45	45	FINENESS BEFORE GRINDING 52 MICRON
			4	10	10	35	30	
			5	10	9	25	20	
			6	9	9	20	18	
			7	9	9	15	13	
			8	9	9	10	10	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
120	74	16	3	13	15	50	45	FINENESS BEFORE GRINDING 53 MICRON
			4	12	13	40	40	
			5	10	10	30	35	
			6	9	10	20	25	
			7	9	9	15	15	
			8	9	9	10	10	
120	74	18	3	15	15	50	50	FINENESS BEFORE GRINDING 54 MICRON
			4	13	12	30	35	
			5	12	10	20	25	
			6	10	9	15	20	
			7	9	9	10	15	
			8	9	9	10	10	
120	74	20	3	15	15	50	45	FINENESS BEFORE GRINDING 53 MICRON
			4	13	13	35	40	
			5	12	12	25	35	
			6	10	10	20	25	
			7	9	9	15	15	
			8	9	9	10	10	
120	76	16	3	15	15	50	45	FINENESS BEFORE GRINDING 54 MICRON
			4	13	12	40	40	
			5	12	12	30	35	
			6	10	10	20	25	
			7	9	9	15	20	
			8	9	9	10	15	
120	76	18	3	15	15	50	50	FINENESS BEFORE GRINDING 55 MICRON
			4	13	13	45	40	
			5	12	12	35	30	
			6	12	12	25	25	
			7	10	10	20	20	
			8	9	9	15	15	
120	76	20	3	18	18	50	50	FINENESS BEFORE GRINDING 55 MICRON
			4	15	17	40	45	
			5	13	15	35	40	
			6	12	13	25	30	
			7	10	12	20	25	
			8	9	9	15	15	

Table C-1 Data from experiments (continued)

PREMIX		GRINDING		FINENESS (MICRON)				REMARK
TIME (MIN.)	VISCOSITY	FLOW RATE (KG/MIN.)	TIME (HR.)	FROM PIPE (OUT) (MICRON)		IN STIRRED TANK (MICRON)		
				TEST # 1	TEST # 2	TEST # 1	TEST # 2	
120	85	16	3	15	15	50	50	FINENESS BEFORE GRINDING 58 MICRON
			4	13	13	45	45	
			5	12	12	40	40	
			6	10	10	30	35	
			7	10	10	25	20	
			8	9	9	18	15	
120	85	18	3	16	15	50	50	FINENESS BEFORE GRINDING 58 MICRON
			4	15	15	50	45	
			5	13	13	40	40	
			6	12	12	35	30	
			7	10	10	25	20	
			8	9	9	20	15	
120	85	20	3	18	16	50	50	FINENESS BEFORE GRINDING 57 MICRON
			4	16	15	45	50	
			5	15	13	35	40	
			6	13	12	30	30	
			7	10	10	25	25	
			8	9	9	20	20	

VITA

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