



JANUARY 1944

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#177 - Pigment Studies

Paints have been prepared for the cooperative exposure evaluation of 414 leaded zinc oxide in conjunction with basic silicate white lead. We are working with the National Lead Company on this project.

In this program substitutions of 414 dry with basic silicate white lead are made by the following methods.

- A. ZnO replacement by equal poundage.
Lead replacements by equal volume.
- B. Maintain a 35/65 Pb pigment/ZnO ratio -
replacement is based on total volume.
- C. Maintain 35/65 Pb pigment/ZnO ratio replacements
based on total pounds. (Adjust volume with extender.)

Further details will be given when the panels are placed on exposure.

0007-SWP-044030

0007-SWP-000113400

Paint Research
August, 1953

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#177 - Pigment Studies

Panels 12349 - 12358 C were examined after 4-1/2 years' exposure at 45° south in Chicago. This is a set of 6" x 12" cold rolled steel panels on which an evaluation of a stainless steel powder has been conducted. Other test conditions on this pigment have been reported previously. In general, these earlier tests showed that stainless steel is not a good pigment in paints that are used in contact with metal substrates. Under these conditions they tend to accelerate corrosion. These Chicago exposures serve to confirm the earlier findings. The only advantage for stainless steel over aluminum in surface coatings was observed where severe chemical fumes are prevalent. Even here a good chemically resistant vehicle such as vinyl copolymers and a primer are necessary to realize any benefit in appearance from the stainless steel pigment. Under normal atmospheric conditions aluminum pigmented top coats retain better appearance than stainless steel pigmented top coats.

0007-SWP-044031

0007-SWP-000113401

Paint Research
September, 1955

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#177 - Pigment Studies

The color stability and flooding characteristics of a series of improved du Pont copper phthalocyanine blue pigments are being compared in a mineral spirits soluble alkyd enamel. Each of the pigments under study was dispersed in the bodied linseed (510), zinc resinate (5071) combination used in BL 44 Tint Base. Bases prepared in this manner were used to shade factory produced Rex 710 White Enameloid to approximately equal color densities. Samples of each enamel tint are being stored at room temperature and at 135° F. to study color and flooding stability.

Initial characteristics and ratings of the pigments under study follow:

Pigment		<u>Flooding</u>	<u>Tint Factor</u>
CP 1057	S-W Toner	Very bad	97
BT 375-D	du Pont xylene stable toner	Very bad	98
BT 366-D	du Pont resin coated toner	Moderate	93
BL 282-D	du Pont aluminum benzoate lake	Very slight	126
CG 5980	du Pont xylene stable toner	Very bad	94
P 125	du Pont xylene stable toner	Very bad	105

Tint factors represent the grams of tint base used to shade 50 ounces of Rex 710 enamel to the depth of color at which the series is being evaluated. Flooding is rated by observing the extent to which a disturbed area of wet film contrasts with adjacent undisturbed film surfaces. The fresh film is disturbed at regular intervals by wiping the finger tip gently across the surface during the setting up period.

0007-SWP-044032

0007-SWP-000113402

Paint Research
April, 1954

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#177 - Pigment Studies

A series of special phthalocyanine blue lakes, MB 1, 2 and 3, has been submitted by the C. P. Department for flooding and color stability testing. These were dispersed in HL 44 type tint base formulations and used to shade separate samples of Enameloid White Rex 710 and Kem Glo White Rex 51400 to approximately equal color levels. Shaded specimens were stored at room temperature and at 135° F. and rated for flooding after a two month storage period. Enamels shaded with du Pont's resin coated phthalocyanine blue BT 366-D served for reference purposes.

Kem-Glo tints show slightly more flooding than their Enameloid counterparts at both temperatures. Differences between the various items in this study are insignificant. MB-3 looks best in Rex 710 at both temperatures and at 135° F. in Kem Glo. Its performance is equalled by MB-2 at 135° F. in Kem-Glo and excelled by it at room temperature. MB-1 has lost the favored position that it held at the one month inspection. It is now second best in the Kem-Glo line while it shares top rating with MB-3 at 135° F. in Enameloid.

Comparative Flooding ratings are rated from 1 for least, to 4 for the most in the following table:

Enameloid Rex 710 Tinted

<u>Pigment</u>	<u>135° F. Storage</u>	<u>75° F. Storage</u>
MB-1	1	2
MB-2	3	3
MB-3	1	1
BT 366-D	3	3

Kem Glo Tinted

<u>Pigment</u>	<u>135° F. Storage</u>	<u>75° F. Storage</u>
MB-1	2	2
MB-2	1	1
MB-3	1	2
BT 366-D	4	4

Cost differences would be the most significant factors to consider in a selective rating of these pigments.

Silicone surface treatments failed to improve the dispersibility or decrease the flooding tendency of phthalocyanine blue CP 1037. Samples of this material were surface treated in four different manners by the Linde Air Products Company.

0007-SWP-044033

0007-SWP-000113403

Paint Research
April, 1954

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#177 - Cont.

1. Methyl silicone oil
2. Ethyl silicone oil
3. Highly polymerized methyl oil gum stock
4. Vinyl triethoxy silane

EL 44 type tint bases were prepared from these materials and used to shade Enameloid Rex 710 specimens to a pastel blue. The gum stock treated pigment dispersed with greater difficulty than regular GP 1057. The flooding characteristics of all treated systems remained standard. Panels have been prepared for exterior exposures in which branning will be observed.

0007-SWP-044034

0007-SWP-000113404

Paint Research
June, 1954

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#177 - Pigment Studies

A final evaluation of the flooding characteristics and color stability of a group of phthalocyanine blue lake pigments submitted by our C. P. Department shows substantial fading in MB 3 tinted Enameloid White Rx 710 and Kem Glo White Rx 51400 after aging 4 months at 135° F. Room temperature stored samples retained good color stability. The results of this test may have been disturbed by an erroneous adjustment of the thermostat on the 135° F. oven that raised the temperature to 155° F. for possibly two weeks at the end of the test. This may account for the color fade in the MB-3 tinted enamels, since the full toner CFI 55L on which MB-3 is based had previously passed the 135° F. storage test in Rx 710. However, it does place the other items in a preferred position for use in materials where storage temperatures are expected to exceed 135° F.

Pigments under study are:

MB-1	CP lake based on du Pont's BNF wet press cake.
MB-2	CP lake based on du Pont's BNF dry pigment.
MB-3	CP lake based on CFI 55L.
BT-366-D	du Pont's resin coated phthalocyanine blue.

The flooding ratings of these materials in Rx 710 enamel at 135° F. storage showed most flooding in MB-3 tinted material, decreasing progressively through BT 366-D, MB-2, to MB-1, which showed the least. At room storage the Rx 710 tinted enamels all showed moderate flooding with variations too limited to rate.

In Kem Glo White Rx 51400, MB-2 flooded most at 135° F., decreasing through MB-1 and MB-3, which flooded less but equal to BT 366-D, which flooded the least. At room temperature BT 366-D reversed its position, flooding the most. Flooding decreased in this group through MB-3, MB-2, to MB-1, which flooded least.

In appraising the color stability of these materials, visual ratings were made by comparing each 135° F. specimen with its 75° F. parallel. It was assumed that the 75° F. sample would be the most stable, so ratings indicate the positions of the 135° F. samples relative to these. The Hunter reflectance measurements tend to confirm these observations, but show that the considerable fade reported for the 135° F. MB-3 samples are exaggerated by this appraisal, since it is based on the relative difference between two panels that have drifted in opposite directions during the aging period.

Chart follows.

0007-SWP-044035

0007-SWP-000113405

Paint Research
June, 1954

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#177 - Cont.

Hunter Reflectance Rx 710

		<u>Green Filter</u>			<u>Blue Filter</u>			<u>Amber Filter</u>			<u>Visual Inspection</u>
		<u>Fresh</u>	<u>4 Mo.</u>	<u>Diff.</u>	<u>Fresh</u>	<u>4 Mo.</u>	<u>Diff.</u>	<u>Fresh</u>	<u>4 Mo.</u>	<u>Diff.</u>	
MB-1	135° F		51.0	- 1.1		63.0	- 2.4		22.4	- 2.0	Slight fade
MB-1	75° F	32.1	30.5	- 1.6	65.4	63.0	- 2.4	24.4	23.2	- 1.2	
MB-2	135° F		28.8	- 1.4		55.8	- 1.5		19.8	- 5.1	Slightly darker
MB-2	75° F	25.2	27.8	- .4	57.5	56.7	- .8	22.9	19.8	- 3.5	
MB-3	135° F		35.5	+ 8.1		59.4	- 3.4		28.8	+ 5.2	Cons. fade
MB-3	75° F	29.2	28.6	- .6	62.8	60.2	- 2.6	23.6	21.6	- 2.0	
BT 366-D	135° F		32.0	+ .8		63.6	- .6		23.5	- .9	Stable color
BT 366-D	75° F	51.2	30.6	- .6	64.2	63.6	- .6	24.4	22.2	- 2.2	

Rx 51400 Enamel

		<u>Green Filter</u>			<u>Blue Filter</u>			<u>Amber Filter</u>			<u>Visual Inspection</u>
		<u>Fresh</u>	<u>4 Mo.</u>	<u>Diff.</u>	<u>Fresh</u>	<u>4 Mo.</u>	<u>Diff.</u>	<u>Fresh</u>	<u>4 Mo.</u>	<u>Diff.</u>	
MB-1	135° F		30.2	+ .4		63.6	- .6		21.5	- .9	Slight fade
MB-1	75° F	29.8	29.4	- .4	64.2	63.6	- .6	22.4	20.5	- 2.1	
MB-2	135° F		23.0	- 2.6		56.6	- .2		18.0	- 3.6	Slightly darker
MB-2	75° F	25.6	24.4	- 1.2	56.8	56.6	- .2	19.6	17.4	- 2.2	
MB-3	135° F		36.4	+ 7.5		61.5	- .5		28.0	+ 5.6	Cons. fade
MB-3	75° F	28.1	27.4	- .7	62.0	60.0	- .20	22.4	19.4	- 3.0	
BT 366-D	135° F		30.8	+ 1.9			- 1.0		23.0	+ .0	Slight fade
BT 366-D	75° F	28.9	30.8	+ 1.9	64.0		- 1.0	23.0	21.6	- 1.2	

0007-SWP-044036

0007-SWP-000113406

Paint Research
September, 1954

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#177 - Pigment Studies

The National Lead Company has submitted a sample of an improved basic silicate white lead identified as 45 I SC. This pigment has been incorporated into Rx 450 SWP Undercoater for storage tests and hiding power comparisons. Tinting strength was also compared with the current standard material. To date no advantage could be ascribed to the SC material. Rx 450 opacity was unchanged, grinding was approximately equal, being rated at 2-3/4 H on the standard and 2-1/4 H on the SC. Viscosities were substantially the same, rated at 16.0" and 16.8" on the #5 Sherwin-Williams flowmeter, respectively. Tinting strength favored the SC material very slightly. Storage tests are under way in sealed one gallon cans stored at 95° F.

0007-SWP-044037

0007-SWP-000113407

Paint Research
September, 1954

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#177 - Pigment Studies

The National Lead Company has submitted a sample of an improved basic silicate white lead identified as 45 I SC. This pigment has been incorporated into Rx 450 SWP Undercoater for storage tests and hiding power comparisons. Tinting strength was also compared with the current standard material. To date no advantage could be ascribed to the SC material. Rx 450 opacity was unchanged, grinding was approximately equal, being rated at 2-3/4 H on the standard and 2-1/4 H on the SC. Viscosities were substantially the same, rated at 16.0" and 16.8" on the #8 Sherwin-Williams flowmeter, respectively. Tinting strength favored the SC material very slightly. Storage tests are under way in sealed one gallon cans stored at 95° F.

0007-SWP-044038

0007-SWP-000113408

Paint Research
July, 1955

#177 - Pigment Studies

A study of four samples of Ferrite Yellow 8280 dry evolved from work done in the Dispersion Laboratory and the Raw Material Control Laboratory. The Materials Laboratory reported the colors to be similar on the basis of oil rub ups. The Dispersion Laboratory showed that the pigments were quite different. The Reichard Coulston material dried flat and light in color. The Columbia Carbon material was intermediate and the two C. K. Williams samples were the most glossy and had the deepest color.

Our work was directed first to review the work of the Dispersion Laboratory and second to reconcile the divergent reports on these materials. In running the Quickie Mill technique we first ran into differences in vehicle demand between these ferrites as shown in Table No. 1. Using a spatula mixing we attempted to use mill bases of equal viscosity. To do this, vehicle quantities were adjusted as shown. Dispersions were measured on the grind gage and are reported for each time interval.

Table No. 1

<u>Material</u>	<u>5 min.</u>	<u>10 min.</u>	<u>15 min.</u>	<u>30 min.</u>
C. K. Williams Lot #145	6H	6H	7H	
Columbia Carbon Lot #991	5H	5H	5-1/2 H	
Reichard Coulston Lot 1-2-55	No Grind	2H*	2H	7H**
C. K. Williams Lot #146	6H	6H	6H	

*20 cc vehicle blend added

**20 cc (145) Mineral Spirits added

Note: This dispersion was made on a 45% pigment concentration. In the actual test 39 grams pigment were used, and 55 cc of the vehicle blend were used. The vehicle blend is made up of 2 parts (3962) soya alkyd varnish and 1 part (151) Mineral Spirits (hi flash).

At the conclusion of the milling step all of the samples were reasonably similar in color when wet. Drawdowns on glass were quite similar to those obtained by the Dispersion Laboratory. It was noted that drying was more rapid with the Reichard Coulston pigment.

Paint Research
July, 1955

#177 - Cont.

A second test was made with the Quickie Mill in which a blend of raw and bodied linseed oil with thinners was used as the dispersing liquid. Here again more vehicle was required to wet the Reichard Coulston pigment than the C. K. Williams sample. Milling proportions and finenesses obtained are given in Table No. 2 below.

Table No. 2

<u>Material</u>	<u>5 Min.</u>	<u>10 Min.</u>	<u>15 Min.</u>
C. K. Williams Lot #145	6H	6H	6-1/2H
Reichard Coulston Lot 1-2-55	1H*	5H	6-1/2H

*Extra 30 cc of vehicle blend added.

Note: New vehicle blend used in this dispersion. Blend made up of 20 cc (1521) raw linseed oil, 15 cc (2539) bodied linseed oil, and 25 cc (151) Mineral Spirits.

It is of interest that drawdowns on glass of the above oil dispersions are comparable while wet. Color is still comparable after 1 hour drying but the Reichard Coulston material had set up to a stiff paste while the C. K. Williams material is still a fluid paste.

In addition to the above tests the Analytical Section made oil absorption tests on these samples of 8280 dry plus additional lots of material currently in stock. They reported as follows:

<u>Supplier</u>	<u>Lot No.</u>	<u>Oil Absorption</u>
C. K. Williams	145	39.6
C. K. Williams	146	41.0
Reichard Coulston	889	44.8
Reichard Coulston	1-2-55	63.0
Columbia Carbon	991	44.8
8280 dry Standard Sample		45.2

The problem material by these tests is shown to be not only difficult to wet but also high in the conventional oil absorption test.

One danger of relying on the Quickie Ball Mill test is that no differentiation may be made between a texture deficiency and a wetting deficiency. Just as soon as a technique is established for measuring paste consistency of ball mill bases this may be overcome.

#177 - Pigment Studies

A sample of Vansil, an experimental precipitated calcium silicate, was submitted for test by the R. T. Vanderbilt Company. It is hydrophilic in nature due to precipitation in the presence of a small amount of starch. Particle size is extremely fine, being below one tenth of a micron, but some aggregates are present. Several comparisons were made against Wollastonite, a natural calcium silicate and Santocel, a very finely divided silica. An oil absorption test gave a value of 25 for Wollastonite, 185 for Vansil and 300 for Santocel. Replacement of Santocel with Vansil, if possible, appeared attractive since Vansil can be produced for about ten cents per pound.

A low sheen varnish was produced by grinding 0.5 pound of Santocel into a gallon of Rexpar. The same varnish with a full pound of Vansil retained a high gloss so that this pigment does not appear to be useful as a gloss modifier. The supplier states that Vansil is difficult to disperse in oil media. In our tests it dispersed quite readily, both in varnish and in an oil base house paint.

Partial and complete substitution for the extender in SWP Redwood Velvet Flat was made with Vansil. Paints were formulated to maintain standard viscosity. These paints showed rather high gloss and the low sheen characteristic of SWP Velvet Flat could not be obtained with Vansil. Drying time was retarded considerably, even when the normal drier content was doubled. Vansil appears to act as a drier absorbent.

Only a preliminary test could be made in a PVA paint in comparison with Wollastonite due to the small amount of material available. It disperses quite readily and may serve as a useful extender in emulsion paints. Since Vansil demonstrates a number of unusual properties, further tests are planned.

0007-SWP-044041

0007-SWP-000113411

Paint Research
January, 1956

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#177 - Pigment Studies

Four months' aging have been completed on phthalocyanine blue enamels and tints. The pigments used were K 143 and K 145 supplied by S-W Organic Research Department, Cyan Blue Toner BNF 55-3750 supplied by American Cyanamid, and Solfast Blue Toner BNC, 7710 dry, supplied by du Pont. The paints have aged at 75° F. and 135° F. The paints made from the S-W pigments are a green shade although one of the pigments was a red shade before being incorporated into the enamel, a vinyl acetate-vinyl chloride copolymer paint.

No change has been found during the aging of the S-W enamels and tints. The American Cyanamid pigment is very good and shows no change. The du Pont blue has exhibited a slight color change which is probably due to crystallization of the pigment.

0007-SWP-044042

0007-SWP-000113412

Paint Research
February, 1956

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#177 - Pigment Studies

Phthalocyanine blue pigments in vinyl enamels and tints have completed six months' aging at 75° F. and at 135° F. The pigments evaluated in this high solvency system include K 143 and K 146, a red and green shade, respectively, provided by S-W Organic Research Department, a red shade Cyan Blue Toner BNF 55-3750 supplied by American Cyanamid, and a red shade ENC phthalocyanine blue supplied by du Pont, 7710 dry.

The du Pont blue has shown a slight loss in color which may be due to crystallization of the pigment. The Sherwin-Williams and American Cyanamid blues have shown no change from their original shade but the S-W red shade had converted to a green shade before the original draw-downs were made.

The Sherwin-Williams blue tints remained in suspension during the aging test, while the Cyanamid and du Pont tints settled out. The du Pont tint was especially difficult to re-disperse. This may indicate better performance for the S-W phthalocyanine blues. The six months aging completes the tests on these pigments.

0007-SWP-044043

0007-SWP-000113413

Paint Research
April, 1956

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#177 - Pigment Studies

One of the objectionable features of chalking paints is the appearance of a light colored chalk face on colored paints. This is attributed to the higher dry hiding of inerts compared with their hiding in the paint film itself. Lowe Brothers suggested encasing the pigment particles in a durable vehicle prior to incorporation in the paint. Then as chalking occurs the color of the chalk face should remain the same as the original color.

Two attempts at accomplishing this in SWP Flat Java Brown Al N 15 were not successful. Acryloid A-10 and a non-drying alkyd with a very high proportion of melamina were tried. Slurries of the pigment, resin and solvent were dried at 300° F. The resultant cake was crushed, micropulverized and incorporated into a paint. Unfortunately these vehicles were sensitive to the vehicle-solvent mixture in the paint. They swelled to such an extent that the paints were not practical.

0007-SWP-044044

0007-SWP-000113414

Paint Research
May, 1956

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#177 - Pigment Studies

An investigation is under way to determine the comparative tint retention properties of various semi and non-chalking titanium dioxides and titanium calcium pigments in SWP Trim and Tinting White and Intermix Tint Base. The various titanium pigments will also be evaluated in an emulsion latex paint and in an automotive high gloss alkyd enamel formulation. The pigments used are as follows:

Old No.	New No.	Lot No.	
1011	6632	418066	Unitane OR 640. Guide
2174	6630	L363-26	Ti-Pure R 610
1004	6631	D55L15 No. 4 or 791	Titanox RANC
1013	6622	117423	Unitane OR 540
2229	6623	8033-A25	Ti-Pure R 510 Chloride Process
2229	6620	112487	Ti-Pure R 510 Sulfate Process
---	6643	From du Pont	Ti-Pure 1102 Chloride Process
1014	6621	C56B25 No. 9 or TSV6-426	Titanox RA 50
2140	---	From du Pont Lot 2920	Ti-Cal R 60
2140	6685	56C-17-21	Titanox RC
1202	6682	29861 B9	Ti-Cal R 27
2132	6680	55 L 126	Titanox RCHT

Rx 473, Card 17

0007-SWP-044045

0007-SWP-000113415

Paint Research
May, 1956

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#177 - Cont.

It was reported last month that initial attempts to coat pigments with a durable resin to control the chalk face color on colored paints were unsuccessful. The vehicles that were tried, a melamine-alkyd and an acrylic, tended to swell in the paint vehicle (Flat SWP) even after curing for eight hours at 300° F. Two new attempts have given apparently complete insolubilization of the resins used for coating the pigment. However, intense ultraviolet exposures have not shown any marked advantage in color control for the paints containing coated pigments. Possibly milder exposures will be more productive.

The resins that were insolubilized successfully were a polyurethane prepared from toluene diisocyanate and a polyester prepared by Resin Research and Resimene 814, a water soluble melamine. The technique used of slurring the pigment in a solution of the resin, curing as a cake, and breaking up of the cake to make a paint leaves some doubt as to whether each pigment particle is coated adequately. Future work will include spray drying, higher resin-pigment ratios, and exterior exposures.

National Lead has shown through mathematical calculations, optical considerations and actual demonstration that there is an optimum PVC for white enamels to get the maximum hiding. This is not based on cost of hiding per pound of titanium dioxide but on actual hiding power per mil of dry film. In one case with a TiO_2 enamel this optimum PVC was 30%. The demonstration consisted of making draw downs over Moreset charts of a 15% PVC paint, a 45% PVC paint, and a 50/50 blend of the two. The blend had noticeably better hiding power than either of the individual paints.

Attempts to apply this with the Kam Savelite vehicle have been inconclusive. In this case the blend showed about equal hiding with the 45% PVC formulation using straight TiO_2 . Perhaps the optimum is not 30% PVC in this case. In addition, the application of such a principle to formulations such as Kam Savelite where inert is present is difficult. The inert can be treated either as part of the vehicle or part of the solvent in PVC calculations depending upon its particle size and the PVC of the paint. Further work is planned, particularly to determine the optimum PVC for straight TiO_2 in the Kam Savelite vehicle.

0007-SWP-044046

0007-SWP-000113416

Paint Research
June, 1956

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#177 - Pigment Studies

Exposure panels 24054-24107 C, F were prepared during the month, 50 cedar panels for Chicago south and 50 for Florida south. This is the major part of an extensive series testing various titanium pigments with special emphasis on chalking and fading. This part of the project covers R-473 SWP Tinting White and Intermix White. In each case, the paints tested are both as white and shaded to Castle Blue. The titaniums involved are:

Ti-Pure R-610	Titanox RANC
" R-510 chloride process	" RA-50
" " sulfate process	" RC
" R-110 Z chloride process	" RCHT
Ti-Cal R-60	Unitane OR-640
" R-27	" OR-540

The same titanium pigments are being exposed as whites and blue tints in Rasyn 12 K 51 emulsion paints as panels 23938-85 C, F. PVC is 35% using Wollastonite and mica as extenders. The guide on the panels is one coat of emulsion paint over a coat of SWP 450 Undercoater with the test portions two coats of emulsion paints on bare cedar bevel siding. Exposures are at Chicago and Florida.

The same lots of titanium pigments are also being exposed as whites and blue tints in the new automotive vehicle (37 C 62). The panel numbers are 24108-25 C, F.

0007-SWP-044047

0007-SWP-000113417

Paint Research
July, 1956

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#177 - Pigment Studies

The resin coated pigments as previously reported were prepared by making a slurry of pigment and resin and baking in the oven to drive off the solvent. The resultant cake was broken up and ground to the proper particle size. This method produces a usable pigment but it is not certain that each pigment particle thus produced has a continuous coating of resin.

It was thought that spray drying the resin-pigment slurry would produce a continuous film around each pigment particle. The pigment portion of Al N 15 SWP Flat Java Brown was mixed in a water solution of Resimene 814 and spray dried by spraying into an oven. The pigment produced was made into SWP Flat Java Brown Al N 15 and tested under the Uviarc ultraviolet lamp. The spray dried pigment was found to discolor more rapidly than an uncoated pigmentation. The Uviarc lamp was only three inches from the panel and the heat produced may have altered the performance of the resin coating.

Work on this project will be discontinued for the time being awaiting exterior exposure results. Exterior exposure panels of the standard, SWP Flat Java Brown Al N 15, a polyurethane coated pigment, and melamine coated pigments prepared by the grinding method and by the spray dry method are on exposure at Chicago and Florida.

Exposures 22226-35 C, F were examined recently after 12 months at Florida, vertical south, and 14 months at Chicago, north and south. The series consists of Rx 471 SWP Gloss White, over Rx 450 Undercoater and also self-primed, on cedar bevel siding. The tests are of silicone coated pigments as indicated below, the processing having been done by Linde Air Products Company on pigments submitted by us. The process is their "A" treatment, using methyl oils LM-3 and L-45. Besides the general durability characteristics, we were interested in the possibility of reducing the severity of rutile yellowing of R-200 titanium dioxide.

<u>Paint No.</u>	<u>Description</u>	<u>Results to date</u>
OJ 588 S	Rx 471, Card 80, untreated 6600 dry anatase TiO_2	Good, clean - both locations.
OJ 589 S	Same, treated pigments*	Show less chalking, more dirt at Florida and Chicago north; but it may be significant for the future that Chicago south shows slightly the reverse and is quite clean.

0007-SWP-044048

0007-SWP-000113418

Paint Research
July, 1956

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#177 - Cont.

<u>Paint No.</u>	<u>Description</u>	<u>Results to date</u>
OJ 590 S	R-200 replacing anatase TiO ₂ in basic formula	Noticeably less chalk, more dirt than guide, with a very little yellowing, mostly at Florida.
OJ 591 S	Same, treated pigments*	Much like the results above, a little less clean-up except that Chicago south shows a bit more. Essentially no yellowing.

*Treatment was given not only to the TiO₂'s, but to the other
white pigments: 6840 dry leaded zinc, 6232 dry Nylal 300 extender.

0007-SWP-044049

0007-SWP-000113419

Paint Research
October, 1956

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#177 - Pigment Studies

Paints have been prepared for exposure to evaluate a series of Ti Pure R 517 pigments. This series includes five samples of the chloride process pigment and five samples of the sulfate process R 510 pigment. Also included is a sample of New Jersey Zinc R-750 titanium dioxide and a sample of Titanox RA 50. These paints are prepared in the SWP Trim and Tinting White formula and will be exposed in Chicago south and north and in Florida south only.

0007-SWP-044050

0007-SWP-000113420

#177 - Pigment Studies

Phthalocyanine blue pigments produced in the new Sherwin-Williams PC Blue Plant are being tested for non-crystallizing properties in vinyl solvents. A previous series of tests (February 1956 Report) using laboratory prepared pigments showed good non-crystallizing properties but did show that the red shade was converted to the more stable green shade in these solvents. It was not known whether this was due to the strong vinyl solvents or to excessive heat produced during the dispersion of the pigments in vinyl vehicles.

A red shade PC Blue Solfast Blue MENC, CP 1404 and a green shade GDT, CP 1408 are being compared with du Pont Monastral Fast Blue BNC pigment, CP 1037, 7710 dry. These pigments were dispersed in vinyl resin on a 2-roll mill and also on a pebble mill where less heat would be obtained. The S-W red shade CP 1404 dispersed very easily by both methods but the green shade CP 1408 proved to be difficult to disperse, especially in the pebble mill. The standard CP 1037 was more difficult to disperse than CP 1404, but it was easier than CP 1408. The pebble mill dispersion did not develop the color strength that was obtained with the two roll mill dispersions.

The sand mill or bead mill was also tried as a means of dispersing the PC blue pigments in vinyl. CP 1404 was used since it was the pigment most likely to change during the grinding operation. With this particular vinyl system the vinyl dries too fast and clogs up the screen on the bead mill. The pigment also does not develop good color strength even after two passes through the mill. The bead mill does not appear to be suited for this particular type formula.

Enamels and tints prepared from the two-roll and pebble mill dispersions of these pigments are being stored at 25° C. and 70° C. for periods of one week, one month, and 2, 4, and 6 months. Draw-downs of the enamels and tints prior to storage showed that the red shade CP 1404 had a red cast compared with the green shade CP 1408, but it does not have the depth of color or red shade of the standard CP 1037. Apparently any change from red to green shade is due to the solvents since the same differences show up regardless of the method of dispersion.

0007-SWP-044051

0007-SWP-000113421

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#177 - Pigment Studies

One week and one month storage tests have been completed on Sherwin-Williams production lots of phthalocyanine blue pigments. CP 1404, a red shade PC blue, CP 1408, a green shade PC blue and CP 1037, du Pont BNC blue 7710 dry were dispersed in a vinyl vehicle with a solvent system of 50/50 aromatics/ketones. They were stored at 25° and 50° C. Drawdowns of the aged samples were made after stirring with a spatula and after 10 minutes shaking on a Red Devil shaker.

CP 1404 shows a definite change toward the green shade. CP1048 appears stable and shows no tendency to change from its original shade. CP 1037 has exhibited a slight loss in strength, but it is still bluer and redder than CP 1404. The Sherwin-Williams PC blues remain in suspension and are more easily redispersed by stirring than the du Pont standard CP 1037. The du Pont blue tints settle badly and are more difficult to disperse. However, their full color is recovered after 10 minutes on the Red Devil shaker.

0007-SWP-044052

0007-SWP-000113422

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Project #177 - Pigment Studies

Panels 24176 - 24179 C have completed six months 45° south exposure at Chicago. This series evaluates polyurethane and Resinene 814 coated pigments in SWP Flat Java Brown Al N 15. The purpose of the resin extended pigments was to attempt to eliminate white chalk face and fading from dark colored house paints upon exposure. The results show that the polyurethane coated pigment is no better than the standard SWP Flat while the Resinene coated pigment is much poorer on fading. These results agree with those found on accelerated tests under the Uviarc ultraviolet lamp. These exposures are being discontinued although work on this project is being continued along other lines.

Panels 24108-25 C and F have been inspected after six months' exposure in Chicago and Florida. In this study a number of titanium dioxide pigments are being evaluated against each other in Exlon automotive vehicle, (37 C 62). The exposures were made in straight whites and in blue tints. A table is listed below in which loss of washed gloss is used to indicate the relative durability of the pigments being evaluated.

Florida Exposure - 6 Months

Pigment	White			Blue Tint			
	60° Photovolt Gloss			60° Photovolt Gloss			
	Original	Washed 6 Mo.	Loss in Gloss	Original	Washed 6 Mo.	Loss in Gloss	Total Loss White/Tint
OR 640	97	85	12	93	78	15	27
R 610	92	85	7	93	75	18	25
RANC	93	83	10	94	73	21	31
OR 540	92	82	10	94	66	28	38
R 510 ¹	93	45	48	94	43	51	99
R 510 ²	93	72	21	93	61	32	53
RA 50	94	74	20	94	67	27	47
R 110	93	58	35	93	51	42	77
R 610 ³	96	63	33	94	57	37	70

¹Chloride Process

²Sulphate Process

³Kem Transport Vehicle
Control

0007-SWP-044053

0007-SWP-000113423

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Project #177 - Cont.

From the table it can be seen that little differences exist between the non-chalking type titanium pigments. However, in the semi-chalking titanium class some significant differences do show up. du Pont's R 510 pigment made with the chloride process has relatively poor chalk resistance. du Pont's R 510 pigment made by the sulphate process and Titanium Pigment's RA 50 show fair chalk resistance. Calco's OR 540 shows the best chalk resistance of the semi-chalk pigments and approaches the chalk resistance of the non-chalking pigments. du Pont's R 110 sample also was a chloride process pigment and would be expected to be about equal to R-510 chloride process. The loss in gloss for the Kem Transport control was largely due to dirt pick-up and mildew.

In Chicago the panels have not reached significant chalking at six months except for the chloride processed R 510 pigment. The panels will be re-exposed in Chicago and in Florida.

0007-SWP-044054

0007-SWP-000113424

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March, 1957

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Project #177 - Pigment Studies

Four months storage tests have been completed on phthalocyanine blue pigments CP 1404, CP 1408, and the standard CP 1037. CP 1404 is the Sherwin-Williams production red shade PC blue while CP 1408 is a green shade. The standard CP 1037 is du Pont ENC, TT10 dry. CP 1404 was converted to the green shade within the first week of storage but it does not show any further change since that time. CP 1408 shows a slight loss of strength but otherwise it is excellent. The control, CP 1037, showed a considerable change in color strength but it still maintains its red shade.

A comparison was made between pebble mill and two roll mill dispersions of CP 1037 and CP 1404 in the vinyl resins. The pebble mill dispersions did not develop as much color strength as the 2-roll mill and therefore less change is found with them, but the change from the red to green shade in CP 1404 is still evident. The final series of tests on these pigments will be made after six months' storage.

Panels 24176-24179 F have completed six months' exposure in Florida. These panels are an evaluation of resin extended pigments in SWP Flat Java Brown formulation. The purpose of this test is to develop a means of preventing the formation of a white chalk face on the dark colored house paints. A polyurethane resin and Resimene 814 were used as protective coatings for the pigments. The Resimene 814 coated pigments faded quite badly and were much worse than the control paint SWP Flat Java Brown Al N 15. The polyurethane coated pigments showed about the same amount of fade as the control. Similar panels exposed at Chicago gave the same results. These are reported in the January, 1957 monthly report. Since no advantage has been found for the resin extended pigments the panels are being retired.

Further work has been done in an attempt to develop a suitable coating for house paint pigments which will control fading and white chalk face. A melamine-alkyd combination (48 C 27) and (40 D 14) has been tried but it also showed fading when exposed under a Uviarc ultraviolet light. The good ultraviolet resistance of Hypalon sounded interesting but the flexibility of this material made it impossible to regrind the coated pigment. Efforts to harden the Hypalon have not proven too successful. Work will continue with other coatings which may prove useful.

0007-SWP-044055

0007-SWP-000113425

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March, 1957

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Project 177 - Cont.

Florida exposures 24260-24265 F were inspected after six months' exposure. These exposures show two experimental titanium pigments from du Pont coded SR 40-1 and 985-B to be slightly inferior to du Pont's R 610 in gloss retention. These panels were re-exposed.

Routine examination for the third year of Florida south exposure has been made on panels 18380-7 F, all cedar bevel siding, and the most recent Chicago south readings are at 46 months. This series continues to be of considerable interest and will be continued on test. It evaluates four colored leaded zinc oxides made as pilot plant batches at Coffeyville by the antimony process. These are varying shades of yellow and are tested as single-pigment paints, compared directly with SWP Tint Base shaded to match. The details of chemical composition are covered in our progress report of February 8, 1956.

At 3 years' Florida exposure, the special samples continue to show much less fading, dirt and mildew than the controls. However, 40 X microscopic examination shows some checking on the specials, with some preference for those based on Oxlo 12 as against those based on Oxlo 35, but this is certainly not serious considering the long exposure. The Chicago panels show the same marked advantages for the special in color and appearance over the regular tint. Furthermore, the remarkably slight failure (mostly erosion) tends to favor the special samples. Their chalking rate is fairly rapid, but the chalk seems to be very adherent and its deep "self-colored" characteristic seems to be the main cause of their good color retention.

0007-SWP-044056

0007-SWP-000113426

Paint Research
April, 1957

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Project #177 - Pigment Studies

108 cedar bevel siding panels, comprising series 25842-80 CS, CN, F, were prepared for exposure at Chicago north and south and at Florida. The purpose of the series is to study the frequency of rutile yellowing, as well as chalking and durability of various titanium dioxide pigments in SWP Tint Base, used both as white, yellow and gray. The basic formula is a special, using leaded zinc, calcium carbonate and mica in an oleoresinous vehicle. The thirteen titanium pigments tested are:

Titanox RA 50
Ti-Pure R 610
Ti-Pure R 750, lot 75004
Ti-Pure R 510 - 10 samples submitted by du Pont,
 of which 5 are sulfate process
 and 5 chloride process.

We have seen instances where rutile yellowing appears to develop more frequently with du Pont's chloride process R 510 than with their sulfate process 510. The last item listed above covers this comparison in a broader test. It also will check uniformity of production.

0007-SWP-044057

0007-SWP-000113427

Paint Research
May, 1957

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Project #177 - Pigment Studies

Sherwin-Williams production of phthalocyanine blue pigments Solfast Blue MDNC, CP 1404, and GDT CP 1408 have completed six months' storage tests in high aromatic-ketone solvent vinyl formulations. Comparison of drawdowns made of the original paints and those made after six months' storage at 25° C. and 50° C. show that the red shade PC blue CP 1404 has been converted to the more stable green shade. The control pigment, du Pont's Monastral Fast Blue BNC, CP 1037, shows some loss of redness but it does not convert completely to the green form. The green shade PC Blue CP 1408 shows only a very slight loss in strength.

Duplicate samples of CP 1037 and CP 1404 were made up in the pebble mill and on the two roll mill to test the effect of heat formation during dispersion on the stability of the pigment. The initial color development was poorer in the pebble mill dispersion but the changes on aging were also much less. The conversion of CP 1404 to the green shade was still apparent regardless of the dispersion method.

0007-SWP-044058

0007-SWP-000113428

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August, 1957

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Project #177 - Pigment Studies

Four samples of titanium dioxide have been received from New Jersey Zinc for evaluation. One of these samples, R-99, represents an experimental super chalk resistant pigment. The other three - R 760-1, R 760-2, and R 760-3, represent normal production batches. du Pont has also sent four samples of titanium dioxide. These pigments represent blends of a number of lots for each of the following grades: R 610, R 510 sulfate, R 510 chloride, and R 110 chloride. These samples were submitted by du Pont for the purpose of comparing the various grades of their titanium pigments.

The above pigments are being evaluated in Exlon vehicle (37 C 83). Exposures were made in both white and a light blue tint. Three additional lots of R 610 type, four lots of OR 640 type, and three lots of RANC type titanium pigment were included as controls.

Preliminary tests show New Jersey Zinc's super chalk resistant pigment, R-99, to give a poor dispersion. This is as expected since it is a laboratory sample and has not been jet milled.

Chicago, Florida, Weather-Ometer and laboratory exposures are being run on the above pigments. Exterior exposures are also being made in SWP Trim and Tinting White, and in blue tints of PVA emulsion paints at 35% PVC.

0007-SWP-044059

0007-SWP-000113429

Paint Research
November, 1957

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Project #177 - Pigment Studies

Panels 22226-35 F, C were studied recently, after 24 months' exposure at Florida vertical south and slightly longer at Chicago north and south. All are cedar bevel siding. The paints indicated below are compared both over A2 W 2 SWP Undercoater and as self-primed work. The guide paint is A2 W 4 SWP Gloss White, Card 80. The purpose is to test silicone treated pigments, our pigment samples having been sent to Linda Air Products Company to be treated (or coated). Their "Method A," involving methyl oils LM-3 and L-45, was used. Essentially, there are only two parts to the test:

1. Treated pigments 6600 dry anatase TiO_2 , 6840 dry 35/65 leaded zinc and 6232 dry Nylal 300 versus same pigments untreated.

Results: Florida shows the special paint as somewhat cleaner, but having serious checking as against none for the regular.

2. Same comparison, but R-200 rutile TiO_2 used instead of 6600 dry.

Results: Same with regard to dirt and checking. However, the reduction in rutile yellowing due to the silicones is quite noticeable. Chicago panels show no checking, but definitely confirm the better clean-up of the specials in both categories.

Exposure series 23938-85 F, C (plus 24388-95 F, C) was examined recently after 12 months at Florida vertical south and the same at Chicago. This is one of the several series put out to test chalking rates and tint retention of various titanium dioxides, using paints both in the white and shaded light blue with phthalocyanine. In this case, the paints are latex exterior type at 35% PVC, all using Rasyn 12 K 51 PVA copolymer. In the tests using pure titanium, Wollastonite and mica make up the extender; in those using titanium calcium, it is the only pigment. The test systems include both one coat over A2 W 2 SWP Undercoater and two coats self-primed, all on new cedar bevel siding.

In general, there is no film failure and very little mold growth at either location. There is essentially no chalk rub-off except in the cases specified below. Florida tests are rated down considerably on the special undercoater tests because of a thin or gray appearance as against the better whiteness of the self-primed, but this does not seem to show up much at Chicago.

The results indicate about three categories:

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0007-SWP-000113430

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Project #177 - Cont.

1. No chalking to date, clean, color of blues good to excellent:

du Pont's 985-B	6632 dry OR-640	6630 dry R-610
du Pont's SE-40-1	6631 dry RANC	6622 dry OR-540
	R-510, Cl process	Ti-Cal R-60
		Ti-Pure 110 Z

2. Slight chalk, slight to moderate fading, not quite as clean:

R-510, SO ₄ process	6621 dry RA-50
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3. Definitely unsatisfactory to date:

RC-6685	Not very chalky but serious fading.
6680 dry RCHT	More chalky, even worse fading.
6682 dry R-27	Poorest of series; free chalk, extreme fading.

Exposure panels 27070-82 C, F were prepared during the month, all cedar bevel siding primed with A2 W 2 SWP Undercoater. Exposure is to be at Chicago and Florida, vertical south. The purpose is to evaluate ten production samples of Titanox RANC submitted by Titanium Pigments Corporation, uniformity of chalking and fade resistance being of primary concern. Also included is a sample of Japanese TiO₂ which reached us by way of our Sao Paulo plant. The TiO₂ samples are compared in A2 W 8 SWP Tinting White shaded to a light green with phthalocyanine and ferrite bases.

0007-SWP-044061

0007-SWP-000113431

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August, 1958

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Project #177 - Pigment Studies

A sample of MP-1111 rutile titanium dioxide from Titanium Pigment Corporation was put out for test on outdoor exposure, panels 28258-67 C, F. Exposure was made at Chicago and Florida, vertical south, on cedar bevel siding primed with A2 W 2 SWP Undercoater. In order to tie in with extensive TiO_2 tests already on our fences, the paints were formulated on a modification of A2 W 8 SWP Trim and Tinting White. Also, a light blue (phthalocyanine only) shade was used for panels paralleling the whites.

The comparisons involved are:

Unitane OR-640
Titanox RANC
Ti-Pure R-610
T.P.C. MP-1111 special

Exposures were put out during the month at Chicago and Florida, vertical south, testing two samples of 90% TiO_2 Ti-Cal pigment from du Pont's Pigment Division. The panels are cedar bevel siding and are numbered 28285-99 C, F. All are primed with A2 W 2 SWP Undercoater. In A2 W 4 SWP Gloss White card 2 the comparisons are:

175 pounds 6680 Titanox RCHT
105 " du Pont's Sample A
105 " du Pont's Sample B
105 " Titanox C-50, 6686

Each is used in combination with 50 pounds each of 6600 dry anatase TiO_2 and 6603 dry anatase semi-chalk. The same proportions are tested in A2 W 8 SWP Trim and Tinting White, card 5, shaded both to Berkeley Yellow and Chelsea Gray, conforming to the regularly used titanium content of this rex.

Panels 28304-9 CS, CN, F were prepared for exposure at Chicago, north and south vertical, and at Florida, south, all cedar bevel siding panels primed with A2 W 2 SWP Undercoater. The series is intended to evaluate Ti-White A-39, an anatase titanium dioxide of Japanese manufacture. Its source is The Baird Chemical Corporation, 10 W. 33rd St., New York, N. Y. The material is tested in A2 W 6 SWP Fume Resisting White, card 5. One sample uses 50 pounds with 75 pounds of 6603 dry anatase semi-chalking TiO_2 , and another 125 pounds alone. Other comparisons are:

- a. 50 pounds 6600 dry anatase/75 pounds 6603 dry.
- b. 125 " Ti-Pure FF.
- c. 125 " T.P. A-MO anatase.

0007-SWP-044062

0007-SWP-000113432

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October, 1958

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Project #177 - Pigment Studies

The General Purchasing Department's Procurement Information of June 19 announced that R. T. Vanderbilt will distribute Glidden's titanium pigments under Vanderbilt's trade name Raycox. Since we may be approached for information regarding the quality of Glidden's materials as compared with Titanium Pigment, du Pont or American Cyanamid, paints were made with the various TiO_2 pigments for exposure tests at Chicago and Florida. Unitane O-220 to be added when available.

322 W	Intermix White	Glidden R-88 Non-chalking rutile TiO_2
323 W	" "	TiPure R 610 Lot 754 Q 5 "
324 W	" "	Titanox RANC Lot D 57 C 21 #4 "
325 W	" "	Unitane OR-640 Lot 418146 "
326 W	Trim and Tinting White	Glidden R-88 non-chalking "
327 W	" " "	Ti Pure R 610 Lot 754 Q 5 "
328 W	" " "	Titanox RANC Lot D 57 C 21 #4 "
329 W	" " "	Unitane OR 640 Lot 418146 "
331 W	SWF Gloss White	Glidden SD Anatasa free chalking "
332 W	" " "	Ti Pure FF Lot 5284 D 25 "
333 W	" " "	Titanox A-MD Lot SF 57 C 1344 "

Panels 26705-26742 C were examined after 12 months 45° south exposure in Chicago. These exposures were made to evaluate a number of rutile titanium oxide pigments from New Jersey Zinc and du Pont in a fast dry automotive alkyd, (37 C 83). Three of these pigments, R-760-1, R-760-2, and R-760-3, represent normal production batches of non-chalking TiO_2 from New Jersey Zinc. One pigment, R-99 represents an experimental super chalk resistant TiO_2 from New Jersey Zinc. du Pont has also sent four samples of TiO_2 . These pigments represent blends of a number of lots for each of the following grades: R 610, R 510, R 500 (chloride), and R 100 (chloride). du Pont submitted these samples for the purpose of comparing the various grades of their TiO_2 pigments. Four lots of OR 640, TiO_2 , three lots of RANC TiO_2 and three additional lots of R 610 TiO_2 were included as controls.

The exposures showed New Jersey Zinc pigments to be comparable to those from du Pont, R 610, and those from Calco Chemical, OR 640. One lot of Titanium Pigment's RANC, showed excessive chalking. du Pont's R 510, R 500, and R 100 showed comparable results. As would be expected, these three pigments did show a higher chalking rate than R 610. New Jersey Zinc's R-99 pigment actually shows a higher rate of chalking than do the standard materials.

These exposures were made also in Florida.

0007-SWP-044063

0007-SWP-000113433

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Project #177 - Pigment Studies

Pigments are needed that will produce durable bright yellow shades at reasonable cost. An extensive series of yellow pigments, 27518-78 C, has been on exposure for eight months. Some work has been done with 4,4'-dinitrocarbanilide DNC, supplied by Merck. While not intended originally as a pigment, it has a desirable yellow color which compares favorably with Hansa G. Results are based principally on the original sample which was not purified or micro-pulverized. Light stability after eight months' exterior exposure at Chicago is considerably better than Hansa G and a little better than Hansa 10 G. Exposures were made in a latex vehicle since DNC showed bleeding in oil. DNC is weaker than Hansa, requiring a larger amount to produce a shade of equal depth. Exact ratio between the two materials and cost data have not been determined. It is thought that the cost will be competitive with Hansa.

The oil bleed of DNC was said to be due to the presence of traces of p-nitraniline which can be removed. A more recent sample designated RTS-749 was free from impurity. Laboratory tests as well as two oil paints made with this material show no tendency to bleed. They include a yellow paint and SWP Verdas Green which employs a considerable amount of yellow. Shade is satisfactory. Oil absorption of DNC is high, being in the range of Hansa.

While DNC shows promise as a yellow pigment, a more complete evaluation is necessary. DNC has good heat stability which may be useful in industrial finishes. It is also being tested in Kam Tinting Colors. While the particle size of the RTS-749 sample appeared satisfactory, it will be necessary to determine optimum particle size for best tinting strength and other pigmentary properties. There is some evidence that DNC will disperse more readily than dry Hansa yellow. A larger supply is being obtained for further testing.

DNC and other yellows will be exposed shortly at Chicago and Florida. This series will include Hansa G 12251 and 10 G 12250 as well as a new type, 12101. Others are du Pont Dalamar Yellow and two related pulps from the Dry Color Department, D-3279 and D-3282. Dry forms of these pulps, D-3280 and D-3283 will also be tested. Combinations of these pigments designed to produce standard colors in the Lucco-Tax and Muro-lite lines are included. Paints from the earlier series will be used for comparison.

0007-SWP-044064

0007-SWP-000113434

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Project #177 - Cont.

The Fallick Products Company has furnished samples of Japanese Titanium Dioxide produced by the Furukawa Chemical Company of Japan for our evaluation. The Japanese TiO_2 , Ti Pure FF - Lot 5284 D 25 and Ti Pure R 610 - Lot L-363-26 will be compared for durability, chalking and tint retention in SWP Trim and Tinting White and Special SWP Gloss White A2 and 4. The paints will be exposed as whites and shaded blue to check tint retention.

The Purchasing Department has also furnished envelope samples of Japanese TiO_2 from M. W. Hardy and Company. The producer of this material is the Tochigi Chemical Industry Company, Ltd. Based on preliminary tests, the Japanese TiO_2 is lower in oil absorption, slightly stronger in tinting strength and slightly whiter in appearance than 6600 dry (free chalking TiO_2). A larger sample of this material was requested for exposure tests.

0007-SWP-044065

0007-SWP-000113435

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Project #177 - Pigment Studies

Exposure series 26983-27022 F, C, examined after 12 months at Florida and at Chicago, vertical south, evaluates several rutile pigments of the R-760 type from New Jersey Zinc Company. Lots #1, 2 and 3 of R-760 are production samples and R-99 is experimental. All panels are cedar bevel siding primed with A2 W 2 SWP Undercoater. The R-760 pigments are compared with certain du Pont samples as noted below. All were made up into four groups of paints: A2 W 8 SWP Trim and Tinting White, both as white and shaded light blue, and Intermix non-reactive pigmented low PVC, white and blue.

Since these particular panels showed lighter than normal mold growth at Florida, the contrasts in fading and dirt were quite readily noticeable. Because the Intermix tests to date show little chalk and heavy dirt, the following results at one year refer to the A2 W 8 group unless specified:

Control, Unitane OR-640 -- Very little chalk, moderate dirt. Fading is rather serious at Chicago; in fact, worse than on several tests, whereas at Florida the reverse is true. This is only one point in the numerical ratings.

du Pont's R-610 and New Jersey's R-760, lots #1 and #3 -- very closely alike in all respects, and very much like the control.

New Jersey's R-760, lot #2, and their R-99 -- the same in the white as those cited above, but a little more fading tendency (not verified at Chicago in the case of R-99).

du Pont R-110, lot 8361 -- more chalky; cleaner in whites, but worse fading.

du Pont R-510 (two lots) -- much like 110, but one lot is clearly the most chalky and most faded of the series.

The American Cyanamid Company has furnished samples of five lots of OR-540 and five lots of OR-640 titanium dioxides to be checked for uniformity and exterior durability. The titanium dioxide samples will be evaluated in four paints: SWP Trim and Tinting White A2 W 8, Intermix White, PVA latex and non-oxidizing type automotive enamel. Laboratory batches of the SWP Trim and Tinting White and Intermix White have been made with each lot of TiO_2 and shaded blue to study tint retention. Panels are to be prepared for exposure test at Chicago in the near future.

0007-SWP-044066

0007-SWP-000113436

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Project #177 - Pigment Studies

Exposure series 27070-82 F was examined after 12 months at Florida, vertical south. These are cedar bevel siding panels primed with A2 W 2 SWP Undercoater. Production control samples of RANC titanium dioxide from Titanium Pigment Corporation are compared in a modified A2 W 8 SWP Trim and Tinting White, the guide or control sample of which uses 180 pounds per 100 gallons of 6630 dry rutile non-chalking titanium oxide. All paints are shaded light green with phthalocyanine and ferrite bases.

Results at Florida lend themselves quite readily at present to simple groupings:

- a. The control formula shows normal or satisfactory color retention, very little chalk and normal dirt, would be rated very good in general appearance except for a moderate amount of mold growth. Test samples corresponding very closely to the control are:

D57A1 #4	D57A8 #4
D57C16 #4A	D57C18 #4

- b. Noticeably more faded, but not more chalky nor more subject to dirt and mold: D57E15 #4, D57A31 #3A, D57C17 #3, and probably D57C17 #4, although it shows a trifle more dirt.
- c. D57A12 #6A, though differing in no other way from those in group (a), looks slightly best of the series because of having the least mold growth.
- d. D57A29 #3, though it has the same light mold growth as (c) rates as one of the poorest in general appearance because of greatest fading. Also, it is the only one to show more than very slight chalk rub-off.

A recent examination of parallel Chicago exposures at 14 months show no outstanding variations from the above, but differences are smaller. Actually, D57C17 #4 is the only lot showing noticeably more fading than normal. D57C18 #4 and D57A1 #4 are the only ones to show a slight superiority in this respect.

0007-SWP-044067

0007-SWP-000113437

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January, 1959

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Project #177 - Cont.

The same ten lots of RANC were exposed in an M20 J automotive enamel, baking type. Duplicate exposures, 26326-78, were made on metal in white enamel and in blue tints of these enamel. After 12 months' exposure in Florida and Chicago no significant differences in performance between the ten lots could be observed. These panels have been returned for further weathering.

The house paint series included a sample of Japanese titanium oxide from the Sao Paulo plant. This was one of the fastest chalking TiO_2 's in a light tint we have ever seen. Even considering that it obviously is an anatase type some caution in its use is indicated.

Series 28725-48 C, F was prepared for exposure to test the color stability of a group of yellow pigments in PVAc paints based on National Starch's 12 K 51. They include a purified form of Merck's DNC dinitro carbanilide in both yellow and Verdes Green; three types of Hansa yellow supplied by the Dry Color Department; du Pont Dalmalar Yellow and equivalents from Dry Color in pulp and dry form; 80 A 14 Sun Yellow straight and in blends; Lucco-Tex Canton Yellow, regular and experimental formulas, and Mucolite PVAc yellows.

0007-SWP-044068

0007-SWP-000113438

Paint Research
February, 1959

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Project #177 - Pigment Studies

Exposure series 24054-24107 C, F was studied recently after 24 months at Florida, vertical south, and the same at Chicago. Its supplement, 24284-99 C, F was also covered, exposure conditions essentially the same. Our monthly report of December, 1957, presented a one year progress report on these tests. All panels are cedar bevel siding primed with A2 W 2 SWP Undercoater. The main purpose is to evaluate several titanium dioxides for tint retention. Intermix Low PVC and A2 W 8 SWP Trim and Tinting White are the basic formulas involved. Both are shaded light blue with phthalocyanine and, on account of the interest in chalking and clean-up, the same paints are also tested as white.

The following summary classifies the titanium pigments on the basis of the most important results to date. Again, mold growth is not a problem at either location, but results on dirt collection show up in many cases as considerably more interesting than at one year.

Group 1. Good tint retention.

Unitane OR-640 and R 610 (as before, relatively).
Normal chalking, not particularly clean, but essentially as clean as any in the series.

Group 2. Poor tint retention.

- (a) As before, Unitane OR 540, Ti-Pure R 510 sulfate process, Titanox EC, Ti-Cal R-27 (poorest, very yellow face), Titanox RCHT.
- (b) Down-graded from Group 4 formerly, Ti-Cal R 60 now seems very poor.

Group 3. Near normal, upper range, probably satisfactory. Titanox RANC and RA 50; not equivalent as before, but with the former showing a rather definite edge and RA 50 almost dropping to Group 4.

Group 4. Somewhat below normal, probably unsatisfactory. Ti-Pure R 510 chloride process (now R-500) and R 110 Z (now R 100) as before, relatively good in Intermix but poor in A2 W 8.

0007-SWP-044069

0007-SWP-000113439

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February, 1959

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Project #177 - Cont.

Supplementary Group

du Pont's special samples 958 B and SR-40-1, variations of R 610, were previously rated in Groups 2 and 4. Since these are in a separate exposure series, with a guide containing OR 640, and since the two year results look relatively better, these deserve a reconsideration. Both now seem at least equal to the guide in color retention, and are normal in chalking and clean-up.

Generally speaking, the samples poorest in fading are holding the most dirt on the whites. This dirt on the tints, plus adherent chalk makes an unsightly mask. The only apparent exception is RA 50, which is on the poor side for tint retention but cleaning up well.

Two related series of exposures, numbered 27242-50 and 27284-27307 F, C were studied recently after one year at Florida and at Chicago, vertical south. All are cedar bevel siding primed with A2 W 2 SWP Undercoater. The purpose is to evaluate three Monastral Red pigments from du Pont for which unusual permanence has been claimed, namely Red B, Red Y and Violet R.

The 27284 series covers the trial of these pigments in A2 W 8 SWP Tinting White and in Intermix Low PVC. Further, each formula tests the colors in a light and dark tint approximating the shades of 6 and 22 grams of Kem Tinting Color Red Oxide per pint of paint, respectively. This color, representing a stable red for practical use, serves as the control. Besides the three du Pont materials, toluidine is also included as an example known to be fugitive in tints.

The Florida tests in the Intermix tints show serious mold growth, but for purposes of a one year progress report, it is felt that color retention only should be considered. In this the Florida and Chicago panels agree well, with one exception. Red oxide looks very good. du Pont Red Y looks equally good; in fact, in A2 W 8, in which chalking is a factor, it looks better in most cases. du Pont Red B is a little more faded than either of these. A few cases show it nearly equal. Toluidine, as expected, shows extreme fading. Violet R is the exception mentioned above; Chicago panels show it consistently on a par with Red B, which is rather good for a violet shade, but Florida panels show it definitely more faded.

0007-SWP-044070

0007-SWP-000113440

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February, 1959

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Project #177 - Cont.

Series 27242-50 covers similar comparisons in latex house paint, in this case FVA Flexbond 800, two coats over oil primer. The two levels of color are one and four ounces per gallon on the Kem Tinting Color basis. Though not chalking, these tests are all clean and bright, and the ratings at the two locations agree well. Except for toluidine, it is difficult to choose between any pair of paints, since none show more than "8" fading. Red B and Violet R tend to show slightly more fading than Red Y or red oxide. It should be mentioned that the mere estimate of fading or loss of color tells only part of the story. These pigments, though in some cases more susceptible to fading than red oxide, are of great interest because of their brightness and eye-appeal, as against the dull salmon color of red oxide.

Panels 26629-56 C were prepared for exposure at Chicago only, vertical south, all cedar bevel siding primed with A2 W 2 SWP Undercoater shaded blue. These are a part of a study which includes FVA latex paints and non-oxidising automotive enamel. The purpose is to evaluate certain titanium dioxides for chalking, fading and durability, as has been done over the past two years or so with a long list of TiO_2 pigments. The ones covered by this series are Calco's OR 640 and OR 540, five lots of each having been submitted to check for uniformity of production. The OR 540 samples are compared against a guide paint using Ti-Pure R 510 and the OR 640 samples against New Jersey Zinc's R 760. All are incorporated in two formulas: regular A2 W 8 SWP Trim and Tinting White and Intermix Low PVC, both being shaded light blue.

0007-SWP-044071

0007-SWP-000113441

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August, 1939

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Project #177 - Pigment Studies

The Cleveland Purchasing Department has requested an evaluation for color and strength of several competitive phthalo Green Lake colors with S-W Solfast Green 50% Lake 79-C-27. Fastolux Green 64-2500 from Ansbacher Siegle Corporation was found to be the nearest match in masstone and strength to 79 C 27. The Heliogen Green GL Powder from General Dyestuff Company appeared to be the second best match for the Sherwin-Williams material.

Comparison With 79 C 27

	<u>Color</u>	<u>Strength</u>
Heliogen Green GL Pdr. General Dyestuff Co.	Slightly light in color	Equal but greener 2nd best match
Fastolux Green - 64-2500 J-65654 (Amsbacher Siegle Corp.)	Same color	Same strength but greener. Best match.
Monastral GL-761-D E. I. du Pont	Chalky and lighter	Weak in tinting strength.
Monastral Green Lake GL-754-D (SD-518)* E. I. du Pont	Light and chalky	Very weak.
Phthalocyanine Green Lake Standard Ultramarine and Color Co.	Light and chalky	Much stronger than 79 C 27.

*Recommended for floor coverings only and restricted for sale.

0007-SWP-044072

0007-SWP-000113442

Paint Research
October, 1959

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Project #177 - Pigment Studies

Exposure panels 30527-54 C, F were prepared for Florida and Chicago, vertical south. These are all on cedar bevel siding and A2 W 2 SWP Undercoater is used for the priming coat. The main purpose of this series is to evaluate Ti-Pure R-900. This TiO_2 is submitted by du Pont as an "improved R-500 chloride type." Materials compared with R-900 are R-500, R-510, Unitane OR-640 and OR-540, and Titanox RA-50. These are tried in A2 W 8 SWP Trim and Tinting White, which carries R-610 and is used as the guide paint. An extension of the above comparisons is made by testing the following in Intermix Low PVC: R-610, R-900, R-500 lot 8210 (chloride) and R-510 lot 1181 (sulfate). All the paints mentioned were put out both as white and shaded light blue with phthalocyanine.

A secondary purpose of the series is to evaluate Unitane OR-540, a new sample coded lot 117223 as against the regular material used in the past. The new grade is claimed to have softer texture and improved wetting and grinding properties.

Exposures 25842-80 F, C were examined after 24 months at Florida, vertical south, and nearly 30 months at Chicago, north and south. All are cedar bevel siding panels, primed with A2 W 2 SWP Undercoater. The main purpose of the series is to evaluate five lots of sulfate process TiO_2 and five lots of chloride process TiO_2 , from du Pont. As comparison pigments, we have used R-610, regularly used in A2 W 8 SWP Trim and Tinting White, which is used as the basic formula and guide paint, TPC's RA-50 and New Jersey Zinc's R-750. The series consists of the A2 W 8 in white and in yellow and gray tints. Yellowing of the white paints is a prime consideration, as well as chalking, durability and tint retention.

Referring to the whites, we have checked these panels at Chicago much more frequently than usual in the early stages, trying to spot rutile yellowing, particularly in damp weather. None was noted during the first six months (spring and summer of 1957), but with the wet weather of late October and November, with chalking just starting to develop, some slight occurrence of yellowing was seen. In a special series of six readings in November, December and February (up to 9 months), rutile yellowing was observed to be rather noticeable on the guide but very slight on any of the tests. In chalking and dirt, the very slight differences within the chloride and the sulfate groups were as great as any differences noted throughout the series.

0007-SWP-044073

0007-SWP-000113443

Paint Research
October, 1959

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Project #177 - Cont.

Considering the whites at a later stage, 30 months at Chicago, in a relatively wet period of October, 1959, there was a somewhat different picture. Panels which showed fairly noticeable though not particularly bad yellowing are R-750 and all but one of the five sulfate samples. Showing a very slight yellowing were the R-610 guide and RA-50. The chloride samples showed no yellowing. Chalking at this stage was normal for all, rated 6 or 7. The chloride samples were cleaner than the sulfate or any others. The chloride samples showed less mold on the south, but the reverse was very obviously true of the north panels.

Florida white tests show definite rutile yellowing at 24 months on the R-750 sample only. RA-50 and three of the five sulfate samples show slight yellowing, all others none. The chloride tests might be given a slight edge with regard to mold and dirt.

Concerning the tints, no location shows any clear-cut differences in fading or in mold and dirt. The grays look poorest because of white chalk-mask, and one of the chloride lots, #8914, shows up as slightly the worst of the series. The R-610 guide looks best by a small margin.

0007-SWP-044074

0007-SWP-000113444

Paint Research
November, 1959

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Project #177 - Pigment Studies

Panels 30711-20 C, F were exposed at Chicago and at Florida, vertical south, all cedar bevel siding primed with A2 W 2 SWP Undercoater. The purpose was to evaluate Mistron Talc as used with the cationic surfactant Arquad 2HT. Claims have been made for considerable improvement in the body characteristics, leveling, etc., of house paints containing Mistron when such an agent is used. For comparison purposes, Nyltal 300, Desertalc No. 55, and Mistron MSC, a stearate surface treated talc, are included. The specific Mistron talcs tested with and without Arquad 2HT, at about 1.5%, are #139, Vapor CI and T-076.

Four panels were prepared for exposure at Chicago and Florida, vertical south, numbered 30726-30 C, F. These were cedar bevel siding, primed with A2 W 2 SWP Undercoater. The purpose is to evaluate P-25 ultra-fine titanium dioxide from Godfrey L. Cabot, Inc. It is tried only in A2 W 8 SWP Trim and Tinting White in relatively small amounts to determine whether it could be used to increase the chalking rate through addition as on the Color Meter to provide a white as well as a tinting base. The amounts used are 1/4, 1/8 and 1/16 pounds. The paints are shaded blue, so that not only chalking but fading differences should be easy to ascertain.

Exposure series 26285-99 F, C was examined recently after 12 months at Florida and 14 months at Chicago, vertical south. All are cedar bevel siding panels primed with A2 W 2 SWP Undercoater of matching shade. The purpose was to evaluate two experimental samples of 50% Ti-Cal pigments from du Pont, designated only as samples A and B, R-50 type. First, these were tried in A2 W 4 SWP Gloss White, Card 2, the basic formula of which (used as guide) carries 175 pounds of 6680 dry RCHT, along with a smaller amount of anatase TiO_2 . Differences in performance are minor; the specials seem somewhat slower in clean-up than the guide, yet they show less mold growth. A sample using Titanox C-50 seems the same as sample B. On some occasions, however, the Ti-Cal 50 pigments show severe rutile yellowing, the Titanox C-50 none.

Second, comparisons were made in A2 W 8 SWP Trim and Tinting White, Card 8, shaded both to Berkeley Yellow and to Chelsea Gray. The basic formula and guide in this case carries 325 pounds of 6685 dry RC. Although showing up much more at Florida than at Chicago, the regular has much better tint retention than either of the special samples or C-50. The guide, perhaps because of less free chalking, shows considerably more mold growth and somewhat more dirt than the tests. Again, occasionally the du Pont samples showed rutile yellowing.

0007-SWP-044075

0007-SWP-000113445

Paint Research
January, 1960

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Project #177 - Pigment Studies

Evaluation of du Pont R 900 Johnsonville chloride process TiO_2 in M30J-type automotive enamels was carried out, comparing its performance with that of both du Pont R 510 and R 610 sulfate process TiO_2 pigments. Two enamels were prepared with each TiO_2 , using two different lots of coconut alkyd and melamine resin in each pair. The R 510 TiO_2 used was a composite mixture of lots 1142, 1162, and 1122. Lot No. 279R41 R 610 TiO_2 was used. There was no lot number on the sample of R 900 which was used. However, it is the only actual production sample of R 900 which has been received thus far.

Pigment dispersion was accomplished with a three-pass grinding procedure on the roller mill. A sample of pigment base was removed from each formulation after each pass, then let down to form the final paint. The resultant 18 paints were each drawn down twice on glass with the 3 mil drawdown blade. One set of drawdowns was given the conventional bake of 30 minutes at 250° F. The other set received the conventional bake as well as an overbake of 30 minutes at 300° F. Photovolt 60° gloss measurements were made on the baked drawdowns. Also Hegman grind readings were taken on the topcoats. The results of the gloss and Hegman grind readings are shown in the table below.

Paint	Pigment- tion	Passes Thru Mill	Hegman Grind	60° Gloss After 30 Min. at 250° F Bake	60° Gloss After Overbake 30 Min. at 300° F	Points of Gloss Lost Upon Overbake
RS 2909	R 900	1	7-1/2	95	87	8
"	"	2	7-1/2	89	89	0
"	"	3	7-1/2	85	85	0
RS 2910	R 510	1	5-1/2	90	82	8
"	"	2	6	88	84	4
"	"	3	7	85	77	8
RS 2911	R 610	1	7-1/2	88	79	9
"	"	2	7-1/2	86	78	8
"	"	3	7-1/2	83	74	9
RS 2912	R 900	1	7	89	80	9
"	"	2	7-1/2	84	78	6
"	"	3	7-1/2	84	77	7
RS 2913	R 510	1	5	67	58	9
"	"	2	5-1/2	72	64	8
"	"	3	6	72	66	6
RS 2914	R 610	1	6	78	68	10
"	"	2	7	75	66	9
"	"	3	7-1/2	72	67	5

0007-SWP-044076

0007-SWP-000113446

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Project #177 - Cont.

Note that both topcoats having R 510 pigmentation (RS 2910 and RS 2913) showed a lower grind than the R 900 and R 610-containing topcoats after both the first and third pass through the roller mill. This is probably explained by the fact that, in forming a composite lot mixture of R 510, the pigments were put on the shaker. The procedure caused the pigment particles to form pebble-like agglomerates, thus aggravating the grinding conditions. Notice also that R 900 performed very similarly to R 610 with respect to Hegman grind.

Both topcoats with R 900 pigmentation showed a higher 60° gloss than the corresponding topcoats pigmented with R 510 and R 610. However, the exceptionally low glosses shown by RS 2913 and RS 2914 are difficult to explain. Also difficult to explain is the lowering of topcoat gloss effected by multiple passes of the pigment base through the roller mill. One possible explanation for this phenomenon is that further passing of the pigment base through the roller mill increased the dirt pickup, thus decreasing the gloss. This explanation, however, does not seem too likely.

The next step in the testing procedure was to split each of the six topcoat batches into two equal portions. One of these portions of RS 2910 was tinted with B72 L 2 blue tinting base to a light blue. The following table indicates the relative amounts of pigment base added per gram of topcoat in order to produce a satisfactory shade.

Paint	TiO ₂	Wt. Untinted Topcoat	Wt. B72 L 2 Tinting Base Added to Produce Color Match	R = $\frac{\text{Wt. Tinting Base}}{\text{Wt. Untinted Topcoat}}$
RS 2909	R 900	800.0	139.1	0.1739
RS 2910 (Std.)	R 510	800.0	141.0	0.1762
RS 2911	R 610	800.0	138.5	0.1731
RS 2912	R 900	843.0	127.2	0.1505
RS 2913	R 510	810.0	131.8	0.1627
RS 2914	R 610	825.0	116.6	0.1413

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0007-SWP-000113447

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January, 1960

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Project #177 - Cont.

The tints of RS 2909 (R 900) and RS 2911 (R 610) match very well with the standard RS 2910, but RS 2912 (R 900), RS 2913 (R 510), and RS 2914 (R 610) all showed a reddish undertone, and thus were impossible to match as closely as the others, without the addition of a different tinting base. Since any paint in the latter three differed in formulation from the corresponding paint in the former three only in the lots of vehicle used, the red undertone present in the latter three must be due to one or more of the vehicles present.

The next step is to spray all topcoats, tinted and untinted, onto 6" x 12" Bondarite "100" panels which have previously been primed with Acme 407 R 39 epoxy-type primer surfacer, and water sanded. Three panels will be sprayed for each topcoat. One panel will be used for physical testing, while the other two will be given Florida or Chicago exposure.

0007-SWP-044078

0007-SWP-000113448

Paint Research
March, 1960

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Project #177 - Pigment Studies

Exposure panels 27070-81 F are being retired after 24 months at Florida, vertical south. All are cedar bevel siding, primed with A2 W 2 SWP Undercoater. Parallel Chicago panels were also examined at 24 months, and remain on test. This series was reported in January, 1959. It constitutes a quality control test of RANC TiO_2 production, using ten samples taken randomly from RANC production by the Titanium Pigment Corporation in 1957. These were put into a modified A2 W 8 SWP Trim and Tinting White, at 180 pounds per 100 gallons, as straight substitutions for Ti-Pure R-610. The R-610 paint serves as a guide or control on one-third of each panel. The paints are shaded light green, using phthalocyanine blue and ferrite bases. The special samples used, with brief results to date, follow. There is no checking or cracking at either location. The only plainly noticeable difference in performance throughout is a yellowish chalk-mask on the guide, as against a white mask on the tests. All are quite unsatisfactory because of this poor color retention.

- D57 A 1 #4. A bit less fading, noticeably less mold than guide.
- D57 C 16 #4A As preceding at Florida, more like guide at Chicago.
- D57 A 8 #4 Same fading as guide, but much less mold growth.
- D57 E 15 #4 As preceding.
- D57 A 12 #6A Same
- D57 A 29 #5 Same
- D57 A 31 #3A Same
- D57 C 17 #3 Same
- D57 C 17 #4 Essentially the same at Florida. Chicago shows a bit more fading but less dirt collection than guide.
- D57 C 18 #4 Seems most faded of all at Florida, by a slight margin, but Chicago panel does not confirm this; little mold, one of the cleanest.

0007-SWP-044079

0007-SWP-000113449

Paint Research
May, 1960

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Project #177 - Pigment Studies

Panels 31936-47 C,F were prepared for exposure at Chicago and at Florida, vertical south. All are cedar bevel siding primed with A2 W 2 SWP Undercoater. The tests consist of (a) three Momastral colors submitted by the E. I. du Pont Color Division, (b) toluidine red and (c) iron oxide, all used both in A2 W 8 SWP Trim and Tinting White and in Internix Low PVC White.

The du Pont Momastral colors are Red Y, Scarlet B and Maroon. These were converted by the Emulsion Laboratory into Universal Tinting Colors, numbered 7 W 125, 7 W 126 and 7 W 127. The other two materials used were Solfast Red A2 R 32 (toluidine) and ETC Red Oxide.

Series 31948-51 C,F was prepared to evaluate the du Pont pigments in a latex vehicle.

0007-SWP-044080

0007-SWP-000113450

Paint Research
June, 1960

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Project #177 - Pigment Studies

The Titanium Pigment Corporation has furnished samples of improved Titanox C-50 for inspection. The new pigment appeared to be better in whiteness and in clarity of tint tone. Experimental batches of Semi-Lustre White A36 W 7 were made with the regular and new Titanox C-50 to check the comparative performance. The new C-50 pigment appeared to be identical to the present stock of Titanox C-50 in general performance, with somewhat better brightness as claimed. The replacement of 6686 dry by the new Titanox C-50 may require some time in order to make adjustments in tinting strength that may be necessary in intermix formulations. Test data are listed in the following table.

Paint	OJ 617 Y	OJ 618 T
Pigment	6686 dry (Titanox C-50)	New Titanox C-50
Paint Viscosity #3		
Fresh	25.0"	27.0"
24 Hours	29.0"	29.0"
Brushing	Good	Good
Flow	Good	Good
60° Sheen	54	55
Drying		
Set-to-touch	4 hr. 30 min.	5 hr. 30 min.
24 Hr. Through Dry	Good	Good
Brightness (W)	78.4	79.4
Hiding (B/W)	94.2	94.5

0007-SWP-044081

0007-SWP-000113451

Paint Research
July, 1960

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Project #177 - Pigment Studies

Series 32144-53 CS, F was prepared for exposure in Chicago and Florida, vertical south, on cedar bevel siding panels primed with A2 W 2 SWP Undercoater. The purpose is to try ultrafine P-25 titanium dioxide in A2 W 8 SWP Trim and Tinting White, to see if this will produce a slight increase in chalking rate. The paint is tested both as white and tinted light blue with phthalocyanine. Three samples were made, using 1/16, 1/8 and 1/4 pounds of P-25.

Series 32158-83 CS, F were prepared for exposure at Chicago and Florida south vertical. This is a quality control test of R-900 using six lots selected at random by du Pont. They are compared with various titanium pigments as listed below, in SWP Trim and Tinting White A2 W 8 and Intermix White. du Pont will prepare similar exposures. The series includes R-900 at 87% of the amount of rutile TiO_2 normally used. The paints are tinted to a light blue to compare tint retention.

Ti-Pure R-610 Lot 105

Ti-Pure R-900 Lot 4069

Ti-Pure R-900 Lot 4124

Ti-Pure R-900 Lot 4157

Ti-Pure R-900 Lot 4167

Ti-Pure R-900 Lot 4169

Ti-Pure R-900 Lot 4210

Ti-Pure R-510 Lot 1996

Titanox RA 50 Lot C60 R 20 - 1/6

Unitane OR 540 Lot 117911

Titanox RANC Lot D60 R 25 - 1/5

Unitane OR 640 Lot 418861

0007-SWP-044082

0007-SWP-000113452

Paint Research
August, 1960

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Project #177 - Pigment Studies

Exposure series 32158-83 F, C was prepared during the month, for Chicago and Florida, vertical south. The purpose is to evaluate du Pont's R-900 TiO_2 pigment. A sample of lot #4069, representing du Pont's standard checked material and five other lots picked at random from current production, were supplied by Mr. M. C. Londergan. Each of the six samples are tried in (a) A2 W 8 SWP Trim and Tinting White and (b) Intermix Tinting White. They are introduced at 85% of the poundage of R-610 which is used in the guide or control paint for both the (a) and (b) parts. Other paints included for comparison use R-510, Titanox RA 30 and RANC and Unitane OR-540 and OR-640. All paints were shaded light blue with B72 L 5 Phthalocyanine Blue. The usual painting procedure, cedar bevel siding primed with A2 W 2 SWP Undercoater, was used in the series.

Series 32196-219 CS, F was prepared for exposure at Chicago and Florida south vertical. This is a quality control test of R-900 titanium dioxide similar to 32158-83 above but in standard A-100 latex house paint. The paints are tinted blue to compare tint retention. All test panels have a three coat system on redcedar. The left half has two coats of blue tint over Wood Undercoater A6 W 28. The right half has three coats of latex paint, with A6 W 30 A-100 Super White as the first coat. The pigments which appear in this test again include six lots of R-900, Ti Pure R-510 and 610, Titanox RA-30 and RANC, and Unitane OR-540 and 640.

In oil paints, 85 parts by weight of R-900 Titanium dioxide give hiding equal to 100 parts of the other grades of rutile titanium dioxide. Preliminary tests with R-900 in latex paints do not give the same results.

0007-SWP-044083

0007-SWP-000113453

Paint Research
September, 1960

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Project #177 - Pigment Studies

In the Paint Research Monthly Report for August a reference is made to several lots of Ti Pure R-900 exposed in the SWP Trim and Tinting White A2 W 8 and Intermix Tinting White. These lots of R-900 were introduced at 87% of the Ti Pure R-610 poundage used in the various paints. The paints exposed in this series have been applied at equal film thickness and checked for brightness and hiding characteristics. These values are reported in the data which follows.

Experimental Data on Brightness and Hiding
SWP Trim and Tinting White A2 W 8

Paint	Titanium Dioxide	Pounds TiO ₂	Brightness Over		Contrast Ratio B/W
			White	Black	
694 Y	Ti Pure R-610	172 $\frac{1}{2}$	82.0 $\frac{1}{2}$	79.5 $\frac{1}{2}$	97.0
701 Y	Ti Pure R-510	172 $\frac{1}{2}$	81.6	79.8	97.7
702 Y	Titanox RA 50	172 $\frac{1}{2}$	81.6	79.4	97.3
703 Y	Unitane OR 540	172 $\frac{1}{2}$	82.0	79.5	97.0
704 Y	Titanox RANC	172 $\frac{1}{2}$	81.8	79.8	97.6
705 Y	Unitane OR 640	172 $\frac{1}{2}$	81.8	79.2	96.9
864 Y	Ti Pure R-900 Lot 4003C38	172 $\frac{1}{2}$	82.6	81.0	98.0
695 Y	Ti Pure R-900 Lot 4069	146 $\frac{1}{2}$	82.4	80.8	98.1
696 Y	Ti Pure R-900 Lot 4124	146 $\frac{1}{2}$	83.7	82.0	98.0
697 Y	Ti Pure R-900 Lot 4157	146 $\frac{1}{2}$	83.4	82.0	98.4
698 Y	Ti Pure R-900 Lot 4167	146 $\frac{1}{2}$	83.8	82.0	97.9
699 Y	Ti Pure R-900 Lot 4169	146 $\frac{1}{2}$	84.4	82.5	97.8
700 Y	Ti Pure R-900 Lot 4210	146 $\frac{1}{2}$	83.8	82.2	98.1

Experimental Data on Brightness and Hiding
Intermix Tinting White

Paint	Titanium Dioxide	Pounds TiO ₂	Brightness Over		Contrast Ratio B/W
			White	Black	
706 Y	Ti Pure R-610	225 $\frac{1}{2}$	82.5 $\frac{1}{2}$	80.2 $\frac{1}{2}$	97.2
713 Y	Ti Pure R-510	225 $\frac{1}{2}$	81.4	83.0	97.4
714 Y	Titanox RA-50	225 $\frac{1}{2}$	83.0	81.2	97.8
715 Y	Unitane OR 540	225 $\frac{1}{2}$	82.8	81.4	98.2
716 Y	Titanox RANC	225 $\frac{1}{2}$	86.8	84.2	97.2
717 Y	Unitane OR 640	225 $\frac{1}{2}$	85.8	82.6	96.4
865 Y	Ti Pure R-900 Lot 4003C38	225 $\frac{1}{2}$	82.4	81.2	98.6

(Cont.)

0007-SWP-044084

0007-SWP-000113454

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Project #177 - Cont.

Experimental Data on Brightness and Hiding
Intermix Tinting White
(Cont.)

Paint	Titanium Dioxide	Pounds TiO ₂	Brightness Over		Contrast Ratio
			White	Black	B/W
707 Y	Ti Pure R-900 Lot 4069	192#	83.9	82.1	98.5
708 Y	Ti Pure R-900 Lot 4124	192#	86.3	83.7	97.0
709 Y	Ti Pure R-900 Lot 4157	192#	85.8	83.5	97.3
710 Y	Ti Pure R-900 Lot 4167	192#	82.0	80.6	98.5
711 Y	Ti Pure R-900 Lot 4169	192#	83.4	82.0	98.4
712 Y	Ti Pure R-900 Lot 4210	192#	81.7	80.4	98.3

Paints were prepared for exposure to compare the durability, tint retention and brightness of SWP Gloss White A2 W 4, SWP Trim and Tinting White A2 W 8 and SWP Fume Resisting White A2 W 6. The titanium calcium formulations were compared with special formulas based on Ti Pure R-610, replacing the TiO₂ in the titanium calcium, and also of Ti Pure R-900 at 100 and 85% of the Ti Pure R-610 poundage. The brightness and hiding values of the experimental paints, when freshly applied and after bleaching for three days, are reported in the following data.

Paint	Product	Fresh Paint-Out			Paint-Out Bleached 3 Days		
		Brightness Over		Contrast Ratio	Brightness Over		Contrast Ratio
		White	Black	B/W	White	Black	B/W
903 Y	A2 W 4 Card 3 6680 dry	84.3%	81.3%	96.4	83.9%	80.7%	96.4
904 Y	A2 W 4 Card 3 6630 for 6680	83.2	80.7	97.0	82.6	80.0	96.9
905 Y	A2 W 4 Card 3 R-900 for 6630	83.6	81.0	96.9	82.6	80.1	97.0
906 Y	A2 W 4 Card 3 85% Ti Pure R-900	83.1	80.6	97.0	82.0	79.4	96.8

(Cont.)

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<u>Paint</u>	<u>Product</u>	<u>Fresh Paint-Out</u>			<u>Paint-Out Bleached 3 Days</u>		
		<u>Brightness Over</u>		<u>Contrast</u>	<u>Brightness Over</u>		<u>Contrast</u>
		<u>White</u>	<u>Black</u>	<u>Ratio</u>	<u>White</u>	<u>Black</u>	<u>Ratio</u>
				<u>B/W</u>			<u>B/W</u>
907 Y	A2 W 8 Card 6 6685 Dry	85.7%	82.4%	96.0	84.4%	81.2%	96.2
908 Y	A2 W 8 Card 6 6630 for 6685	85.8	83.3	97.1	85.0	82.6	97.2
909 Y	A2 W 8 Card 6 R-900 for 6630	86.1	84.0	97.6	85.6	83.0	97.0
910 Y	A2 W 8 Card 6 85% Ti Pure R-900	85.7	82.7	96.5	84.6	81.6	96.5
911 Y	A2 W 6 Card 5 6680 Dry	85.6%	82.9%	96.8	85.0	82.3	96.8
912 Y	A2 W 6 Card 5 6630 for 6680	84.2	82.0	97.4	83.8	81.5	97.3
913 Y	A2 W 6 Card 5 R-900 for 6630	84.4	82.4	97.6	84.2	82.1	97.5
914 Y	A2 W 6 Card 5 85% Ti Pure R-900	84.0	81.8	97.4	83.6	81.6	97.6

6680 dry - Titanox RCHT

6630 dry - Ti Pure R-610

6685 dry - Titanox RC

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Project #177 - Cont.

More work was done with R-900 in Latex paints. It was tested in A-100 Latex House Paint and in Semi-Gloss PVA Wall Paint. Only slightly better hiding is obtained, but R-900 helps to increase the gloss of the wall paint. It is not as easy to incorporate into latex paints as other grades of titanium dioxide used so far. It is still possible that a way of incorporating R-900 into a latex formula can be found which will result in better hiding.

Panels 32314-22 C, F were prepared for exposure at Chicago and at Florida, vertical south, all cedar bevel siding primed with A2 W 2 SWP Undercoater. This series is intended to evaluate Ti Pure R-900 and Ti-Pure PC titanium dioxides in A2 W 4 SWP Gloss White. The R-900 is tried both as 100% and in lesser amounts as replacement for the rutile TiO_2 in titanium-calcium pigment and the PC, an anatase grade, is used similarly with respect to the Ti-Pure FF or similar pigment normally used. Certain changes in leaded zinc content are also involved.

Panels 32418-20 CS, CN, F were prepared for exposure at Chicago north and south vertical and at Florida south only, comparing the regularly used 7702 dry P.C. blue against a new P.C. blue flushed color FL-11-328 in Enameloid Blue.

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Project 3177 - Pigment Studies

Series 29395-624 F was examined after 12 months' exposure in Florida, vertical south. This series evaluates Glidden's R-88 non-chalking rutile TiO_2 and free-chalking anatase SD grades in Internix White, SWP Trim and Tinting White A2 W 8 and SWP Gloss White A2 W 4. Standard approved grades were used as controls. After 12 months' exposure the Glidden titanium oxides are equal to comparable approved grades.

Exposure panels 31357-31368 F were examined after six months' Florida exposure at 45° south. This series is concerned with the evaluation of du Pont's R 900 titanium dioxide in an M50-J type automotive enamel, both as a white and as a blue tint. du Pont's R 310 and R 610 TiO_2 's were used as controls. Each paint was prepared using two different lots of vehicle. All the topcoats were applied over Acme 407 R 39 primer-surfacer.

In general, the results after six months' exposure are favorable. No visual chalking, cracking, or blistering were observed. Mildew was present in about equal amounts on each panel. The visual and 60° gloss readings showed considerably more variation between the two different lots of vehicle than between the different pigmentations. To summarize: after 6 months' exposure, R-900 compares favorably with both R-310 and R-610, with no significant differences being observed.

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Project #177 - Pigment Studies

Four samples of titanium dioxide produced by the La Porte Titanium Limited, 14 Hanover Square, London, England, were compared with representative types manufactured by E. I. du Pont de Nemours and Company. The titanium dioxides were compared for hiding in the Intermix White formulation, which carries 275 pounds of TiO_2 per hundred gallons. The paints were checked for hiding on the Hunter Reflectometer. Interest in La Porte titanium pigments is increased by their association with American Potash and Chemical Corporation in construction of a TiO_2 plant in California.

1. Tiona G (pure anatase TiO_2) compared with Ti-Pure FF 6600 dry.
2. Tiona T.D. (anatase TiO_2 treated for maximum resistance to after-yellowing) compared with Ti-Pure LO-CR 6608 dry.
3. Runa R.H. 20 (rutile TiO_2 treated for maximum chalk resistance) compared with Ti-Pure R 610 6630 dry.
4. Runa RG (untreated rutile TiO_2) compared with Ti-Pure R 110 6640 dry.

Hiding Characteristics of Paints

Paint	Titanium Dioxide	Hiding Characteristics Contrast Ratios			
		B/W	B/W	B/W	Average B/W
57 Z	Ti-Pure FF	97.2	97.0	96.5	96.9
58 Z	Tiona G	96.6	96.8	96.5	96.6
59 Z	Ti-Pure LO-CR	97.4	96.9	97.2	97.2
60 Z	Tiona TD	96.5	97.5	97.2	97.0
61 Z	Ti-Pure R 610	99.0	98.4	98.4	98.6
62 Z	Runa RH 20	98.8	98.1	98.1	98.3
63 Z	Ti-Pure R 110	98.4	97.8	96.6	97.6
64 Z	Runa RG	98.2	98.1	98.1	98.1

The hiding comparisons in general are very close, although it should be noted that these results are based on only one sample of each type of TiO_2 . Runa RG appeared to be slightly better than Ti-Pure R 110.

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Project #177 - Cont.

The E. I. du Pont de Nemours Company White Pigment Division has claimed that Ti-Pure R 900 has 13 to 15% better opacity than Ti-Pure R 610 in solvent type paints. In order to check these claims, Ti-Pure R 900 was compared with several other rutile TiO_2 pigments for hiding characteristics in SWP Trim and Tinting White A2 W 8 using a pound for pound and an 85% replacement for the TiO_2 content. Two sets of paints were prepared with different lots of each type of TiO_2 to check the hiding power of the various TiO_2 pigments in the series. Work to date has indicated that Ti-Pure R 900 has some advantage in opacity over other rutile grades. Although R 900 lost very little in contrast ratio in going from 172 to 146 pounds per 100 gallons, this also was true of the other grades.

This work pointed out the need for better experimental control in running contrast ratios. Actually the most significant factor in the data was that the second run (on different paint samples) gave consistently high results. Evidently some factor such as temperature or setting of the drawdown gage was out of control. Attempts will be made to locate the cause of such errors and to eliminate them.

Tables are attached showing averaged and individual data. Analysis of these data shows that the 95% confidence limits on individual contrast ratio measurements is about $\pm .5$. Analysis of variance shows that both the type of pigment and the level of the pigment have a significant effect on hiding power at about the 90% level. The effect between Run 1 and Run 2 on the other hand is significant at more than the 99.5% level.

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Project #177 - Cont.

Comparative Hiding Characteristics of Various
Titanium Pigments in SWP Trim and Tinting White A2 W 8
Averaged Data

Run	Titanium Dioxide Tested	Pounds Per 100 Gal.	Average Contrast Ratio R/W	Lot Number on TiO ₂
1	Unitane OR 640	172	96.3	418861
2			98.2	418884
1	Unitane OR 640	146	96.2	418861
2			97.6	418884
1	Ti-Pure R 610	172	96.6	185P25
2			98.4	190558
1	Ti-Pure R 610	146	95.9	185P25
2			97.2	190558
1	Ti-Pure R 900	172	98.1	4003C38
2			98.5	4194846
1	Ti-Pure R 900	146	97.0	4003C38
2			98.3	4194846
1	Titanox RANC	172	97.4	59A17 #10
2			97.6	D601-24 #3
1	Titanox RANC	146	96.9	59A17 #10
2			97.3	D601-24 #3
1	Titanox RA 50	172	97.6	D60E25 #3
2			97.7	C60T25 #10
1	Titanox RA 50	146	96.3	D60E24 #3
2			97.2	60T25 #10

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Project #177 - Cont.

Comparative Hiding Characteristics of Various
Titanium Pigments in Trim and Tinting White A2 W 8
Individual Data

		<u>Run 1</u>		<u>Run 2</u>	
		<u>100%</u>	<u>85%</u>	<u>100%</u>	<u>85%</u>
OR 640	a	96.4	96.4	98.4	97.3
	b	96.2	96.0	97.8	97.5
	c			98.4	98.0
R 610	a	96.5	95.9	98.4	97.3
	b	96.7	95.9	98.4	97.2
	c			98.3	97.2
R 900	a	98.2	97.5	98.4	98.3
	b	97.9	96.0	98.4	98.4
	c			98.8	98.3
RANC	a	97.2	97.0	97.8	97.6
	b	97.5	96.7	97.7	97.1
	c			97.5	97.1
RA 30	a	97.6	97.4	97.6	97.2
	b	97.6	97.2	97.8	97.0
	c			97.6	97.3
Standard Deviation		.24			

Exposures 32630-5 F, C were prepared during the month, all cedar bevel siding primed with A2 W 2 SWP Undercoater. The purpose is to compare the following titanium pigments in A2 Y 16 SWP Berkeley Yellow, Card 8, at both 100% and 85% replacement levels.

Ti-Pure R 610, Lot #105

Titanox RANC D60E23, Lot #3

Unitane OR 640, Lot #41886

Ti-Pure R 900, Lot #4003C38

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Project #177 - Pigment Studies

On page 20 of the November report the question of the relative hiding of du Pont's Ti-Pure R-900 was discussed. Although contrast ratio studies in SWP Trim and Tinting White seemed to confirm du Pont's claim for greater hiding, this also appeared to be true for other rutile titanium dioxide pigments. The difficulty was that contrast ratios were not accurate enough to detect differences between 100% of the normal titanium loading and 85% of normal. Further studies using just R-900 and R-610 have brought out some of the errors in the method of running contrast ratios. There still appears to be an advantage in hiding power for R-900.

The greatest improvement in the method of running contrast ratios was accomplished by using a vacuum plate to hold the Munsell charts flat during the application of the film by draw-down blade. This encouraged using a thinner film, resulting in lower contrast ratios (.94 - .95 vs .97 - .98) where the Hunter Multipurpose Reflectometer has better resolution. This, coupled with careful control of viscosity in the paints by using blends of under and over pigmented batches, did substantiate the fact that R-900 had at least as much hiding power at the 85% level as R-610 had at the 100% level. It should be borne in mind that this is only substantiated with one lot of each pigment in one formula (SWP Trim and Tinting White).

The data are shown in the table. Each contrast ratio represents the average of ten different draw-downs. No correction was made for film thickness since neither measurements with an Ames Dial Gauge or calculations from volume solids correlated with measured contrast ratios. Further work with other rutile titanium dioxides will be carried out.

<u>TiO₂ Pigment</u>	<u>Pounds/100 Gals.</u>	<u>Contrast Ratio</u>
R-610	172 (100% level)	94.0 ± .2
R-900	172 (" ")	95.2 ± .2
R-610	146 (85% level)	93.0 ± .2
R-900	146 (" ")	94.3 ± .2

Panels 30527-54 F, C were examined after 12 months at Florida and at Chicago, vertical south, all cedar bevel siding primed with A2 W 2 SWP Undercoater. The main purpose is to evaluate Ti-Pure R-900 chloride process titanium dioxide. R-500 chloride process TiO₂ is also

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included in the tests, along with R-610, R-510 and RA 50 sulfate process oxides. These are tried both in A2 W 8 SWP Trim and Tinting White and in low PVC Intermix. In each case, the paints are tested both as white and shaded to light blue.

A secondary purpose is to compare Unitane OR-540 Lot 117223, 6622 dry, with OR-640 and an older sample of OR-540. Lot 117223 represents an improved TiO_2 with softer texture and better wetting and grinding properties. The Unitanes are tested only in the A2 W 8 formula, not in Intermix.

In both white and blue and at both locations, mold and dirt are quite heavy on all Intermix formulations, with R-900 showing at least as much as the R-610 guide. This formula shows no chalking and considerable gloss retention. R-500 is a little more faded than the others. R-900, though not positively less faded, looks brighter than any of the others, a partial confirmation of du Pont's claims for better "tint appearance."

Considering the A2 W 8 tests, white only, both locations, the R-900 shows little chalking and serious dirt, though not much mold, the same as the R-610 guide. R-500 (chloride) and R-510 (sulfate) show more chalk rub-off, but this is not reflected in better clean-up. In the Unitanes, OR-640 is like the guide and OR-540 (old) is much the same, but OR-540 lot 117223 is a stand-out at Florida, much more free chalking and much cleaner and whiter than any other in the series.

In the blue tints made on the A2 W 8 formula, about the same might be said with respect to chalk rub-off and dirt collection at Florida. R-900 is low in chalk and quite dirty, while the OR-540 regular cited above shows a heavy chalk rub-off. However, the big feature in the blues is fading. All show a serious chalk-mask. The OR-540 regular looks poorest because of extreme chalk-mask. The guide with R-610, OR-640 and OR-540 (old) are pretty much alike, least mask but still poor in appearance. R-500, R-510, RA-50 and R-900 seem all alike, very badly chalk-masked and dirty, so that their appearance is obviously poorer than that of the guide. The Chicago panels show less variations, but some of them tend to contradict the Florida results. Thus, OR-540 regular looks best, not poorest, because it seems cleanest and brightest in color. Therefore, no conclusions can be drawn as to relative "tint appearance" for one oxide in all formulas at all locations.

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Project #177 - Pigment Studies

The Chemical Products Laboratory has submitted 15 phthalo blue and phthalo green lakes in which the color pigments are laked on extender or extender plus TiO_2 in ratios which are or can be used in regular raxes. It is hoped that such combined pigments will show better tint or color retention than the usual mechanical mixes. The dry pigments will be evaluated in exterior latex paints. Portions of the pigment samples were flushed in (3870), long oil linseed-soya alkyd, for test in solvent type exterior paints, SWP Ardmore Green A2 G 12 and SWP Terrace Green A2 G 34.

The flushed pigments were used to the maximum extent possible depending on the color and TiO_2 in the formulas, adding TiO_2 or regular flushed colors if needed. Exposures will be in Chicago and Florida.

Exposure panels 28285-99 F, C were studied after 24 months at Florida and at Chicago, vertical south, all cedar bevel siding panels primed with A2 W 2 SWP Undercoater. In this series two samples of 50% TiO_2 Ti-Cal pigments coded R-50 from the du Pont Pigment Division are evaluated. In A2 W 4 SWP Gloss White, the guide and basic formula uses 175 pounds of 6680 dry RCHT and another comparison sample uses 105 pounds of Titanox C 50. The C 50 sample shows relatively little mold and is quite clean, looks slightly best at both locations at present. Chicago panels, which show no mold, do not show up any differences among the other samples. At Florida, the guide looks poorest because of serious mold growth. The two R 50 samples are closely alike, showing only very slightly more mold and a little more dirt than C 50.

The same titanium pigments were also tried in A2 Y 16 SWP Berkeley Yellow and A2 A 20 Chelsea Gray, except that the basic formula was made with Titanox RC. Mold growth at Florida seems to show no variation between tests and guide, although there is a slight indication favoring C 50. This is verified by the Chicago panels, which show light mold growth, but also one of the special samples also looks good in this respect. Dirt follows the same pattern as mold. Chalking is less free with RC than the others and the guide is noticeably less faded. This fading is the main factor in rating the general appearance -- reasonably good on the guide but unsatisfactory on all others.

du Pont has indicated that they have no further interest in the production of a 50% calcium titanium pigment.

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Project #177 - Cont.

Exposures 30711-20 F, C were studied recently after 12 months at Florida and the same at Chicago, vertical south. All are cedar bevel siding primed with A2 W 2 SWP Undercoater. The purpose of the series is to check the durability of several talcs in A2 W 4 SWP Gloss White. The guide and basic formula uses Nyltal 300 (Card 4). Desertalc No. 53, a West Coast material somewhat similar to the Mistron #139 Talc cited below, was included. This looks good and smooth (very light brush-marks), the same as Nyltal 300. The series as a whole looks good, shows normal chalking and is unusually clean and free from mold for Florida exposures. The principal interest is in the Mistron talcs and among them we find quite noticeable variations in brush-marks. There is no significant film failure on any.

Following is an account of the Mistron talcs covered:

Mistron #139, regular grade -- medium brush-mark effect, satisfactory.

Mistron MSC, a surface-treated product known to give lower viscosity and thixotropy than the preceding -- same in brush-marks.

Mistron #139 plus 1/2% Arquad 2HT; this and the following are treated with this additive, an oil-soluble cationic surfactant, in an attempt to facilitate dispersion and eliminate the serious thixotropic effect usually encountered with Mistron talcs -- shows just a bit less noticeable brush-marks than the preceding.

Mistron Vapor GI -- very heavy brush-marks.

Same plus 1.5% Arquad 2HT -- medium brush-marks.

Mistron T-076 -- medium brush-marks.

Same plus 1.5% Arquad 2HT -- smooth, like Nyltal 300 sample.

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Project #177 - Pigment Studies

It has been reported that difficulty has been encountered in attempting to check on du Pont's claims of superior hiding for R-900 over R-610 and other types of rutile TiO_2 pigments. The use of contrast ratio studies indicated that although R-900 lost very little in contrast ratio in going from 172 to 146 pounds per 100 gallons in A2 W 8 Trim and Tinting White this also was true for other TiO_2 pigments.

This work pointed out the need for better experimental control in running contrast ratios. Some improvement was made by using a vacuum plate to hold the Moresst charts flat during the application of the film by drawdown blade. This encouraged using a thinner film, resulting in lower contrast ratios (.94 - .95 vs. .97 - .98) where the Hunter Multi-purpose Reflectometer has better resolution. In addition very careful control was exercised over the viscosity of the experimental paints to minimize differences in film thickness resulting even from constant settings of drawdown blade clearances.

Actually the most significant factor in earlier work was that a repeat lot of paints on the same formulas gave consistently higher contrast ratios. It was thought that some factor such as temperature or setting of the drawdown blade clearance was out of control. This was not confirmed by further work. Now it appears that the factor out of control was the discoloration of the paint batches, probably from iron contamination during the grind. At least there was a correlation between the grayness of the paint batches and the contrast ratio. Further studies are under way using pebble mill batches to minimize this factor.

It is possible to correct for brightness by using the Kubelka Munk equations. However, this entails a lengthy experimental procedure and involved calculations. A proposed ASTM method of test for "Hiding Power of Nonchromatic Paints" covers this correction.

The Mineral Products Laboratory has furnished two samples of colored titanium oxides 87K and 88K for evaluation. The two experimental samples of colored TiO_2 were compared with Sun Yellow N 80 A 14 dry, in SWP Tyrone Yellow A2 Y 36, Card 8, for texture, color, opacity and tint retention characteristics.

The two colored TiO_2 samples coded 87K and 88K compared favorably with Sun Yellow N in most respects. However, they produced lower gloss and somewhat higher consistency than 80 A 14 dry in A2 Y 36 SWP Tyrone Yellow. The fade resistance of the experimental samples appeared to be equal to Sun Yellow N when run for 95 hours under the Uviarc light. The paints are to be exposed at Chicago and Florida to check tint retention and durability.

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The lower gloss with the experimental samples apparently was due to a coarser intermediate zone in the particle size distribution. Since they received no post-calcination grinding or separation of coarse particles reduction in average size probably will present no problem, and dispersion and gloss properties should then be equal.

Experimental Data

SWP Tyronc Yellow	Paint 3222	Paint 3232	Paint 3322
Pigment Tested	Sun Yellow N 80 A 14 dry	Colored TiO ₂ - Sample 87K	Colored TiO ₂ - Sample 88K
Viscosity #3 *			
Fresh	64"	75"	80"
24 Hr.	63"	80"	91"
Brushing **	Sl. sticky	Sl. sticky	Sl. sticky
Flow	Good	Good -	Good -
Color	Standard	Slightly red	Very close to standard.
Hiding (Draw-down film)	Standard	Lower than Sun Yellow N	Very close to standard
Texture	Good	Not as fine as Sun Yellow N	Not as fine as Sun Yellow N
Gloss 60°	45	18	21
Grinding Time	3 min.	3-1/2 min.	4 min.
Grind	4-1/4 H	4 H	4-1/4 H
Fade Resistance after 95 Hours (Uviarc)	Slight	Slight	Slight

*All paints were much higher in viscosity than standard,
apparently due to substandard varnish.

**The slightly sticky brushing is due to the high viscosity.

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The 87K yellow titanium oxide was also tested in an acrylic latex paint. It was somewhat more difficult to disperse in an aqueous system than the Sun Yellow N. The coarse nature of the 87K was apparent when the paint was applied to a smooth surface. Stability and viscosity of the paint is satisfactory thus far. With smaller and more uniform particle size S-W production of this colored titanium pigment should give satisfactory performance in latex paints.

Panels 25884-90 F, C were examined after 36 months at Florida and slightly longer at Chicago, both vertical south. These are cedar bevel siding, two coats self-primed. 6026 dry Dicalite SA-3 is compared with Micro-Cel 1E in SWP Velvet Flat Redwood. Three PVC's are involved with each, at the critical PVC and at $\pm 10\%$ of the CPVC. The 6026 dry is in the 25 - 30% range and the Micro-Cel in the 14 - 18% range. While there is no excessive chalk rub-off on either at any location, there are wide differences in chalk-mask fading. Micro-Cel, though not particularly good, looks much better than 6026 because of the latter's extreme chalk-mask, particularly on Florida exposure. Micro-Cel shows checking but seems definitely better with respect to mold growth. Both seem to carry about the same amount of dirt. One feature is a very sharp reduction in mold due to the higher PVC's in the case of Micro-Cel (16.2% and 18% as against 14.6%), showing the excess binder below the CPVC.

Exposures 29450-69 F, C were examined after 12 months at Florida (retired) and 14 months at Chicago, vertical south. All are cedar bevel siding, primed with A2 W 2 SWP Undercoater. The purpose is to evaluate two Japanese titanium dioxides, one supplied by Falek Products Company and the other by M. W. Hardy and Company. The latter is claimed to be an anatase type, the former is unspecified. Therefore, we used both Ti-Pure FF anatase and Ti-Pure R 610 rutile as comparison pigments. The tests are carried out both in A2 W 4 SWP Gloss White and in A2 W 8 SWP Trim and Tinting White. Both are used as white and shaded to a light blue.

In A2 W 4 White, these two materials are closely alike and perform very much the same, at both locations, as the regular with FF. There is very free chalking, much more than on the R-610 sample and some incipient erosion, but the paints are clean and look good. In A2 W 4 shaded blue, there seems to be more dirt on the guide and Japanese samples, fully as much as on R-610. However, the R-610 shows considerably less fading than the others, which have a very bad white chalk-mask. In the tint base, there is a heavy chalk rub-off

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on all, both white and blue, except the R-610. The general appearance is poor on the anatase and both Japanese samples because of heavy dirt and mold, the latter being considerably worse. R-610, however, shows extremely heavy dirt and mold. In blue, the white face seems fully as bad as in the case of A2 W 4, with R-610 the only one to show reasonably good color retention.

In summary, the Japanese samples perform as anatase TiO_2 and show no advantages over Ti-Pure FF up to 12 months, but do seem more susceptible to mold growth and dirt collection.

Panels 30726-30 F were retired after twelve months' exposure in Florida, and readings compared with those of twelve months in Chicago. The purpose of the series is to determine whether Cabot's Ultra Fine titanium oxide P-25 could be used as an additive to SWP Trim and Tinting White to increase the chalking when A2 W 8 is used as a white. The Cabot TiO_2 is added at 1/16, 1/8 and 1/4 pounds per gallon and the paints shaded to a light blue to accentuate effects of chalking on fading. Although there are only minor differences in chalk rub-off, there are large differences in color retention. Even 1/16 of a pound of the TiO_2 shows a bad white chalk face whereas the regular with R-610 TiO_2 is quite satisfactory.

Series 33214-33237 C, F, has been prepared for exposure at Chicago and Florida. This series is designed to determine the color retention of laboratory phthalocyanine blue and green lakes in A-100 formulations. These lakes contain various percentages of PC blue and green laked on Nylal 300 Talc, Nylal 300 plus R-510 TiO_2 , and Nylal 300 plus R-900 TiO_2 . A sample in which both PC blue and green are laked on Nylal 300 plus mica plus R-510 TiO_2 is also included. Solfast Blue and Green lakes are included as controls. Depth of color is similar to A-100 Stratford Blue. All paints are based on Rhoplex B-60A at 35% PWC. Two coats of latex paint were applied to both A6 W 28 A-100 Undercoater and OJ 115 Z (RC 2098 A Alkyd primer) on new cedar bevel siding.

Exposure panels 33433-41 F, C were prepared for Florida and Chicago, vertical south, all cedar bevel siding primed with A2 W 2 SWP Undercoater. The purpose is to check the durability of AURL 6429, an 18 M leaded zinc made from Anaconda fume. It is substituted 100% in two formulas, in A2 W 4 SWP Gloss White Card 5 and A2 W 8 SWP Trim and Tinting White Card 9, both of which normally use 6829 dry Ozlo 18 M. The A2 W 8 is tried both in Chelsea Gray and Berkeley Yellow. The regular formulas serve as guide paints.

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Project #177 - Cont.

Panels 33421-32 P, C were prepared for exposure at Florida and at Chicago, vertical south, all cedar bevel siding primed with A2 W 2 SWP Undercoat. The purpose is to evaluate samples of anatase and rutile titanium dioxide from The Nylos Trading Company. In the case of the anatase, it is tested in A2 W 4 SWP Gloss White Card 5, with Ti-Pure FF and Titanox A-MO as reference materials. In A2 W 8 SWP Trim and Tinting White, both Chelsea Gray and Berkeley Yellow shades, there are similar comparisons against Titanox RANC and Ti-Pure R-610.

0007-SWP-044101

0007-SWP-000113471

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Project #177 - Pigment Studies

The last report submitted on the subject of the determination of the hiding power of titanium oxides indicated that a refinement of method was necessary. The major differences between the present study of 40 paints and the previous study of 30 paints lie in the elimination of the error due to iron from the mill rolls by employing pebble mill batches and the incorporation of suggestions drawn from some of the methods in the literature which call for hiding determinations at various film thicknesses, and subsequent graphing of these points. In the previous report on the group of 30 paints, the hiding power of each paint was measured ten times at the same film thickness. In the current series every one of the 40 values in the following summary table is read from a graph derived from six points representing three different film thicknesses. We therefore have a total of 240 separate contrast ratios involved in the data. The vacuum plate was used in both studies. The Gardner Ultra Applicator was used as a drawdown gauge in this study.

Hiding Power of Various TiO_2 's
in Trim and Tinting White

All values are read from graphs at the 95% hiding level in units of sq. ft./gal. at 95% hiding.

	<u>Set 1</u>	<u>Set 2</u>	<u>Set 3</u>	<u>Set 4</u>	<u>95% C.L.*</u>
100% or 172# Ti-Pure R-610	528	585	568	578	565 $\pm$ 24
100% or 172# Ti-Pure R-900	603	660	655	687	651 $\pm$ 29
100% or 172# Unitane OR 640	520	603	560	570	563 $\pm$ 34
100% or 172# Titanox RANC	545	635	602	576	589 $\pm$ 38
100% or 172# Titanox RA-50	543	587	610	556	574 $\pm$ 30
85% or 146# Ti-Pure R-610	498	520	505	552	519 $\pm$ 24
85% or 146# Ti-Pure R-900	598	550	607	562	579 $\pm$ 28
85% or 146# Unitane OR 640	533	495	523	563	528 $\pm$ 28
85% or 146# Titanox RANC	518	577	495	500	523 $\pm$ 38
85% or 146# Titanox RA-50	531	534	520	555	535 $\pm$ 15

* 95% confidence limits

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The following conclusions may be drawn from this study:

1. At both 100% and 85% TiO_2 levels, the R-900 TiO_2 has the most hiding of any TiO_2 tested.
2. The 85% level of R-900 TiO_2 is equal to the 100% level of any other TiO_2 tested.
3. At the 100% level, R-900 is 15% above R-610 in hiding, and R-900 is 10.5% above its closest rival, Titanox RANC. Titanox RANC shows some indications of being slightly erratic from lot to lot.
4. du Pont's claim for the hiding power of R-900 has been proved statistically to be correct at the 95% confidence level.

The total error of four lots at one level is 2.8 to 6.5%, but this includes variation between lots over which we have no control. The error would be less than this if calculated on the basis of all samples run in this test.

In a practical paint, we are operating on the linear portion of the curve and have not reached the area of diminishing returns. In other words, we are utilizing the TiO_2 effectively.

Consideration should be given to the use of R-900 at 85% of the level of like TiO_2 to provide equal hiding in the present SWP Trim and Tinting White and to replace 85% of the TiO_2 in BCHI in SWP Gloss White. We can save 6.78¢/gallon for Trim and Tinting White and 1.10¢/gallon for Rx 471, by such use of R-900. These paints are on exposure. We are checking the tinting strength in Trim and Tinting White and will report later.

A sample of colored titanium dioxide dated 5-3-61 was received from Coffeyville for evaluation. This sample was produced in the pilot plant and represented material with improved texture. It was compared with 80 A 14 Sun Yellow in SWP Tyrone Yellow A2 Y 36. Paints made with the above TiO_2 yellows were checked for brushing, flow, texture and color. The yellow TiO_2 sample from Coffeyville compared quite favorably with Sun Yellow for general properties. However, the texture and gloss properties are not quite equal to 80 A 14 dry and the tint is very slightly redder than 80 A 14 in the SWP Tyrone Yellow formulation. Test data are listed in the following table.

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Project #177 - Cont.

Batch	Pigment	Brush	Flow	Gloss	Texture	Color	Grind	Viscosity #3
516 Z	80 A 14	Very good	Good	Good	Good	Standard	5 H	38"
517 Z	Yellow TiO ₂	Very good	Good	Slightly low	Not as fine as 80 A 14	Undertone slightly red	4-1/2 H	36.2"

Panels 33786-94 were prepared, all cedar bevel siding primed with A2 W 2 SWP Undercoater, for exposure at Chicago vertical north and south, and at Florida vertical south. The purpose of this series is to evaluate UC-540 Clay from United Clay Mines. This extender was used at 150 pounds per 100 gallons in A2 W 4 SWP Gloss White and also in A2 W 8 SWP Trim and Tinting White shaded to Chelsea Gray and to Berkeley Yellow. The regular extender used as guide and comparison was Nytal 300.

0007-SWP-044104

0007-SWP-000113474

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Project #177 - Pigment Studies

The Coffeyville plant has furnished a sample of colored titanium dioxide for evaluation. This material was taken from the 1400 pounds that had been wet ground by pebble milling and submitted under the name of Solfast Titan Yellow CFF 2100. The sample was compared with the original sample dated 5-1-61 and regular Sun Yellow, 80 A 14 dry, in SWP Tyrone Yellow A2 Y 36.

The laboratory batches of SWP Tyrone Yellow A2 Y 36 made with the above yellow pigments were evaluated for brushing, flow, texture, color, etc. CFF 2100 was found to be similar in texture and slightly stronger in tinting strength than 80 A 14 dry in Rx A2 Y 36.

SWP Tyrone Yellow A2 Y 36 Paints

Batch	Pigment	Brushing	Flow	85°		Texture	Color	Grind	Viscosity
				Gloss					No. 3
701 Z	80 A 14	Good	Good	77.4		Standard	Standard	4-1/2 H	54"
702 Z	Yellow TiO ₂ 5-1-51	"	"	49.4		Not as fine as 80 A 14	Under- tone slightly red.	4-1/4 H	62"
703 Z	CFF 2100	"	"	72.0		Same as 80 A 14	Slightly red and deeper tint.	4-1/2 H	60"

Exposure panels 31357-31368 C and F were examined after 12 months' Chicago and Florida exposure at 45° south. This series is concerned with the evaluation of du Pont's R-900 chloride process titanium dioxide in an M50-J type automotive enamel, both as a white and as a blue tint. du Pont's R-510 and R-610 sulfate process TiO₂'s were used as controls. Each paint was prepared using two different lots of vehicle. All of the topcoats were applied over Acme 407R39 primer-surfacer.

0007-SWP-044105

0007-SWP-000113475

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Project #177 - Cont.

At the present point in the exposure, the panels look quite good. Approximately the same mildew formation (not severe) was noted on all panels, both Chicago and Florida. The Florida panels all showed slight chalking, but the Chicago panels, with one exception (an R-510 white), showed no chalking. With respect to gloss retention, R-610 looks slightly better than both R-510 and R-900 in both whites and tints in topcoats made with the first vehicle lot, but shows either equal or less gloss retention than R-510 or R-900 in the topcoats made with the second vehicle lot. Thus, there is apparently more variation occurring due to the different vehicle lots used than there is due to the different pigmentations.

The panels will be re-exposed.

0007-SWP-044106

0007-SWP-000113476

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July, 1961

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Project 5177 - Pigment Studies

A-100 Heather Blue, A6 L 20, employs (78 A 5) Imperial X-2764 Hydrated Chromium Oxide pulp. The Imperial X-1010 dry form of this pigment was difficult to disperse in latex paints. Recently, they supplied X-2944, a new dry form of this pigment which is finer in particle size and much easier to disperse. Several latex paints including A6 L 20 have been prepared with the X-2944 and good dispersion was achieved readily. It is suggested that X-2944 is more desirable and would eliminate troublesome handling of the pulp form. Satisfactory dispersion should encourage wider use of this pigment which we find has outstanding color retention on exterior exposure even in light shades. Blends with 80 A 14 Sun Yellow and other pigments offer interesting possibilities.

Series 33996 - 34023 was prepared for exposure at Chicago and Florida. It is designed to evaluate a group of yellow pigments and includes both organic and inorganic types. The inorganic pigments are 80 A 14 Sun Yellow N, 113-K supplied by S-W Mineral Products Laboratory and X-3145 Imperial Empress Yellow 1. The Imperial pigment contains some lead and differs somewhat in composition from the usual nickel titanate yellows. It is considerably stronger and brighter in color than Sun Yellow. The organic yellows are chiefly of the Hansa type and include 81 C 92, 81 C 93, 81 C 96, 81 C 90, 8100, 8101 and Imperial counterparts of some of these pigments. All are exposed in both PVA and acrylic latex paint formulations.

0007-SWP-044107

0007-SWP-000113477

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Project #177 - Pigment Studies

A series of exposures evaluating Titanox PL was studied recently. The panel numbers are 32066-80 F, C. All are cedar bevel siding primed with A2 W 2 SWP Undercoater. The panels have been up 12 months at Florida, vertical south, and 16 months at Chicago. Titanox PL is a paper laminate grade titanium dioxide furnished by the Titanium Pigment Corporation, used primarily in such materials as Formica and Micarta. The purpose of this series is to compare it with the commonly used non-chalking titanium dioxides Ti-Pure R-610, Titanox RANC and Unitane OR 640. It is tried in A2 W 8 SWP Trim and Tinting White and also in the same shaded to A2 A 20 SWP Chelsea Gray and to Rockaway Blue (1 gallon A2 W 8 plus 1 oz. KTC Blue).

The white tests show just slightly less dirt with R-610 than any of the others at Florida. Chicago shows them all alike except that the PL sample seems a little more dirty at 16 months, although all were alike through 10 months. The tints do not confirm this conclusion, consistently, so in general we can only say that there seems to be a possibility of slightly more dirt collection with PL.

The two tints agree quite closely at Florida, considering the critical characteristics of chalk rub-off and fading. RANC and PL show slightly less chalk and fading than R-610 and OR 640. The Chicago panels show no differences in chalking on the tints so far. The fading is too close to justify a full notch difference in ratings, but the impression is that RANC is slightly most faded of the four and PL slightly least.

Exposures 32196-32219 F, C were examined recently after 12 months at Florida and at Chicago, vertical south. This is an A6 W 30 A-100 Latex House Paint series, on cedar bevel siding. The left half of each panel is primed with A6 W 28 A-100 Wood Undercoater and the right half is self-primed. The purpose is to check the uniformity of performance in paint of several lots of R-900 titanium dioxide. Several other titanium pigments, as indicated below, were included, all on a 2-1/4 pound basis. All paints were shaded light blue, using Painter-craft Tinting Color Phthalo Blue.

0007-SWP-044108

0007-SWP-000113478

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Project #177 - Cont.

There is no film failure and essentially no chalk rub-off at 12 months at either location throughout the series. Fading also is very slight. The real differences at this stage are confined to dirt collection and mold growth (at Florida). Briefly these are:

- a. The R-900 lots. No. 105, 4069 (standard), 4124, 4157, 4167, 4169 and 4210. Serious mold and dirt at Florida and dirt only at Chicago on the primed half, rated 6 in most cases. Little or no mold and somewhat less dirt on the self-primed half at Florida. There are a number of exceptions, variations of one notch in ratings, but only one shows even a possibility of a trend. The standard lot #4069 not only shows less dirt (self-primed half) at Florida than the others, but also is the only one in the entire series to show discernible chalk rub-off or fading (both rated 9).
- b. Other titanium pigments.
 1. Ti-Pure R-510. Same as most of the R-900 lots.
 2. Titanox RA-50. Shows a bit more mold at Florida and a bit more fading at Chicago than the R-900's.
 3. Unitane OR-540. As preceding, Florida shows a bit more mold (but on the primed half only), while Chicago shows a little more fading.
 4. Titanox RANC. Slightly more mold than the R-900's, otherwise same.
 5. Unitane OR-640. Good, perhaps a bit better over-all than any of the foregoing.

Exposures 34735 - 34743 were prepared during November for exposure at Chicago and Florida south. The purpose is to evaluate Oncor T 15 a lead silico titanate pigment made by the National Lead Company. The Oncor pigment was introduced on a hiding basis for the old lead titanate pigment 1895 dry in the old SWP Cream House Paint Rx 462 Card 21, the old One Coat House Paint CH 4697 and a formulation based on 1/3 inert, 1/3 lead titanate and 1/3 leaded zinc.

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Project #177 - Pigment Studies

An evaluation is being made of the various so-called paper grades of TiO_2 as produced by the companies listed below:

Unitane O-520, American Cyanamid Co.
Ti-Pure PC, E. I. du Pont
Titanox ACG, Titanium Pigment Corp.

These pigments are to be evaluated for durability and ease of wetting in SWP formulations. The experimental paints will be manufactured on a Cowles Dissolver Model 410-VHV now installed for use on a trial basis.

Our initial exposure work was with the Ti-Pure PC grade and has been covered by the exposure series 32314-22. Ti-Pure PC is on test in A2 W 4 card 5 as a replacement for (a) 50 pounds Ti-Pure FF, (b) 50 pounds Ti-Pure FF plus 50 pounds Ti-Pure Y-CR and (c) same as (b) but in conjunction with 50 pounds of Ti-Pure R-900, the approximate TiO_2 content of the 175 pounds of Titanox RCHT in the formula. These tests have been on exposure for 12 months at Florida and 16 months at Chicago. The general appearance of the Ti-Pure PC paints after this exposure period appear very good and similar to the guide paint. The panels are being continued on exposure.

In the new exposure series on TiO_2 pigments, all three paper grade TiO_2 pigments have been included in the titanium calcium-free formulation for A2 W 4 Card 7 and A2 W 8 Card 9. In this series several other grades of TiO_2 have also been included, such as Ti-Pure R-900, Ti-Pure 610, Unitane OR-450 and Titanox PL. The pigment combinations are as follows:

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Project #177 - Cont.

Paints To Be Exposed in New Series

SWP Gloss White A2 W 4

Description

175# Titanox RCHT, 50# Ti-Pure FF, 50# Ti-Pure Y-CR
175# Titanox RCHT, 50# Ti-Pure FF, 50# Ti-Pure Y-CR
175# Titanox RCHT, 100# Unitane O-520
175# Titanox RCHT, 100# Ti-Pure PC
175# Titanox RCHT, 100# Titanox ACG
175# Titanox RCHT, 100# Unitane OR-450
175# Titanox RCHT, 80# Unitane OR-450
43# Ti-Pure R-900, 50# Ti-Pure FF, 50# Ti-Pure Y-CR
43# Ti-Pure R-900, 50# Ti-Pure FF, 50# Ti-Pure Y-CR
43# Ti-Pure R-900, 100# Ti-Pure PC
43# Ti-Pure R-900, 100# Unitane O-520
43# Unitane OR-450, 100# Unitane O-520
43# Ti-Pure R-900, 100# Titanox ACG
52# Ti-Pure R-610, 50# Ti-Pure FF, 50# Ti-Pure Y-CR
52# Ti-Pure R-900, 50# Ti-Pure FF, 50# Ti-Pure Y-CR

SWP Trim and Tinting White Shaded SWP Rock Green

172# Ti-Pure R-610
172# Ti-Pure R-610
172# Titanox PL
172# Unitane OR-450
143# Ti-Pure R-900
143# Unitane OR-450
172# Ti-Pure R-610 with Drikalite for #10 Whiting
172# Ti-Pure R-610 with Drikalite for #10 Whiting
172# Titanox PL with Drikalite for #10 Whiting
172# Unitane OR-450 with Drikalite for #10 Whiting
143# Ti-Pure R-900 with Drikalite for #10 Whiting
143# Unitane OR-450 with Drikalite for #10 Whiting

0007-SWP-044111

0007-SWP-000113481

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Project #177 - Cont.

Exposure panels 31357-68 C were examined after 18 months' Chicago exposure at 45° south. This series is concerned with the evaluation of du Pont's R-900 titanium dioxide in an M30J-type automotive enamel, both as a white and as a blue tint. du Pont's R-510 and R-610 sulfate process TiO_2 's were used as controls. Each paint was prepared using two different lots of vehicle. All of the topcoats were applied over Acme 407 R 39 primer-surfacer.

In general, at this point in the exposure, the panels look good. With respect to gloss retention, the R-610-pigmented topcoats show a definite superiority in performance to those pigmented with R-900 and R-510, irrespective of vehicle lot and in both whites and blue tints. R-510 showed generally the poorest performance, with R-900 being somewhat better. All panels show a certain amount of chalking, but again, the R-610 pigmented topcoats showed best chalk resistance and R-510 pigmented topcoats the least. A slight amount of mildew was noted on all panels. No color change was observed.

Earlier in the exposure period (i.e., after 12 months), it seemed that there was more variation in performance due to the use of different vehicle lots than there was due to the different TiO_2 pigmentation. However, it is now clear that any variation in performance due to the difference in vehicle lots is insignificant as compared with the difference in TiO_2 's. The panels will be re-exposed.

In previous reports we have presented the idea that Cabot's P-25 ultra-fine TiO_2 could be used in the form of Kem Tinting Color to convert a chalk resistant exterior white paint into a chalking white, thus eliminating the need for two basic whites. Series 32144-53 F, C testing this ultra fine titanium dioxide in A2 W 8 SWP Trim and Tinting White, Card 8, both as white and shaded blue, was examined recently. These exposures are on cedar bevel siding primed with A2 W 2 SWP Undercoater, and have been up twelve months at Florida and essentially the same time at Chicago vertical south. The readings were compared with those of series 30726-30 F, C, which was reported on at twelve months in February, 1961.

0007-SWP-044112

0007-SWP-000113482

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Project #177 - Cont.

Only the blue-shaded A2 W 8 was tested in the earlier series. The main finding was that the P-25 developed extreme chalk-mask fading. The amounts used in both cases were 1/16, 1/8 and 1/4 pounds of P-25 per gallon or 1-1/2, 3 and 6 fl. oz. of the base. This was introduced in the form of Kem Tinting Color White prepared by Emulsion Research. Extreme fading, even at 1/16 pound of P-25 was very apparent on the blues of the repeat series 32144-53. The whites show increased chalking with each increment of P-25. The tests will be continued to see if there is any merit in the idea of using P-25 in the manner described.

Exposures 32158-83 F, C were studied after twelve months at Florida and at Chicago, vertical south. All are cedar bevel siding primed with A2 W 2 SWP Undercoater. A smaller series, 32650-5 F, C, was also studied, its exposure conditions being essentially the same. The main series was put out to evaluate six production samples of Ti-Pure R-900 submitted by du Pont. These were used in two formulas, A2 W 8 SWP Trim and Tinting White, Card 9, and Intermix White, both being tested as light blue (phthalocyanine) tints. Other titanium pigments included for comparison were R-610, Titanox RA-50 and RANC and Unitane OR-540 and OR-640. The R-610 is in the basic and guide formula. The R-900 was substituted at 85% of the poundage used in the case of the others. No white paints were exposed in this project. In the smaller supplementary series the tests were made in A2 Y 16 SWP Berkeley Yellow, with R-900 substituted in this case both at full poundage and at 83%.

Examination disclosed no film failure. The A2 W 8 blue and the Berkeley Yellow showed little or no gloss, while the Intermix type blue showed considerable. Chalking was essentially nil on the Intermix, although at Chicago four of the six R-900 lots, plus RA-50 and OR-540, showed a slight rub-off. The A2 W 8 blues showed as free chalking as normally expected, rated 6, with the exception of RANC and OR-640, which showed much less. No differences showed up on the Yellows.

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0007-SWP-000113483

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Project #177 - Cont.

The factors affecting general appearance, i.e. fading, dirt and mold growth were, for the most part, so close that it was difficult to differentiate in the ratings. The Intermix group shows very heavy dirt and mold growth, the others moderate. Though not showing quite as obviously at Chicago, four panels in the A2 W 8 blue group at Florida differ considerably from the normal:

- (a) R-610 and OR-540 show excessive fading.
- (b) RANC and OR-640, on the other hand, look good as to color.

The Yellows are in poor agreement, Chicago versus Florida, with respect to fading. Both show the regular with R-610 as relatively poor, but (a) Chicago shows OR-640 as a bit more faded (poorest), while at Florida it is among the better ones; (b) Chicago rates RANC quite low, while at Florida it seems best and (c) R-900 seems clearly best at Chicago, but not equal to RANC at Florida.

0007-SWP-044114

0007-SWP-000113484