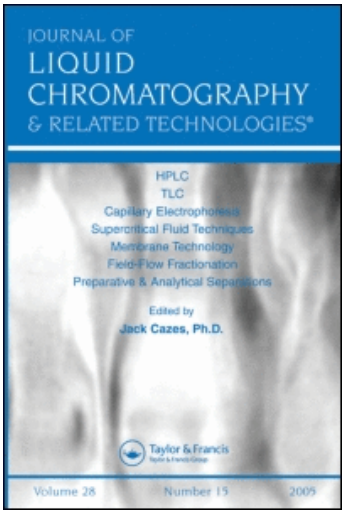

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THIN LAYER CHROMATOGRAPHY OF SYNTHETIC DYES ON ANTIMONIC ACID AND ON ADMIXTURE OF ANTIMONIC ACID AND SILICA GEL 'G' IN A MIXED SOLVENT SYSTEM

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ABSTRACT

Thin layer chromatography of synthetic dyes have been performed on antimonic acid and on admixture of antimonic acid and silica gel 'G' in a mixed solvent system i.e. Butanol: Acetic acid: water (25:5:10). The separation potential of antimonic acid and silica gel 'G' has been explored. Several important separations of closely related dyes have been achieved as a result of such studies.

INTRODUCTION

Synthetic dyes are most widely used in toys, food stuffs, cosmetics and drugs, the slight excess of which cause

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acute health hazard, so their separation and determination have great importance in the field of analytical sciences.

Chromatographic behaviour of metal ions has been extensively studied on several synthetic inorganic ion exchange materials by different chromatographic techniques and a large number of qualitative and quantitative separations have been achieved[1-7].

On the other hand the situation is different where the separation of dyes is concerned, a survay of literature[1-3], which cover the papers upto 1989, reveals that very little work has been done on the separation of synthetic dyes. The available literature indicates that most of work has been carried out on plain as well as on impregnated silica layers[8,9] by using organic compounds and silver nitrate as impregnants . However, Srivastava, et . al. used the inorganic salts such as cadmium acetate[10], Ammonium molybdate and copper sulphate[11] impregnents for the separation of dyes.

Antimonic acid has been used for the separation of cations[12-13] as well as anions[14]. In the present study, we have selected antimonic acid for thin layer chromatographic studies of dyes using a mixed solvent system: BuOH-AcOH-H_2O(25:5:10), on the basis of earlier experiences[10,11] and achieved a large number analytically important separations.

EXPERIMENTAL

Materials and Methods

All the chemicals and solvents used in the work were of A.R. Grade. Thin layers of antimonic acid and antimonic acid and silica gel 'G' were prepared on glass plates of 15 cm x

2.9 cm size and subsequently developed in the solvent system in 20 cm x 5 cm glass jars.

Preparation of Antimonic Acid and Thin layer plates

Antimonic acid was prepared as per literature method[12]. For preparing thin layers, antimonic acid and admixtures of antimonic acid and silica gel 'G' was slurried separately with a little deionised water in a glass mortar and then spread over the glass plates with the help of an applicator. Almost uniform thin layers (0.3 mm thickness) were obtained which were ready for use after drying in air. The plates gave reproducible Rf values.

Test soluions and Detection

Dilute solutions of dyes were prepared in distilled water or water ethanol mixture spots were self visualised.

Procedure

One or two spots of the test solutions were spotted with the fine glass capillaries and the plates were dipped in solvent system after dring in air for 15 minutes. The solvent ascent was always 10 cms.

RESULTS AND DISCUSSION

A close examination of the data (Table 1) reveals that some dyes show tailing on plain silica gel 'G' thin layers for e.g. Haematoxin, Bismark brown, Basic Fuschin, methyl voilet and alizarin Red S, while very sharp and clean spots has been observed on pure antimonic acid thin layers perhaps due to the strong adsorption in matrix of the exchanger. Safranine and Sudan Black also give a single spot on antimonic acid thin

TABLE -1 : CHROMATOGRAPHY OF SYNTHETIC DYES ON ANTIMONIC ACID AND ON ADMIXTURE'S OF ANTIMONIC ACID AND SILICA GEL "G"

Solvent system-Butanol: Acetic Acid: Water (25:5:10)

DEY Dyes	Coatings			
	A	B	C	D
1. Crystal voilet	95.5	55.0	25.0	85.0
2. Gentiant voilet	91.5	55.0	41.0	78.0
3. Haematoxin	05.0	14.0	16.0	50.0 LT
4. Bismark brown	94.0	25.0	55.0	42.0 LT
5. Lacmoid	94.5	94.0	96.5	94.5
6. Resorcinol blue	41.0	12.5	70.0	09.0
7. Basic Fuschin	95.0	67.0	58.0	75.0
8. Amidoswartz	95.0	68.0	96.0	42.0
9. Curcumin S	95.0	05.0	97.5	35.5
10. Eriochrome Black T	94.5	97.5	99.0	41.0
11. Bromophenol Blue	94.0	92.0	97.5	81.0
12. Brilliant green	95.0	76.0	43.0	60.0
13. Safranine	94.5	70.0, 82.0	67.0, 85.0	70.0;83.0
14. Bromothymol Blue	96.0	98.0	97.5	87.0
15. Pan S	93.0	60.5	54.5	96.6
16. Methyl Red	90.5	41.0	45.5	90.0
17. Naphthol green B	92.0	672.5	91.0	06.0
18. Eosin	94.0	96.0	97.5	85.5
19. Orange G	95.0	62.5	85.0	32.5
20. Indigo Carmine	76.0	32.5	24.0	19.0 LT
21. Rhodamine B	95.0	67.5	60.0	77.0
22. Methyl voilet	94.0	55.0	50.0	61.0
23. Alizarin Red 'S'	09.0	0.48LT	94.0	20.0T
24. Sudan Black	92.5	70.0,90.0	82.5, 90	97.0

LT-Long Tailing,T-tailing, A-Antimonic acid, B-Admixture of Antimonic acid and silica gel 'G' (1:3), ,C-Admixture of Antimonic acid and silica gel 'G' (1:1), D-Pure silica 'G', hRf values are in 10 cm. development.

Table-2 : Separation of Dye's achieved on various coatings

Coatings	Separations (R_T-R_L)
A.	Haematoxin (0.00-0.10)/Alizarin Red S (0.00-0.17) — Resorcinol Blue (0.31-0.51) — Indigocarmine (0.68-0.80) — Remaining other dyes.
B.	Curcumin S (0.00-0.10) /Haematoxin (0.00-0.28)/indigo carmine (0.24-0.40) — Methyl violet (0.45-0.65)/Gentian violet (0.50-0.60)/crystal violet (0.50-0.60)—Brilliant green (0.70-0.82)—Lacmoid (0.88-1.00)/ Eriochrome Black T (0.95-1.00)/Bromophenol Blue (0.87-0.97)/Bromothymol Blue (0.96-1.00)/Eosin (0.92-1.00).
C.	Indigocarmine (0.13-0.35)/Crystal voilet (0.15-0.35)— Brilliant green (0.38-0.48)/Methyl Red (0.38-0.53)— Resoranol Blue (0.60-0.80)—Other dyes (Lacmoid, Curcumin S, Eriochrome Black T, Safranine, Bromothynol Blue, Napthol green B, Eosin, Orange G and alizarin Red S).
D.	Napthol Green B (0.00-0.12)/Resorcinol Blue (0.00-0.18) — Orange G (0.27-0.38)/Amidoswartz (0.36-0.48)/curcumin S (0.30-0.40)/Eriochrome Black T (0.42-0.52)—Brilliant green (0.54-0.67)/methylroilet (054-0.68)—Basic Fuschin (0.70-0.80)/Rhodamine B (0.68-0.87)/Gentiant voilet (0.73-0.83)/Bromophenol Blue (0.75-0.87)—Lacmoid (0.89-1.00)/Pan S (0.92-1.00)/Sudan Black (0.94-1.00).

layers. With addition of silica gel in antimonic acid both these dyes either break in two or more spots or give long tailing it may be due to to the high exchange capacity of the material towards dyes constituents or due to adsoprtion behaviour on admixtures. Most of the dyes show high Rf values on antimonic acid thin layers (Coating A) while admixture coatings (B and C) are more usefull for important separations (Table 2). The very interesting feature of the study is, most of the blue colour dyes are separated on coating B which is the admixture of antimonic acid and silica gel 'G' (1:3). It is also important to note that Rf value is not altered when mixture of these dyes are run. The separation of various dyes depends on following factors.

1. Adsorption as well as ion exchange behaviour of the dye on coatings.

2. Differential solubilities of the dyes.

All the dyes can be easily extracted from the plate with the help of absolute alcohal and 0.1 $MHNO_3$ (9:1) and can be quantitized after pH adjustment. The method is useful for separating the dyes from food stuffs, cosmetics and drugs.

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