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HALOGENOBENZOQUINOPHTHALONE AS A NEW PIGMENT TO REPLACE CADMIUM YELLOW

Masaru MATSUOKA, Teijiro KITAO, and Kenzo KONISHI

Department of Applied Chemistry, College of Engineering,
University of Osaka Prefecture, Sakai, Osaka 591

A new organic pigment, 5,8-dibromo-3'-hydroxybenzo[b]quinophthalone, has been developed to replace cadmium yellow. This compound is very similar to cadmium yellow in colour and has excellent pigment properties, such as good fastness to light, heat, migration, acid, alkali and organic solvents.

There has recently been a serious demand for yellow organic pigments because their inorganic counterparts such as cadmium yellow (CdS) and chromium yellow are being prohibited from use because of their toxic properties.

In our previous papers[1,2] on benzoquinophthalones, we showed that 3'-hydroxybenzo[b]quinophthalone derivatives are good disperse dyes and pigments with fast brilliant yellow shade. In the present paper, we wish to report some properties of 5,8-dibromo-3'-hydroxybenzo[b]quinophthalone [I] as a new pigment to replace CdS. The results summerized in Table 1 and Figure 1 show that :

1) The light fastness is good on the P.S., A.B.S. and P.V.C. substrates with or without TiO_2. Good values are also obtained on the P.P. and P.E. but they are somewhat inferior when TiO_2 is added.

2) The fastness to heat and migration is very good except for migration on the P.E. and P.V.C. Neither degradation nor colour change was observed when [I] was heated in alkydresin for 2 hrs. at 250°C. Only 1.3% weight loss by sublimation was found after heat-treatment for 100 min. at 230°C.

3) The resistance to aqueous alkali and acid is remarkably good especially in comparison with CdS which is gradually hydrolyzed under acidic conditions.

4) The colour values of [I] are 8-11 times as much as those of CdS, and the similarity in colour of [I] to CdS is shown in Fig. 1.

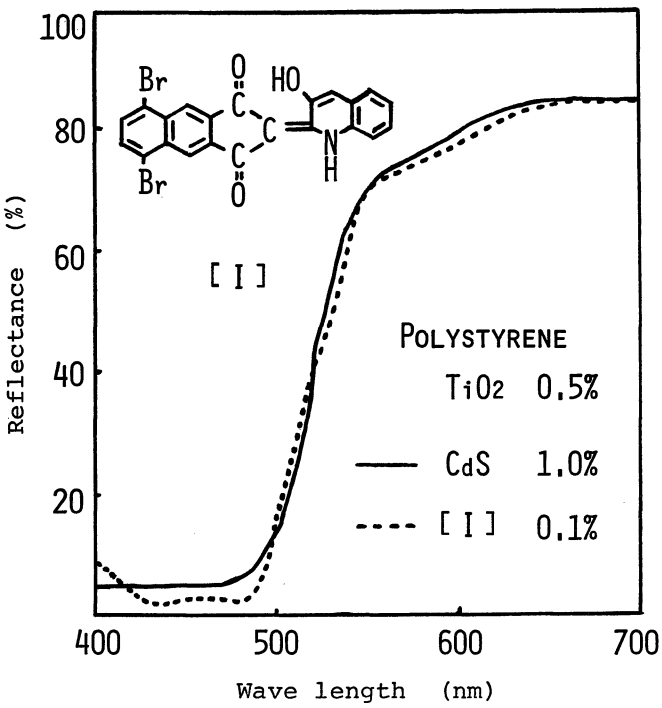

Fig. 1 Reflection spectra of CdS and [I] on polystyrene

Further, [I] is insoluble in almost all organic solvents at room temperature but slightly soluble in hot DMF[1]. The spectral data and synthetic method have been presented in our earlier articles[1,2].

From these results and earlier observation, we can conclude that [I] is an excellent organic pigment and, as it is readily available, may be used in stead of CdS in the future.

The pigment properties of 5,6,7,8-tetrabromo-3'-hydroxybenzo[b]quinophthalone are currently under investigation.

Table 1. Some properties of 5,8-dibromo-3'-hydroxybenzo[b]quinophthalone as a pigment

Substrate [a]	TiO_2 (%)	Fastness and/or Resistance [b] Light [c] (hrs) 100	200	400	Heat [d]	Migration [h]	Alkali [i]	Acid [j]	Hot water [k]	Colour value [m]
Polystyrene	0	5	5	5	5 [e]	5	5	5	5	
(P.S.)	0.5	5$^-$	4-5	4	5 [e]	5	5	5	5	10(6G)
A. B. S.	0	5	5$^-$	4-5$^-$	5 [f]	5	5	5	4-5(G)	
	0.5	4-5	4$^+$	4$^-$	5 [f]	5	4-5(R)	4-5(R)	5	10(6G)
Polyethylene	0	5	4-5	4	5 [f]	2	5	5	5	
(P.E.)	0.5	4-5	4	3	5 [f]	2	5	5	5	10-11(2G)
Polypropylene	0	5	5$^-$	4-5	5 [f]	5	5	5	5	
(P.P.)	0.5	4$^+$	3-4	2-3	4-5 [f]	4	5	5	5	8-10(2R)
Polyvinyl-	0	4-5	4$^+$	4	4-5 [g]	2	5	4-5(R)	4(2R)	
chloride (P.V.C.)	0.5	4-5	4$^+$	3-4	5 [g]	2	4-5(G)	5	5	10(4G)

a) The coloured sheets were made by mixing [I] (Mp.>360°C, λmax 465 nm) (0.05%) with resin pellets for 2 min. at 220°C, but in the case of P.V.C., the mixed substrate was rolled for 3 min. at 160°C. b) The figures were determined by the grey-scale of JIS L0804 or L0805, and those in brackets are the degree of change in colour as compared with CdS standard. (G);greenish, (R);reddish. c) The resistance to light was estimated by irradiation of a carbon-arc lamp for 100, 200 and 400 hr. d) The resistance to heat of sheets was estimated by holding them in a heated cylinder for 10 min. at 240°C (e), for 10 min. at 250°C (f), or for 3 min. at 180°C (g). h) The resistance to migration of sheets was estimated by treating for 5 hr. at 80°C under a pressure of 200 gr/cm^2. i,j) The resistance to alkali and acid was estimated by treating for 24 hr. at 25°C in 10% aq. NaOH or 10% aq. HCl (liquor ratio 1:100). k) The resistance to hot water of sheets was estimated by treating for 30 min. at 80°C (liquor ratio 1:50). m) Colour values are shown by Q-Values of Kubelka-Munk equation in comparison with the 0.5% on weight of CdS #2300 sheet.

Reference

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