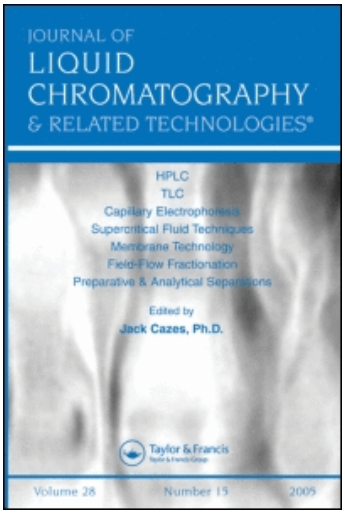

Journal of Liquid Chromatography & Related Technologies
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713597273

TLC Separation of Some Metal Ions on Impregnated Layers

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To cite this Article Srivastava, S. P. , Bhushan, R. and Chauhan, R. S.(1984) 'TLC Separation of Some Metal Ions on Impregnated Layers', Journal of Liquid Chromatography & Related Technologies, 7: 7, 1341 — 1344
To link to this Article: DOI: 10.1080/01483918408074048
URL: http://dx.doi.org/10.1080/01483918408074048

JOURNAL OF LIQUID CHROMATOGRAPHY, 7(7), 1341-1344 (1984)

TLC SEPARATION OF SOME METAL IONS ON IMPREGNATED LAYERS

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ABSTRACT

8-Hydroxy quinoline and dibenzoyl methane have been tried as impregnants for working out TLC separation schemes for a large number of metal ions in group of five or six on silica gel 'G' plates. Dibenzoyl methane impregnation also offers a method for the removal of iron from the silica gel 'G'.

INTRODUCTION

A survey of literature (1,2) shows that the separation of metal ions has been attempted by many workers by paper chromatography and thin layer chromatography, but little attention has been paid to the impregnation technique for the separation of metal ions on thin layers. Srivastava and Coworkers (3,4) have used this technique by employing different complexing agents for improving the separation of some metal ions on silica gel thin layers. The present paper is an extension of this work where 8-OH-quinoline and dibenzoyl methane have been tried as impregnants for improving the TLC separation of metal ions of interest.

0148-3919/84/0707-1341$3.50/0

EXPERIMENTAL

All the chemicals used were of Analar grade. The silica gel 'G' of SISCO make was used as an adsorbent. The TLC plates (Thickness 0.5 mm) were prepared by spreading a slurry of a mixture of 50 g. of silica gel 'G' and a definite amount of impregnant in 100 ml of a mixture of ethanol and water (50:50). The plates were dried for 24 hours at a constant temperature of 60±1°C. The metal salts (0.1% w/v solution in water) were applied to the layers using glass capillary and the chromatograms were developed at a constant temperature of 32±1°C. After development of the plates, spots were visualised by spraying first with a solution of 0.25% alizarin in ethanol and then with a solution of 0.1% of dithizone in chloroform.

RESULTS

An exmination of the hRf values in Table 1, shows that all the metal ions of interest can not be separated in a single run either on plain silica gel plate or on impregnated plate. On the basis of the hRf values observed on the impregnated plate, these metal ions have been put in the following groups for a satisfactory separation.

Metal ions separated with 8-OH quinoline impregnation.

1. Th(IV), Pb(II), Mg(II), Fe(III), V(V)
2. Mg(II), UO_2(II), Cd(II), Ni(II), Pd(II)
3. Pb(II), Mn(II), Cd(II), Ni(II), Cu(II)
4. Th(IV), Mn(II), UO_2(II), Cd(II), Co(II), Cu(II).

Metal ions separated with dibenzoylmethane impregnation.

1. V(V), Pb(II), Co(II), Zn(II), Cu(II), Fe(III)
2. Th(IV), UO_2(II), Mg(II), Cd(II), Ni(II), Cu(II)
3. Th(IV), Pb(II), Mn(II), Co(II), Zn(II), Cu(II).

TABLE 1

Metal Ion	Taken as	Solvent System: BuOH-EtOAc-HOAc 40:10:10 hRf		Solvent System: EtOAc-HCOOH-H_2O-Pyridine 30:10:10:5 hRf	
		Plain	Impregnated*	Plain	Impregnated**
Pb(II)	Nitrate	17	21	25	18
Mn(II)	Acetate	32	38	21	23
Cd(II)	Acetate	54 LT	63	30	41
Ni(II)	Acetate	38	75	56	73
Zn(II)	Acetate	54 MT	77	37	52
Fe(III)	Nitrate	57 LT	80	16	100
Cu(II)	Acetate	43	85	74	81
Co(II)	Nitrate	37 MT	76	27	34
Mg(II)	Acetate	22	29	22	24
UO_2(II)	Nitrate	49	49	30	14
Th(IV)	Nitrate	02	02	21	04
V(V)	Sod.Salt	87	88	07	03
Pd(II)	Chloride	85	87	-	-

hRf values reported are the mean of two or more identical runs, 10 cm development.

Impregnated* with 8-OH-quinoline,
Impregnated** with dibenzoyl methane.

DISCUSSION

Thus it is apparent that by the selection of the impregnant, it is possible to separate satisfactorily all the metal ions under study. Thus suitable pentanary and hexanary separation schemes of analytical importance have been worked out. It is worthwhile to mention that the hRf values on impregnated plate in both the cases are higher than on silica gel 'G' thin layer plates. This suggests that the complex formed by interaction of the metal ion with the impregnant is more soluble than the free metal ion in the solvent system employed. Thus it may be concluded that the movement of different metals on impregnated plates is governed by complex formation between the

impregnant and the metal ion and by their differential solubility in the developing system.

Moreover, the use of dibenzoylmethane as an impregnant offers a method for the removal of iron from silica gel 'G' which can be accomplished in the following manner :

The silica gel is treated with a trace amount (0.2%) of dibenzoylmethane in - EtOAc - HCOOH - H_2O - Pyridine (30:10:10:5) and heating it at 80°C for two minutes. After this the slurry is allowed to stand for 2-3 hours, the iron present in silica gel forms a soluble complex with dibenzoylmethane and is removed as a red colored floating layer.

ACKNOWLEDGEMENT

One of us (R.S.C.) thanks UGC, New Delhi, India, for financial assistance.

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