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Project #177 - Pigment Studies

We have recently completed a study of various pigments with regard to their ability to absorb and reflect ultraviolet radiation. The study includes white and colored pigments as well as extender pigments. Each pigment was dispersed in an alkyd varnish at a concentration of 10 pounds per 100 gallons. A low concentration was chosen to allow some transmission by such pigments as rutile titanium dioxide. All data are reported for dry films having a corrected thickness of 2 mils. Also reported is the wave length at which transmission by the film becomes 0%. The results of this study are shown in Table I.

The data are reported as percent transmission, the remainder of the light being absorbed or reflected by the film. It should be pointed out that the alkyd resin will absorb some of the radiation and therefore it cannot be assumed that all absorption is by the pigment only. However, the alkyd resin is constant throughout all samples and the transmission of one pigmented film relative to another should be quite meaningful.

It is interesting to note that calcium carbonate transmits more ultraviolet radiation than magnesium silicate. We repeatedly observe that calcium carbonate extended paints exhibit better tint retention than magnesium silicate. This suggested that perhaps it absorbed and/or reflected more UV energy than magnesium silicate, thereby protecting the binder. However, the results are contrary to this thought. It therefore appears that the oil demand of each pigment is of more importance. Calcium carbonate having less oil demand leaves more free vehicle to function as pigment binder. It can also be assumed that because there is more total free vehicle the percentage of degraded binder would be less in a calcium carbonate extended paint at any point in the exposure history, leaving more vehicle to bind the pigment particles together into a continuous film.

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Project #177 - Cont.

Table I

Transmission of Ultraviolet by Pigments

Pigment	S-W Code	% Transmission 280 - 400 mμ	Wavelength of Zero Transmission
Rutile titanium dioxide	66 53 00	3.62%	300 mμ
Anatase titanium dioxide	66 00 22	2.88%	353
Magnesium silicate	62 32 00	24.3%	300
Calcium carbonate	63 01 00	29.2%	304
Aluminum silicate	62 02 27	22.6%	303
Barium sulfate	63 70 00	25.0%	305
Nepheline syenite	Minex-4	26.0%	313
Potassium titanate	PKT	6.0%	335
Zinc oxide	67 21 00	21.2%	310
Leaded zinc oxide	68 22 00	10.8%	320
Basic lead silicate	68 01 00	24.1%	310
Basic lead sulfate	68 10 00	19.0%	310
Basic lead carbonate	68 05 00	18.2%	310
Black iron oxide	71 50 00	9.25%	315
Carbon black (10#)	70 50 00	0%	400
Carbon black (1#)	70 50 00	17.8%	310
Phthalocyanine Green	Monastral Green B	0%	400
-	Dolamar Yellow	0%	487
Quinacridone Red	Monastral Red B	.39%	357

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[redacted] (A6) Class 68 05 00

Lead Containing And Lead Free Pigments In A-100 Undercoater

Series 41173 - 41192 was examined and retired after 24 months exposure at Miami, Florida. It includes A6 W 32 and A6 W 28 type undercoaters with and without lead carbonate. Zirconium sulfate was added to the lead free formulation as a stain control agent. Regular A-100 is the topcoat.

The results of this series indicate no large difference in performance of lead containing primers compared with lead free primers except in mildew resistance. The lead containing primers were rated one to two points better than the lead free formulation.

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