Copies to: P. D. Graham (6)

E. I. du Pont de Nemours and Company
Haskell Laboratory for Toxicology and Industrial Medicine

HASKELL LABORATORY REPORT NO. 396-69 MR NO. 1243

Materials Tested	Code	Lot	Other Identification	Haskell N
rolor® Red	KR-980-D	PS-91413	Standard Sample	6251
rolor® Yellow Medium	KY-795-D	SL-92400	Standard Sample	6253
rolor® Yellow Medium	KY-787-D	TS-91005	Standard Sample	6254
rolor® Orange R	KO-786-D	TS-91322	Standard Sample	6256
rolor® Yellow Light	KY-788-D	SL-90964	Standard Sample	6258
rolor® Orange Y	KO-789-D	SL-90787	Standard Sample	6259
rolor® Yellow Medium	KY-787-D	92546-3	Production Lot	6261
rolor® Yellow Light	KY-788-D	61663	Production Lot	6262
rolor® Orange R	KO-786-D	63280	Production Lot	6263
rolor® Orange Y	KO-789-D	61620	Production Lot	6264
ırome Yellow Light	Y-434-D	PS-90387	Coventional Lead Chromates (Controls)	6255
ırome Yellow Medium	Y-469-D	PS-91872		6260
)lybdate Orange	YE-698-D	PS-86852	Molybdated Lead Chromates (Controls)	6252
)lybdate Orange	YE-637-D	PS-82739		6257

aterials Submitted by: P. D. Graham, Pigments Department

ACUTE ORAL TEST

rocedure: Each pigment, as a 30% suspension in corn oil, was administered by intragastric intubation to young adult aR-CD male rats and young adult male guinea pigs in single doses. Survivors were sacrificed 14 days after dosing.

Results:

Haskell No.	Rats		Guinea Pigs		Lethal Dose for Rats and Guinea Pigs
	Dose (mg/kg)	Mortality	Dose (mg/kg)	Mortality	
6251	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	
6253	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	
6254	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	
6256	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1			
6258	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1			
6259	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	
6261	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	
6262	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1			
	5,000	0/1	5,000	0/1	
6263	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	

Results (Cont'd.):

Haskell No.	Rats		Guinea Pigs		Lethal Dose for Rats and Guinea Pigs
	Dose (mg/kg)	Mortality	Dose (mg/kg)	Mortality	
6264	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	
6255	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1			
6260	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1			
	5,000	0/1	5,000	0/1	
6252	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1			
	5,000	0/1	5,000	0/1	
6257	11,000	0/1	11,000	0/1	> 11,000 mg/kg
	7,500	0/1	7,500	0/1	
	5,000	0/1	5,000	0/1	

Summary: The six standard samples of Krolor® pigments submitted (Krolor® Orange R, Krolor® Orange Y, Krolor® Red, Krolor® Yellow Light, and two Krolor® Yellow Medium) have low acute oral toxicity for male rats and guinea pigs, the Lethal Dose for all samples being greater than 11,000 mg/kg of body weight. Thus, these silica-coated pigments resemble the conventional lead chromates and molybdated lead chromates in toxicity. Production lot samples of four Krolor® pigments also had low oral toxicity; their Lethal Dose for rats and guinea pigs was greater than 11,000 mg/kg of body weight.

Report by: Henry Sherman

Approved by: John A. Jaffe Jr.

/jch

Date: December 17, 1969

K-13004

REPORT NO. 396-69 (OR-A2) CC: MR-1243-001 ~~gfc~~
J.H.BAIRD-J.E.KRAMER
S.J.GORMAN-L.F.ANDREWS-
R. H. ZABEL

W.S.STRUVE-O.J.C.KLEIN, Newark

DU PONT
REG. U.S. PAT. OFF.
ESTABLISHED 1802

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED

PIGMENTS DEPARTMENT

6251-6264

July 1, 1969

Info copies sent 7/2/69 to:
TLL
HS

DR. JOHN A ZAPP, JR.
Haskell Laboratory

TOXICITY EVALUATION OF KROLOR® PIGMENTS

As the first step in determining the toxicological suitability of Krolor® pigments, which are silica coated lead chromate (yellows) and molybdated lead chromate (oranges) products, samples as shown attached have been sent to you for evaluation of approximate lethal oral dose in rats and guinea pigs. The Pigments Department charge for this work is 8294-DZ1750.

We have included conventional lead chromates (Y-434-D and Y-469-D) and molybdated lead chromates (YE-698-D and YE-637-D) as controls for evaluation of the Krolor® pigments. All products are standard samples except a typical production lot of four Krolor® pigments is included.

As you suggested, we have asked our Research Analytical Section to determine the Pb solubility of each of the 14 samples in:

1) 0.02 N HCl
2) 0.1 N HCl
3) 0.1 N Lactic Acid
4) 0.1 N Citric Acid
5) 0.1 N Acetic Acid

The Analytical Laboratory will also advise whether and to what extent the Pb in Krolor® is measurable under the specified method of analyses for United States of America Standard Z66.1-1964. The most recent method of analyses is ASTM D2088-68 replacing 2088-62T.

After we have approximate lethal oral dose, solubility data and heavy metal analyses of Krolor® based on Z66.1-1964, we should then be in a position to determine the possibility of selling Krolor® under the city and state laws and regulations, most of which are based on or specify Z66.1-1964 (copy attached).

P. D. Graham

Oral - acute, no pathology
Rat + guinea pigs

P. D. GRAHAM

RECEIVED
JUL 2 1969
HASKELL LABORATORY

PDG:sj
attachments

Samples received 7-21-69.

ES-3253 REV. C-62

DON'T SAY IT—WRITE IT

DATE 7/21/69

TO Pat

AT

FROM Dick Dion

MR - 1243 - 001

		CODE	LOT
6251	Dyes - Krolar Red	KR-980-D	PS-91413
6252	Dyes - Molybdate Orange	YE-698-D	PS-86852
6253	Dyes - Krolar Yellow Medium	KY-795-D	SL-92400
6254	Dyes - Krolar Yellow Medium	KY-787-D	TS-91005
6255	Dyes - Chrome Yellow Light	Y-434-D	PS-90387
6256	Dyes - Krolar Orange R	KO-786-D	TS-91322
6257	Dyes - Molybdate Orange	YE-637-D	PS-82739
6258	Dyes - Krolar Yellow Light	KY-788-D	SL-90964
6259	Dyes - Krolar Orange Y	KO-789-D	SL-90787
6260	Dyes - Chrome Yellow Medium	Y-469-D	PS-91872
6261	Dyes - Krolar Yellow Medium	KY-787-D	92546-3
6262	Dyes - Krolar Yellow Light	KY-788-D	61663
6263	Dyes - Krolar Orange R	KO-786-D	63280
6264	Dyes - Krolar Orange Y	KO-789-D	61620

DUP040000917

SAFE LIVING IS A LIFETIME PROPOSITION

N 25687.02

K-13006 REV. 10-63

DUPONT
ESTABLISHED 1802

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
WILMINGTON, DELAWARE 19898

PIGMENTS DEPARTMENT
CABLE ADDRESS "DUPIGMENT" WILMDEL

cc: L. J. Young

bc: J. E. Kramer/P. J. Grunwald
J. M. Lipton
H. W. Ling
J. McQuilken
A. J. Hart - Cincinnati

October 4, 1973

Mr. Robert S. Foster
COLUMBUS COATED FABRICS, INC.
Div. of Borden Chemical Co.
1280 Grant Ave.
Columbus, Ohio 43201

Dear Bob:

Confirming our 'phone conversation of yesterday, I am listing the Oral LD_{50} data we have on the pigment colors you mentioned:

		Oral LD_{50}
2) Monastral® Red B	RT-790-D	> 17,000 mg/kg
3) Monastral® Violet R	RT-791-D	> 17,000 mg/kg
Monastral® Violet R	RW-767-P	> 17,000 mg/kg (Est.)
Watchung Red B	RW-635-P	Not available
4) Green Gold	YT-562-D	> 7,500 mg/kg
Green Gold	YW-613-P	> 7,500 g/kg (Est.)
Gold Afflair®	NF-103-D	> 17,000 mg/kg (Est.)
Pearl Afflair®	NF-104-D	> 17,000 mg/kg (Est.)
5) Krolor® Orange R	KO-786-D	> 11,000 mg/kg
6) Krolor® Orange Y	KO-789-D	> 11,000 mg/kg
7) Krolor® Yellow Medium	KY-787-D	> 11,000 mg/kg
8) Krolor® Yellow Light	KY-788-D	> 11,000 mg/kg
Molybdate Orange	YE-421-D	> 11,000 mg/kg (Est.)

In those instances where Oral LD_{50} tests of similar grades of the same pigment color were available, I have indicated estimated data and have labeled them (Est.)

As you can see from the above data, all of the above pigments on which we have LD_{50} data have low acute oral toxicity for male rats and/or guinea pigs.

I hope these data will be helpful to you. Please contact Len Young if we can be of further service.

Cordially yours,

L. F. Andrews
Manager-Environmental Affairs

LFA:jcs

K-13006 REV. 10-63

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
WILMINGTON, DELAWARE 19898

PIGMENTS DEPARTMENT
CABLE ADDRESS "DUPIGMENT" WILMDEL

cc: L. J. Young MR-1243-001 File
bc: J. E. Kramer/P. J. Grunwald
C. F. Reinhart-Haskell Lab.
T. J. McCarthy-Legal Dept.
J. M. Lipton
H. W. Ling
J. McQuilken
A. F. Lewis
S. J. Gorman - Princeton
A. J. Hart - Cincinnati

October 22, 1973

Mr. Robert S. Foster
COLUMBUS COATED FABRICS, INC
Div. of Borden Chemical Co.
1280 Grant Ave.
Columbus, Ohio 43201

For the pigments actually tested, went back to notebooks to see if rats showed signs of nerve dysfunction after dosing. None observed. Informed Andrews 11/1/73 N.J.Hunt
nothing to add to his letter.

Dear Bob:

Len Young has asked me to expand my letter of October 4, 1973 by adding Oral LD_{50} data for Molybdate Orange YE-698-D, Ramapo Blue B BP-173-D and Monastral® Green B GW-749-P. He also indicated you wanted data on heavy metals content of these as well as the pigment colors listed in my October 4 letter.

We have Oral LD_{50} data on YE-698-D and on grades similar to BP-173-D and GW-749-D. The following data on the last two codes are therefore labeled as estimated (Est.).

		Oral LD_{50}
1) Molybdate Orange	YE-698-D	>11,000 mg/kg
Ramapo Blue B	BP-173-D	>17,000 mg/kg (Est.)
Monastral® Green G	GW-749-P	>17,000 mg/kg (Est.)

The following contain the heavy metals listed as essential constituents of the pigments that are a necessary part of their composition:

	Pb	Cr	Mo	Sb	Ba	Sr	Ni	Cu
YE-698-D	56.9%	12.1%	2.5%	1.1%	3.0%	-	-	-
YE-421-D	57.7	12.3	2.8	-	-	-	-	-
KO-786-D	45.2	9.6	2.1	0.9	2.8	-	-	-
KO-789-D	46.0	10.0	2.1	-	-	-	-	-
KY-787-D	39.5	10.0	-	-	-	-	-	-
KY-788-D	47.2	7.9	-	-	-	-	-	-
RT-790-D	-	-	-	-	-	-	-	-
RT-791-D	-	-	-	-	-	-	-	-
RW-676-P	-	-	-	-	-	-	-	-
RW-635-P	-	-	-	-	1.9	0.6%	-	-
YT-562-D	-	-	-	-	6.4	-	7.4%	-
YW-613-P	-	-	-	-	1.9	-	2.4	-
BP-173-D	-	-	-	-	-	-	-	8.2%
GW-749-P	-	-	-	-	-	-	-	1.2
NF-103-D	-	-	-	-	-	-	-	-
NF-104-D	-	-	-	-	-	-	-	-

We have recently obtained analytical data on heavy metals content of our product standards for organic colors and Afflair® Flake Pigments. The following data were obtained by atomic absorption and/or instrumental neutron activation. All results are in parts per million except as noted.

Code	Pb	As	Sb	Cd	Hg	Se	Water Soluble Ba
RT-790-D	16	< 1.0	0.5	< 33	0.32	< 0.1	< .25
RT-791-D	37	< 0.2	1.0	< 7	< 0.05	< 0.2	<2.5
RW-767-P	13	< 0.8	0.1	< 25	0.02	0.1	N.A.
RW-635-P	30	< 0.7	<0.1	< 22	< 0.4	< 1.0	N.A.
YT-562-D	27	< 0.6	1.1	< 18	< 1.80	< 7.4	20
YW-613-P	15	< 0.7	0.2	< 20	< 0.56	< 1.6	N.A.
BP-173-D	16	<13.0	7.6	< 8	0.21	0.6	0.5
GW-749-P	40	< 9.6	0.3%	<0.5	<13.0	<15.0	N.A.
NF-103-D	38	<18.0	0.8%	<250	< 3.2	< 6.9	N.A.
NF-104-D	10	< 4.1	3.7	<130	< 2.2	< 5.3	0.8

N.A. = Not Available

The above results indicated as "less than" (<) are undetected upper limits calculated from neutron activation analysis and define the amount of an element that would have been required for detection in the sample.

Please note that the analyses of the above pigment colors are for one lot of each only. While we would expect other lots to be similar, we do not wish to imply that each lot will be analyzed nor do we certify that the heavy metals content will be identical to the lots tested.

I hope this gives you the information you need. Please contact Len Young if we can be of further service.

Cordially yours,

L. F. Andrews
Manager-Environmental Affairs

LFA:jcs

P.S. (Blind copies only) Dr. Reinhardt-confirming our 'phone conversation of 10/22/73, please review your files of above pigment colors to determine if any data exists that would assist customer identify and solve his problem.

6251-6252-6256-6257-6259

Haskell Number _____

HASKELL LABORATORY FOR TOXICOLOGY AND INDUSTRIAL MEDICINE

SAMPLE SUBMITTED FOR TOXICITY EVALUATION

Department PIGMENTS Division SALES Location WILMINGTON

Systematic Name of Chemical:

Synonym, Product Name and/or Designations:

Krolor® Orange R	KO-786-D	TS91322 - 6256
Krolor® Orange Y	KO-789-D	SL90787 - 6259
Krolor® Red	KR-980-D	PS91413 - 6251
Molybdate Orange	YE-698-D	PS86852 - 6252
Molybdate Orange	YE-637-D	PS82739 - 6257

Formula: Molybdated lead chromate pigments. Krolor® Oranges are silica coated molybdated lead chromates. Krolor® Red is a mixture of 90 parts KO-786-D and 10 parts Quinacridone Violet.

Sample: Code No. See Above Lot No. See Above Amount 1 Quart Each

Grade - Color Orange Form Dry Mol. Wt. -

Special Handling Requirements Dusty - Contain Lead

Is it explosive in air? No in oxygen? Not Measured / If so, at what concentrations? -

Active Ingredient Pb + - 50 %

Composition, if a mixture (are percentages by weight or volume?)

SiO_2 Coated molybdate lead chromates - Krolor®

Impurities (Identity and amounts; are percentages by weight or volume?)

Not Available

Properties: MP - BP - VP @ 25°C - @ Max. Process Temp. - (Attach VP curve if available)

Sp.Gr. - pH - Vapor Density (air = 1) -

Flash Point (Open cup) - (Closed cup) -

Solubility (Quantitative, if possible) in water No Acetone No

Ethanol No Vegetable oil No Other Solvents No

Proposed Use: Trade Sales Interior Paint

Present Stage of Development: Research ___ Semiworks ___ Mfg. ___ Sales x

(OVER)

DUP040000921

N 25687.05

6253-6254-6255-6258-6260

Haskell Number_____

HASKELL LABORATORY FOR TOXICOLOGY AND INDUSTRIAL MEDICINE

SAMPLE SUBMITTED FOR TOXICITY EVALUATION

Department PIGMENTS Division SALES Location WILMINGTON

Systematic Name of Chemical:

Synonym, Product Name and/or Designations:

Krolor® Yellow Light	KY-788-D	SL90964-6258
Krolor® Yellow Med.	KY-787-D	TS91005-6254
Krolor® Yellow Med.	KY-795-D	SL92400-6253
Chrome Yellow Med.	Y-469-D	PS91872-6260
Chrome Yellow Light	Y-434-D	PS90387-6255

Formula: Lead Chromate pigments. The 3 products labeled Krolor® are SiO_2 lead chromate pigments.

Sample: Code No. See Above Lot No. See Above Amount 1 Quart Each

Grade - Color Yellow Form Dry Mol. Wt. -

Special Handling Requirements Dusty - Contain Lead

Is it explosive in air? No in oxygen? Not Measured If so, at what concentrations? -

Active Ingredient Pb ± 44 %

Composition, if a mixture (are percentages by weight or volume?)

SiO_2 Coated Lead Chromates -- Krolor®

Impurities (Identity and amounts; are percentages by weight or volume?)

Not Available

Properties: MP - BP - VP @ 25°C - @ Max. Process Temp. - (Attach VP curve if available)

Sp.Gr. - pH - Vapor Density (air = 1) -

Flash Point (Open cup) - (Closed cup) -

Solubility (Quantitative, if possible) in water No Acetone No

Ethanol No Vegetable oil No Other Solvents_____

Proposed Use: Trade Sales Interior Paint

Present Stage of Development: Research____ Semiworks____ Mfg.____ Sales X

(OVER)

DUP040000922