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KN-44-85

NEWARK PLANT
PIGMENT COLOR RESEARCH REPORT

Progress Report

DX PIGMENTS: EVALUATION OF VIOLET DX TONERS AND LAKES, AND DX RED TONERS

Period Covered: May 14, 1943 to February 29, 1944

FILE: 223.8

DATE: 4-11-44

223.8

NJ6639

Serial No. KN-44-25

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Progress Report

Title: DX PIGMENTS: EVALUATION OF VIOLET DX TONERS AND LAKES, AND DX RED TONERS

Period Covered: May 14, 1943 to February 29, 1944

SUBMITTED BY: D. B. Killian 4/11/44 DATE SUBMITTED: 3-1-44

APPROVED BY: Alfred Siegel 4/11/44. DATE ISSUED: 4-11-44

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I. INTRODUCTION

During the course of the cooperative work between Jackson Laboratory and Newark on coalesced phthalocyanine pigments, a new violet shading pigment for CPC was uncovered. This was named Violet DX and is a dioxazine dyestuff. Its use as a shading color for phthalocyanines is discussed in the report on Coalesced Phthalocyanine Pigments KW-43-178.

Violet DX is one member of a group of pigment dyestuffs which cover a wide range of shades. Three red DX pigments prepared by Jackson Laboratory were submitted for evaluation.

This report covers all evaluations made at Newark on Violet DX and Red DX pigments in the period between May 14, 1943 and February 29, 1944 with the exception of results from exposures still in progress. The following exposure series for evaluation of the DX pigments are on the fences:

S-6744	(Violet DX: toners and TiO_2 tints in lacquer and alkyd)
S-6786	(Red Shade CPC tints, includes Violet DX, in alkyd)
S-6789	(DX Pigments in alkyd)
S-6794	(Violet DX as self-color and tinting color, Amberol Vehicle)
S-6824	(Miscellaneous Violet DX lakes in lacquer)

II. PATENT SITUATION

Many types of dioxazine dyestuffs have been disclosed in the patent literature. The first patents in this field were issued to the firm of Meister Lucius and Bruning from the years 1911 to 1914 (cf. Ger. Pat. 253,091 (6-25-11); 253,761 (8-18-11); 255,642 (11-7-11); 257,834 (12-2-11), U.S. Pat. 1,065,063 (6-17-13); Br. Pat. 8886/12). In recent years, the patent art in the dioxazine class of dyes has been directed towards sulfonated and aminated dioxazines which are soluble textile dyes. However, all the basic patents on the insoluble pigment dyestuff dioxazines have expired and manufacture of such products appear free from patent restrictions.

III. SUMMARY AND CONCLUSIONS

1. Four colors of the dioxazine class have been prepared at Jackson Laboratory and evaluated at Newark. These are Violet DX toners and lakes, Orange DX toner, Scarlet DX toner, and Maroon DX toner.

2. Violet DX is a very strong, red and intense color compared to "Ponsol" Brilliant Violet 4RN. It is a unique shading color for CPC giving intense red shade blues by mechanical mixture with the phthalocyanine and is compatible tinctorially with CPC in any proportion without objectionable dulling. Violet DX permits the preparation of redder shade blues than can be obtained with the "Ponsol" Violet owing to the greater color intensity of the former. In fact, tinctorially, Violet DX appears to possess appreciable merit as a self-color. However, Violet DX has poor lightfastness in tints in linseed oil containing vehicles where the linseed is present as free oil, and is, therefore, of no interest as a printing ink pigment. In paint systems containing no free linseed oil, Violet DX both as a self-color and as a shading color for CPC is as lightfast and durable as "Ponsol". Brilliant Violet 4RN.

It is a non-bleeding paint pigment (linseed oil, lacquer, alkyd enamels) but is sensitive to baking in alkyd enamels. This latter defect is a serious handicap to promotion of Violet DX as a paint pigment. As a self-color Violet DX flocculates severely when extended with a prime white pigment in alkyd or lacquer systems, but no flocculation occurs in systems pigmented with Pigment BX-CR shaded with Violet DX Toner. However, Violet DX/TiO_2 lakes made by co-acid pasting, or co-salt milling are non-flocculating "as is" or when further extended with TiO_2 in lacquers and alkyd enamels.

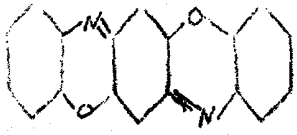
As a linoleum color Violet DX is stable to cure, soapfast, and otherwise satisfactory in chemical resistance. Its lightfastness as a self-color or as a shading color for CPC in linoleum tints leaves something to be desired, but may be satisfactory. Violet DX appears to possess sufficient merit as a linoleum color to warrant submitting samples to the linoleum houses for practical evaluation.

3. The three red DX pigments evaluated are of little interest as paint pigments. They are too dull against standard colors of similar depth. Scarlet DX and Maroon DX darken undesirably on outdoor exposure of full shade enamels. The three red DX colors differ from Violet DX in one important respect, namely, stability and good lightfastness in linseed oil when exposed in the fadeometer. Orange DX is the most lightfast of the three. Orange DX is non-bleeding in linseed oil and paint systems and very lightfast even in linseed oil systems but too dull tinctorially to warrant further consideration. All the red DX pigments are stable to baking in alkyd enamels, and stable to heat cure in linoleum. Both Scarlet DX and Maroon DX bleed objectionably in linseed oil, lacquer and alkyd enamels. As linoleum pigments, the DX reds are soapfast but too poor in lightfastness in tint for utilization in this field. The DX reds have great tinting strength being about twice as strong as the strongest azo red manufactured at Newark. Orange DX and Maroon DX are being evaluated as reds for flesh tints by outdoor exposure since these colors have exceptionally good lightfastness in tints in varnish drier. Scarlet DX is inferior in lightfastness in tint to either of the other DX reds.

4. Owing primarily to poor tinctorial properties, compared with current standard inorganic and organic pigments, the Scarlet, Maroon and Orange DX pigments are of insufficient merit to justify further interest. However, even though the faults of Violet DX preclude its acceptance for general application, it nevertheless possesses sufficient merit to be considered as a specialty color for possible use in the linoleum field.

V. DISCUSSION AND EVALUATIONS

The dioxazines are a class of colored organic compounds many members of which are described in the journal and patent literature. They can be prepared by several known methods, but the most important of these technically is via condensation of an aromatic amine with an aromatic quinone in a high boiling solvent followed by ring closure. The simplest member of this type is triphendioxazine.

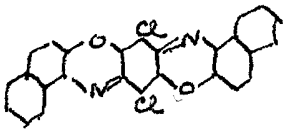


(Beilstein, 4 ed., 27, 746)

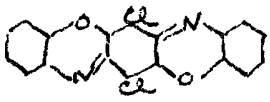
Numerous compounds of this series have been obtained from benzoquinone, toluquinone, chloranil, etc. with various aromatic amines capable of condensation and ring closure. The dioxazines which contain no solubilizing or reactive substituents such as sulfonic, carboxylic, amino, or hydroxyl groups are pigment dyestuffs which are practically inert chemically. The color range of this class of pigments is exceptionally wide extending from yellows and oranges through reds, maroons, blues and violets.

Four dioxazine pigments prepared by condensation of chloranil with β-naphthyl-amine, aniline, p-chloro-o-anisidine, and p-phenetidine, respectively, have been evaluated. These products were prepared at Jackson Laboratory and as a class are referred to as DX Pigments. The constitution and color of the four pigments under investigation are as follows:

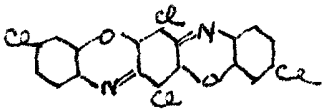
Violet DX



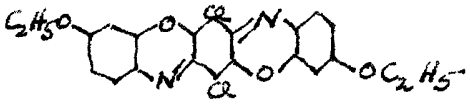
Orange DX



Scarlet DX



Maroon DX



While these colors have been known for many years, they have not been of interest as pigments since no finishing method was known which gave colors of good pigment properties. The dioxazines can be acid pasted with resultant suitable physical form, but otherwise are [illegible] tinctorially. However, Jackson Laboratory has discovered that salt milling these products results in a suitable pigment form as evidenced by increased intensity and strength compared to the unmilled pigments. In general, these salt milled dioxazines possess about twice the tinting strength of the strongest azo colors manufactured at Newark. These salt milled products are very bulky, soft pigments.

The four dichlorodioxazines shown above have been evaluated for lightfastness, paint properties, bleed properties, and as linoleum colors. Several samples of Violet DX toners, and lakes on various substrate have been studied. Only toners of the red DX pigments were investigated. The most interesting of the new pigments tinctorially is Violet DX. Results are briefly summarized below for each of the colors. Outdoor exposures of these colors in lacquer and enamels are in progress (cf. Series 6744, 6752, 6786, 6789, 6794, 6824).

A. Violet DX Toners and Lakes

Five toner samples of this pigment have been submitted. Two of these

have been finished by salt milling, two by acid pasting, and one is a highly purified sample for comparison with the others for lightfastness, etc. Eight samples of extended Violet DX on blanc fixe, "TI BAR" HR, "TI PURE" R-610, and "TI PURE" R-LL (R-610), respectively have been prepared at Jackson Laboratory by co-acid pasting or co-salt milling.

Salt-milled Violet DX toner is stronger and more intense than the acid pasted types. The highly purified sample of toner (D-5620, MDD-749) is very weak vs. either the salt-milled or acid pasted toners. The final sample of Violet DX toner finished by salt milling (D-5620, J-50-F-1) and prepared by the preferred Jackson Laboratory process is slightly duller and somewhat yellower than an earlier sample finished in the same way (D-5327, J-59-F-72). Otherwise all of the toner pigments have the same properties.

Violet DX toner (salt-milled) is a dark bronzy, bulky pigment. In full shade in varnish drier or paints it is a very dull bronze color of no interest as such. Violet DX in tints is intense, red, and strong compared to the vat dye "Ponsol" Brilliant Violet 4RN, and is of considerable interest both as a self-color and as a shading pigment. As a shading color for CPC, it produces intense red shade blues by simple mechanical extension. In this respect, Violet DX is a unique shading color for the phthalocyanines being tinctorially compatible in any proportion without dulling. "Ponsol" Brilliant Violet 4RN, now used as a shading color for CPC, must be acid pasted with the CPC for good results. Violet DX can be used in larger quantities than the "Ponsol" Violet to give redder and more intense shades of CPC than heretofore obtainable. It has been evaluated as a shading pigment in paints and linoleum.

Violet DX is non-bleeding in linseed oil, water, dilute acids and alkalies, and 95% ethanol. It does not bleed in lacquer or alkyd enamels, air dried or oven baked, when overstriped with a white lacquer or enamel. It does bleed slightly in paraffin. As a linoleum color, Violet DX is soap-fast, and unaffected by dilute acids or alkalies.

In lightfastness Violet DX shows variable behavior depending on the nature of the vehicle. In any vehicle, the full shade color is very lightfast. In tints (TiO_2 and ZnO) in linseed oil, varnish drier and spar varnishes containing considerable free linseed oil, Violet DX has poor lightfastness. Tints of Violet DX in synthetic vehicles such as lacquers and alkyd and phenolic enamels are exceptionally lightfast both in the fadeometer and out-doors exposure, being equal to "Ponsol"Brilliant Violet. A 2.5% Violet DX/ 97.5% "TI PURE" R-610 tint in alkyd enamel after 6 mos. Florida exposure shows only a slight fade. Red shade phthalocyanines made with Violet DX are fully equal in lightfastness in these synthetic vehicles to "Monastral" Fast Blue 2R. The poor lightfastness of Violet DX in linseed oil prohibits its use as a printing ink pigment and in some paint systems such as linseed oil modified trim paints.

In paint systems, Violet DX tends to body worse than phthalocyanine toners. The toner flocculates and separates severely in lacquer and alkyd systems. Titanium dioxide tints of Violet DX toner, in lacquer and enamels, prepared by mechanical mixture of toner pigment with the prime white, flocculate and separate even more rapidly than CPC tints. A 50% aluminum benzoate lake of

Violet DX toner made by precipitation of the aluminum salt on a wet paste of the toner shows no improvement in flocculation resistance over regular toner. Violet DX as a self-color or as a shading color for blue pigments is sensitive to baking in alkyd enamels. At 275°F., it dulls and weakens severely, and red shade blues containing the violet change to dull greenish blues. However, alkyd enamels containing Violet DX apparently can be baked at 200° to 225°F., without serious alteration in shade. This sensitivity to baking is the most serious drawback of Violet DX as a paint pigment.

As a linoleum color Violet DX is of interest both as a self shade and especially as a shading color for blues, particularly CPC. As noted above it is soapfast and unaffected by dilute acids or alkalies in linoleum. It is stable to cure at 200°F. The lightfastness of Violet DX in tint linoleum is not as good as that of the better "Naphthanil" type colors, but may be satisfactory for many patterns. Tint linoleums made with "TI PURE" R-510 are more lightfast than those containing "TI PURE" FF. As a shading color for CPC in linoleum compositions, Violet DX appears satisfactory and has not faded out objectionably.

With the exception of a few paint properties, the Violet DX lakes on various susbstrata have the same characteristics as the toner pigment. When Violet DX is co-salt milled with TiO_2 or a TiO_2/blanc fixe combination ("TI BAR" HR), the resultant lakes are non-flocculating in lacquer and enamels. However, only the lakes so prepared on straight TiO_2 can be further diluted with additional TiO_2 without flocculation and separation of the colored component. The lakes on "TI PURE" R-44 (for R-610) are poor in lightfastness both in the fadeometer and outdoors in lacquer or alkyds. This is due to the base TiO_2 rather than any difference in the colored pigment.

Violet DX lakes made by co-acid pasting or co-salt milling with blanc fixe have paint properties similar to dry mixes of the component pigments. These blanc fixe lakes show no improvement in flocculation compared to equivalent mechanical tensions of toner.

The behavior of Violet DX in linseed oil and in baked enamel finishes is reminiscent of that of indigo. The failure of the DX pigments in these cases does not appear to be due to impurities that might be present in the pigment since a highly purified sample of toner behaves in the same way. Mild oxidation of the toner pigment by a method effective in improving the lightfastness of indigo (K-1842) failed to improve the violet. It appears likely that these poor properties are inherent in the nature of the compound.

B. Orange DX, J-45[illegible]

Orange DX is a light red toner which is very dark and dull vs. representative chrome oranges, organic orange pigments and soda Lithols. In masstone, this pigment is nearer RT-525-D (manganese pigment of "Lithosol" Red 2B) in color than any other red in the Newark range, but is very yellow in tint. The foregoing comparisons were made in varnish drier. In enamels and lacquer, Orange DX is a light dull red but not similar tinctorially to any cadmium red. In linoleum, the pigment is a dull orange. Tinctorially, Orange DX, altho possessing great tinctorial strength, is not of much

interest being too dull compared to standard reds and oranges.

Orange DX is remarkably lightfast in full shade and tints both in the fadeometer, in varnish drier and in outdoors exposure in alkyd enamel. A 1:30 tint in ZnO (V.D.) faded only very slightly after 470 hrs. in the fadeometer. This color is being evaluated in flesh tint shades for outdoor-posters.

Orange DX is practically as resistant to bleeding in all type reagents as Violet DX but does show a. bleed in dilute caustic. In baking enamels, it bleeds slightly when overstriped with white enamel.

Orange DX flocculates in lacquer and Dulux and separates when tinted with TiO_2. It is stable to baking, full shade, in alkyd enamels at 275°F.

As a linoleum color, Orange DX is stable to cure, soapfast, and resistant to chemical action in dilute acids and alkalies. However, it fades badly in tint linoleum compositions.

C. Scarlet DX, J-45-P-10

Scarlet DX is a dull medium red of no tinctorial interest. It is poorer in lightfastness than Orange DX or Maroon DX. Tinctorially it is a dull RT-492-D (MRPT-MAS-D) shade, but has great tinting strength. It bleeds in linseed oil and in baking enamels overstriped with white enamel. Scarlet DX bleeds in dilute caustic, alcohol, and paraffin. It darkens badly, full shade, when exposed in the fadeometer.

As a paint pigment, Scarlet DX has properties similar to Orange DX. It flocculates in lacquer and Dulux. On outdoor exposures, serious darkening in full shade occurs in about 2 mos. in Florida in alkyd enamel.

Scarlet DX is a soapfast linoleum color but has poor lightfastness in tint linoleum compositions.

D. Maroon DX, J-45-P-8

Tinctorially, this is the most interesting of the Red DX pigments. It is a very blue, very strong maroon similar to RT-499-D (Manganese of "Lithosol" Rubine 3G) in lacquer and lighter and yellower than thio-indigo maroon, RT-503-D. A blend of 80% Maroon DX and 20% Violet DX, altho duller, approximates RT-503-D tinctorially.

Maroon DX has the poorest bleed properties of any of the DX pigments tested. It bleeds strongly in linseed oil and in lacquer and alkyd enamels when overstriped with white. It also bleeds strongly in dilute caustic, alcohol and paraffin.

As a paint pigment, Maroon DX flocculates in lacquer and enamels and separates in TiO_2 tints in these systems. It is stable to baking but darkens badly on exposure, full shade in alkyd, after 2 mos. in Florida.

The Maroon DX/Violet DX blend also darkens more than RT-503-D on outdoor exposure. As a shading color for CPC, Maroon DX gives duller red shade blues than Violet DX.

Weak tints of Maroon DX have very good lightfastness in varnish drier in the fadeometer. This pigment is being evaluated as a red for flesh tint use.

In linoleum, Maroon DX is stable to cure, soapfast, and satisfactory in all respects except lightfastness in tint which is poor. Tinctorially, Maroon DX is similar to the "Naphthanil" Soapfast Red, PMOA-NB6, K-1888 but is slightly darker and considerably stronger. However, its poor lightfastness in tint linoleum precludes its use in this field.

V. EXPERIMENTAL

The following tabulation lists the various evaluations made with each DX Toner and Lake, and the original notebook reference.

VIOLET DX TONER
Salt Milled D-5327, J-59-F-72

Evaluation	Exp. No.
Tinctorial Properties. strength vs. "Ponsol" Brilliant Violet 4RN (V.D.)	1045-2 1045-15
As shading color with RT-386-D (V.D.)	1045-8
20% Violet DX + 80% Maroon DX vs. RT-503-D (V.D.)	1045-18
As shading Color for CPC: TiO_2 tint	1045-14
Lightfastness. In Varnish Drier (fadeometer)	1045-2,6
MT and Tints (TiO_2 + ZnO) in V.D.	1045-15
Raw Linseed Oil (fadeometer)	1045-19,6
Lacquer and alkyd (fadeometer)	1045-20
Amberol V-3047 (fadeometer)	1061-7
As shading color for CPC: Amberol V-3047 (fadeometer)	1061-7
Linoleum. Self color and as shading color for CPC	1045-18;21, 24,40
Flocculation of TiO_2 tints. MT and Tints (TiO_2)	1027-27 1046-24
plus CPC toners. TiO_2 tints. Alkyd	1061-2
Paint Properties "as is" and as Shading Color for CPC	
Overstripe Bleed - Air Dried and Baked in Alkyd enamel	1061-2
Durability - alkyd and lacquer	
Toner, "TI PURE" R-610 tints vs. "Ponsol" Brilliant Violet 4RN	1046-2 Series 6744
Durability, etc. as shading color in	
Matches for Bureau of Ships Outside Paints: Navy Blue, Haze Gray and Thayer Blue	1046-5 Series 6752
Durability, etc. as shading color CPC toners and Pigment BX-CR (alkyd)	1046-25 Series 6796

Salt Milled D-5327, J-59-F-72 (Cont.)

Evaluation	Exp. No.
Paint Properties (Cont.)	
Durability, etc. TiO_2 tints and as shading color for Iron Blues and CPC (Alkyd)	1061-3 Series 6789
Durability, etc. M.T. and "TI PURE" R-610 tints. Shading color for CPC (Amberol V-3047)	1061-7 Series 6794
Bleed Properties Skin Down Varnish Drier	1045-18
Overstrike-house Paint	1045-18
Raw Linseed Oil	1045-18,19
Linoleum: as self-color and shading color for CPC	1045-18 1045-21 1045-24
Other Properties	
Stability to cure in linoleum	1045-18,21, 24
Stability to heat in V.D. printed on tin	1045-18
Chemical Reactions	
Attempted purification by mild oxidation	1060-3
Attempted reaction with Cu Ammonia Complex, NH_4OH, and PTA	

VIOLET DX TONER
Salt Milled, D-5621 - J-50-F-1

Evaluation	Exp.No.
Tinctorial Properties	
In varnish drier	1085-11
In lacquer	1061-23
Lightfastness & Bleed Properties	
In V.D.	1085-11
Paint Properties	
In lacquer: Flocculation	1061-23
Stability to bake in alkyd enamel: as self-color and shading color for CPC	1085-9
Violet DX/Aluminum benzoate lake: Preparation and paint properties	1085-21

VIOLET DX TONER
Purified Laboratory Sample, D-5620, MDD-749

Evaluation	Expt. No.
Tinctorial Properties	
In V.D.	1085-11
In lacquer	1061-23

Purified Laboratory Sample, D-5620, MDD-749 (cont.)

Evaluation	Expt.No.
Lightfastness and Bleed Properties	
In V.D.	1085-11
Paint Properties	
In lacquer: Flocculation	1061-23
Stability to bake in alkyd enamel: as self-color and shading color for CPC	1085-9

VIOLET DX TONER (D-5467, MDD-633)
Acid Pasted - High Turbulence

Evaluation	Expt.No.
Lightfastness	
M.T. and Tint and shading color for CPC (Amberol V-3047, fadeometer)	1061-7
In Raw Linseed Oil	1045-19
Paint Properties	
Flocculation of TiO_2 tint: lacquer	1046-24
Durability, etc. as shading color for CPC (alkyd)	1046-25 Series 6786
Durability, etc. As self-color and shading color for CPC (Amberol V-3047)	1061-7 Series 6794
Other Properties	
Bleed - Raw linseed oil	1045-19

VIOLET DX TONER (D-5468, MDD-634)
Acid Pasted - Drip Drowned

Evaluation	Expt.No.
Lightfastness	
M.T. and Tint and as Shading Color for CPC (Amberol V-3047, fadeometer)	1061-7
Raw Linseed Oil, "	1045-19
Paint Properties	
Flocculation of TiO_2 Tint: lacquer	1046-24
Durability, etc. As shading color for CPC (alkyd)	1046-25 Series 6786
Durability, etc. Self-Color and shading color for CPC (Amberol V-3047)	1061-7 Series 6794
Other Properties	
Bleed - R.L.O.	1045-19

VIOLET DX LAKES
D-5329, J-59-F-74: Violet DX co-acid pasted with "TI PURE" R-LL for R-610 (1:3)

Evaluation	Expt.No.
Tinctorial	
Rubout vs. "Ponsol" Br. Violet/TiO_2 lake	1045-3
As Self-Color and Shading Color for Pigment BX-CR:Lacquer	1046-14
Lightfastness	
In V.D. : Fadeometer	1045-3
In Raw Linseed Oil : "	1045-19
In Amberol V-3047 : "	1061-7
Paint Properties	
Flocculation in lacquer	(1027-27 (1046-14
Exposure Pigment BX-CR shaded with Violet DX lake: lacquer. Newark	1046-14
Durability, etc.: Lacquer and Dulux	1046-2 Series 6744
Durability, etc. As Shading Color for CPC Rezyl 807-1	1046-25 Series 6786
Durability, etc. Amberol V-3047	1061-7 Series 6794
Durability,etc. Lacquer	1061-17 Series 6824

VIOLET DX LAKES
D-5423, J-59-F-82: Violet DX salt milled with "TI PURE" R-LL (1:3)

Evaluation	Expt.No.
Lightfastness	
Raw Linseed Oil: Fadeometer	1045-19
Amberol V33047 : "	1061-7
Paint Properties	
Flocculation in Lacquer	1046-24
" " Alkyd	1061-2
As Shading Color for Pigment BX-CR	1061-2
Overstripe Bleed: Alkyd-air dried and baked	1061-2
Durability, etc. as shading color for CPC. Rezyl 807-1	1046-25 Series 6786
Durability, etc. Rezyl 807-1	1061-3 Series 6789
Durability, etc. Amberol V-3047	1061-7 Series 6794
Durability, etc. Lacquer	1061-17 Series 6824

VIOLET DX LAKES

On "TI PURE" R-610 :	Co-acid Pasted	(1:6)	D-5568, MDD-694
	" " "	(1:20)	D-5569, MDD-695
On "TI BAR" HH:	" " "	(1:6)	D-5570, MDD-696
	" " "	(1:20)	D-5571, MDD-697
On Blanc Fixe:	" " "	(1:6)	D-5572, MDD-698
	co-salt milled	(1:6)	D-5574, MDD-700
	co-acid pasted	(1:20)	D-5573, MDD-699

Evaluation	Expt.No.
Flocculation "as is" and TiO_2 extensions vs. Toner extensions in lacquer	1061-17
Tinctorial Properties: Rubouts V.D. vs. Toner Extensions	1045-33
Lightfastness. V.D. vs. Toner Extensions	1045-33
Bleed Properties	1045-33
Durability, etc. Lacquer vs. Toner extensions	(1061-17 (Series 6824
Stability to bake in alkyd enamels as shading color for CPC	1085-9

MAROON DX (Dark Red)
D-5474 - J-45-P-8

Evaluation	Expt.No.
Tinctorial	
In V.D. by rubout vs. Newark line of Reds	1045-18
In V.D. plus Violet DX vs RT-503-D	1045-18
In lacquer vs Standard Reds	1061-6
Lightfastness	
In V.D.: MT and ZnO Tints	1045-18
	1045-20
In Linoleum	1045-18
	1045-21
	1045-24
Stability	
To heat in V.D. on tin: M.T.	1045-18
To Baking in Dulux	1061-5
To heat cure in linoleum	1045;18, 21,24
Bleed Properties	
In V.D.	1045-18
In linoleum; Soapfastness	1045-18,21
Overstripe, Enamel: Air dried and baked	1061-5
" " : As Shading Color for CPC, air dried and baked	1061-21
Paint Properties	
Flocculation: TiO_2 tints in lacquer	1046-29
Flocculation: TiO_2 tints in Dulux	1061-5

D-5474 - J-45-P-8 (Cont.)

Evaluation	Expt.No.
Paint Properties (Cont.)	
Durability, etc.: Self-Color and TiO_2 tints Resyl 807-1	1061-3 Series 6789
As Shading Color for CPC in lacquer and alkyd	1061-21

ORANGE DX (Light Red)
D-5475 - J-45-P-9

Evaluation	Expt.No.
Tinctorial	
In V.D. vs. Newark line of Oranges and Reds	1045-18
In lacquer vs. " " " " " "	1061-6
Lightfastness	
In V.D.: MT and Tints	1045-18 1045-20
In Lineleum	1045-18,21, 24
Stability	
To heat in V.D. on tin: MT	1045-18
To baking in Dulux	1061-5
To cure in linoleum	1045-18,21, 24
Bleed Properties	
In V.D.	1045-18
In linoleum; soapfastness	1045-18,21
Overstripe, enamel: air dried and baked	1061-5
Paint Properties	
Flocculation: TiO_2 tints in lacquer	1046-29
" ; " " " Dulux	1061-5
Durability,etc.: M.T. and TiO_2 tints in Resyl 807-1	1061-3 Series 6789

SCARLET DX (Medium Red)
D-5476 - J-45-P-10

Evaluation	Expt.No.
Tinctorial	
In V.D. vs. Newark line of Reds	1045-18
In lacquer vs. " " " "	1061-6
Lightfastness	
In V.D.: MT and Tints	1045-18 1045-20
In Lineleum	1045-18, 21,24

D-5472 - J-45-P-10 (Cont)

Stability	
To heat in V.D. on tin. M.T.	1045-18
To baking in Dulux	1061-5
To cure in linoleum	1045-18,21, 24
Bleed Properties	
In V.D.	1045-18
In linoleum; soapfastness	1045-18,21
Overstripe Enamel: Air dried and baked	1061-5
Paint Properties	
Flocculation: TiO_2 tints in lacquer	1046-29
" " " " Dulux	1061-5
Durability, etc. M.T. and TiO_2 tints	1061-3
Resyl 807-1	Series 6789