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Inorganic circular paper chromatography. Separation of lead, mercury, bismuth, copper and cadmium ions. A. R. Vasudeva Murthy and V. A. Narayan

Inorganic Circular Paper Chromatography.

Separation of Lead, Mercury, Bismuth, Copper and Cadmium Ions.

POLLARD *et al*1) observed a slight difference in the R_F values of the anions when different copper salts of the acids (citrate, tartrate, sulphate, chloride and nitrate) were chromatographed with butanol-acetic acid solvent. By altering the experimental conditions, it has been found possible to separate different salts of the same cation. — 0·1 M solutions of the different salts of the metals (Pb, Hg, Bi, Cu and Cd) were spotted separately at the centre of a filter paper (Whatman No. 3) and chromatographed with different solvents and sprayed with ammoniacal hydrogen sulphide as described in an earlier note2). Mixtures containing the same anion of different metallic radicals (sulphate, chloride, nitrate and acetate) were also tried in a similar way. In another set of experiments mixtures of the sulphate, chloride and nitrate as well as sulphate, chloride and acetate of copper and cadmium were chromatographed using n-butanol saturated with 4 N acetic acid as the solvent. It was noticed that the metals separated in three concentric rings corresponding to the sulphate, chloride and nitrate in one case and sulphate, chloride and acetate in the other case. The R_F values in the systems agreed fairly with those of the individual salts as given in table 1.

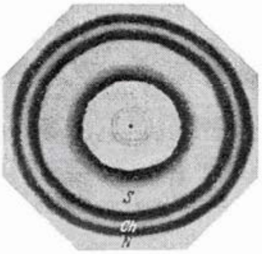

Fig. 1. Separation of sulphate, chloride and nitrate of copper. Solvent: n-butanol saturated with 4 N acetic acid. Temperature 25 to 27° C. Time: 9 a.m. to 4 p.m. *S* sulphate, R_f 0·20; *Ch* Chloride, R_f 0·37; *N* nitrate, R_f 0·48.

Similar results were obtained when the following solvents were used for irrigating the filter paper: ethyl alcohol/acetic acid, n-propyl alcohol/acetic acid, isopropyl alcohol/acetic acid, iso-butyl alcohol (tertiary)/acetic acid. With amyl alcohol/acetic acid, however, such a separation did not take place. When acetic acid was replaced by hydrochloric acid in the solvent, the R_F values of the various metallic ions were strikingly different. There was very little difference in the R_F values of the individual cations when associated with different anions, and it was not possible to separate the salts.

The above results indicate the profound influence of the nature of the acid used with the irrigating solvent on the R_F values of cations. The R_F values obtained in the present work show a greater deviation from those that were obtained by POLLARD *et al.* Further work is in progress to find out factors that influence the R_F value of the ions.

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1) POLLARD, MCOMIE and ELBEIH: J. Chem. Soc. **1951**, 466.

2) MURTHY, A. R. VASUDEVA, V. A. NARAYAN and M. R. A. RAO: Current Sci. **24**, 158 (1955).

Table 1. *R_F values of Pb^{++}, Hg^{++}, Bi^{+++}, Cu^{++} and Cd^{++} with different anions. Temperature: 25° to 27° C.*

Salt	Solvent I*)					Solvent II*)				
	Pb	Hg	Bi	Cu	Cd	Pb	Hg	Bi	Cu	Cd
Sulphate	—	0·57	—	0·27	0·21	—	0·82	—	0·36	0·79
Chloride	—	0·84	0·61	0·40	0·42	—	0·83	0·72	0·36	0·79
Nitrate	0·46	0·69	0·62	0·54	0·52	halo	0·89	0·73	0·38	0·79
Acetate	0·51	0·82	—	0·57	0·54	halo	0·82	—	0·35	0·79

*) Solvent I: n-butanol saturated with 4 N acetic acid. Solvent II: n-butanol saturated with 3 N hydrochloric acid.