

**Note**

**Isotachophoresis on paper**

**Part II. The separation of Ag(I), Tl(I), Hg<sub>2</sub><sup>2+</sup> and Pb(II)**

A survey of about thirty metals in four different isotachophoretic systems by the capillary method has been reported by BECKERS AND EVERAERTS<sup>1</sup>. Although they tried rather elaborate systems for controlling pH, etc., the separations obtained were not very satisfactory and many metals could not be separated from each other.

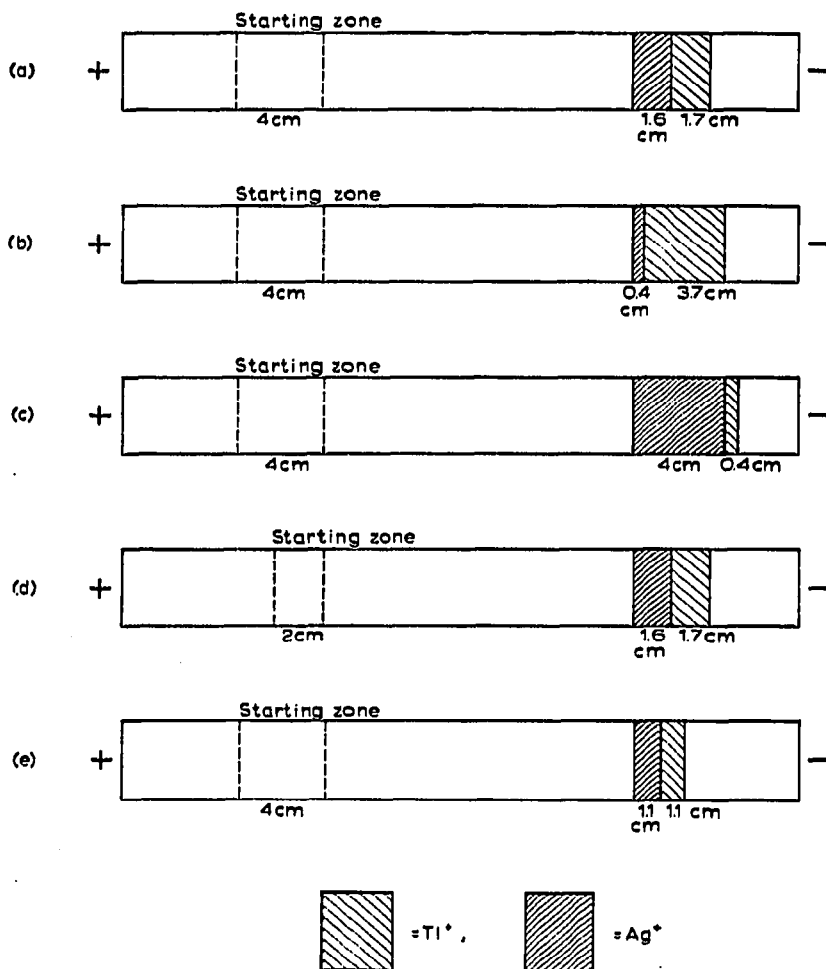


Fig. 1. Isotachophoretic separation of Tl(I) and Ag(I). Leading electrolyte, 0.1 N nitric acid; terminating electrolyte, 0.1 N lithium nitrate solution; time 2 h; potential 400 V; length of run, 25 cm. Sample composition: mixture of Tl<sup>+</sup> and Ag<sup>+</sup> at various ratios and concentrations: (a) Tl<sup>+</sup> 0.1 N and Ag<sup>+</sup> 0.1 N (1:1); (b) Tl<sup>+</sup> 0.1 N and Ag<sup>+</sup> 0.1 N (9:1); (c) Tl<sup>+</sup> 0.1 N and Ag<sup>+</sup> 0.1 N (1:9); (d) Tl<sup>+</sup> 0.2 N and Ag<sup>+</sup> 0.2 N (1:1); (e) Tl<sup>+</sup> 0.05 N and Ag<sup>+</sup> 0.05 N (1:1). Detection: CrO<sub>4</sub><sup>2-</sup> for Tl<sup>+</sup> and Ag<sup>+</sup>.

We tried to use simpler systems on paper in which the differences in the ionic mobilities, without any further factors, could be used and our results are reported here dealing with the first analytical group, *i.e.*, silver, mercurous mercury, lead (II) and thallium (I).

### Experimental and results

The same technique was used as in the previous paper<sup>2</sup>, that is a Whatman No. 1 paper strip (57 × 6 cm) sandwiched between two glass plates (50 × 7 cm) and a potential of 400 V was applied for 2 h. The paper was first washed free from chloride by using two washes with acetic acid followed by distilled water.

As the leading electrolyte, 0.1 N nitric acid was found to be satisfactory and as the terminating electrolyte, 0.1 N lithium nitrate solution.

Fig. 1 shows the separations of various ratios and concentrations of mixtures of Tl(I) and Ag(I) nitrates. The paper was sprayed with potassium chromate, yielding a red colour with Ag(I) and an intense yellow colour with Tl(I). It is evident from these separations that equilibrium conditions were attained.

Pb(II) (yellow colour with chromate), when added to Tl(I) and Ag(I), moved behind these two metals and we presume that it consists of either  $\text{PbOH}^+$  or an ion pair  $\text{PbNO}_3^+$  (Fig. 2). Mercurous mercury (orange-brown with chromate) moves more slowly than the terminating electrolyte and forms a rather diffuse band, as shown in a typical separation in Fig. 3.

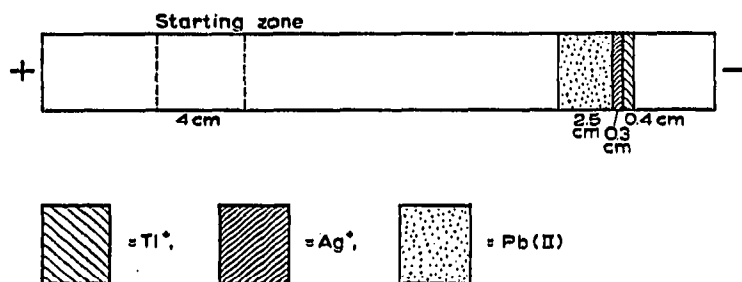


Fig. 2. Isotachopheretic separation of Tl(I), Ag(I) and Pb(II). Conditions of run as in Fig. 1. Sample composition: mixture of  $\text{Tl}^+$  0.1 N,  $\text{Ag}^+$  0.1 N and Pb(II) 0.1 N (1:1:8). Detection:  $\text{CrO}_4^{2-}$  for  $\text{Tl}^+$ ,  $\text{Ag}^+$  and Pb(II).

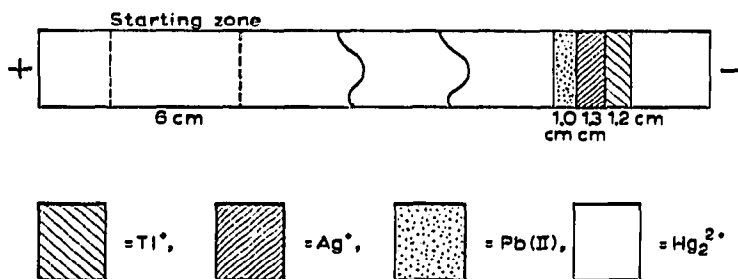


Fig. 3. Isotachopheretic separation of Tl(I), Ag(I), Pb(II) and  $\text{Hg}_2^{2+}$ . Conditions of run as in Fig. 1. Sample composition: mixture of  $\text{Tl}^+$  0.1 N,  $\text{Ag}^+$  0.1 N, Pb(II) 0.1 N, and  $\text{Hg}_2^{2+}$  0.1 N (1:1:1:1). Detection:  $\text{CrO}_4^{2-}$  for  $\text{Tl}^+$ , Ag, Pb(II) and  $\text{Hg}_2^{2+}$ .

This simple unbuffered system thus permits the concentration and separation of both Ag(I) and Tl(I) and a complete separation of all four members of the silver group.

*Laboratorio di Cromatografia del C.N.R.,  
Via Romagnosi 18/A,  
Rome (Italy)*

V. TAGLIA

- 1 J. L. BECKERS AND F. M. EVERAERTS, *J. Chromatogr.*, 68 (1972) 207.
- 2 V. TAGLIA AND M. LEDERER, *J. Chromatogr.*, 77 (1973) 467.

Received January 19th, 1973