

Polyamide-silica gel thin-layer chromatography of red food dyes

The separation of synthetic food dyes by thin layers of cellulose¹, silica gel², aluminum oxide³, polyamide⁴, and paper chromatography have been reported, but none of these techniques gave entirely satisfactory results. The application of a mixed polyamide-silica gel thin layer in the chromatographic separation has not been reported. In this note, the separation of eleven red food dyes and two harmful red dyes (Rhodamine B and Coralline) by this mixed layer is described.

Experimental

Preparation of polyamide-silica gel mixed layer

Seven grams of polyamide (ϵ -polycaprolactam CM 1007S of Toyo Rayon Co., Tokyo, Japan) were dissolved in 100 ml of 75 % formic acid. After gentle warming, a homogeneous solution was obtained; then 52 g of Silica Gel G (E. Merck) was added. Of

TABLE I

CHROMATOGRAPHIC DATA

Solvent I: isopropyl alcohol-5 % NH_4Cl solution (4:1.5). Solvent II: ether-isopropyl alcohol-5 % NH_4Cl solution (0.5:1:1). Solvent III: CHCl_3 -isopropyl alcohol-5 % NH_4Cl solution-glacial acetic acid (0.5:2.5:1.0:0.5). Solvent IV: *n*-butanol-ethanol-5 % sodium citrate solution (3:2:1.5). Solvent V: CHCl_3 -isopropyl alcohol-5 % NaCl solution-glacial acetic acid (0.5:2.5:0.5:0.1).

No.	Substance	R_F value ^a				
		I	II	III	IV	V
1	Ponceau 3R	0.86 ^b	0.85 ^b	0.71 ^b	0.50 ^b	0.00
2	Amaranth	0.69	0.70	0.52	0.16	0.02
3	Erythrosine	0.44	0.43	0.56	0.22	0.40
4	Ponceau SX	0.74	0.73	0.67	0.36	0.32
5	Oil Red XO	0.67	0.81	0.97	0.94	0.88
6	Ponceau 2R	0.76	0.88	0.74	0.44	0.37 ^b
7	New Coccine	0.61	0.78	0.48	0.24	0.12
8	Eosine	0.55	0.58	0.65	0.31	0.44
9	Phloxine	0.57	0.66	0.69	0.34	0.35
10	Rose Bengale	0.37	0.45	0.53	0.26	0.25
11	Acid Red	0.64	0.64	0.78	0.48	0.42
12	Rhodamine B	0.62	0.68	0.94	0.71	0.70
13	Coralline	0.80	0.91	0.81	0.69	0.56

^a The R_F values are the mean of five chromatograms.

^b Tailing.

the above-mentioned solution 200 ml were poured into a dish (14.5 × 19.5 × 2.5 cm) and a glass plate (12 × 14 × 0.1 cm) was dipped into it. Both sides of the glass were covered homogeneously. The glass was hung for 2 min over the dish to let the excess solution drain back. It was then air-dried for 3 h and heated at 100° for 30 min. These layers can be stored for a long period.

Chromatographic procedure

The standard techniques of ascending thin-layer chromatography⁶ was used.

Results and discussion

R_F values obtained with five solvent systems are given in Table I. Separation is achieved by these solvent systems and the detection limit of each compound is approximately 2 μg . It has been found that small and sharp spots are obtained with the addition of salts. The time required to ascend 10 cm from origin is 3-4 h. Separation is based on the formation of hydrogen bonds between the polyamide and the sample and adsorption or partition between the silica gel and the sample. The method described gives good resolution and reproducibility. The layer did not crack or peel and can be stored easily. Both sides of the glass are independent of each other and chromatography can be performed simultaneously on both sides.

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