NOTAS DE FISICA

VOLUME V

Nº 7

PAPER CHROMATOGRAPHY OF INORGANIC IONS IN NITRATE MEDIA

I - SCANDIUM, YTTRIUM, ACTINIUM AND THE LANTHANIDES

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1959

Notas de Física - Volume V - Nº 7

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(Received June 2nd, 1959)

The separation of the rare earths by paper chromatography in nitric acid media and a number of organic solvents was investigated by Lederer[1]. Under these conditions a slight difference between the values of the individual R_f's was observed but no separation could be obtained since considerable tailling occurs.

Analogous results were obtained in anion-exchange studies with the rare earths in HNO_3 media[2]. These elements are slightly adsorbed by Dowex-1 from concentrated HNO_3 solutions, but the small difer - ences between the values of the distribution coefficients do not allow efficient separations.

Further studies have shown that the adsorption of these elements by the resin is considerably enhanced when a soluble nitrate such as lithium nitrate is added to the HNO_3 solution[3] and successfull separations with Dowex-1 of Ac and La[3] and between the individual lanthanides[4] were obtained in this media.

(*) Submitted to publication in the Journal of Chromatography.

On the basis of these results we investigated the separation of Sc, Y, Ac and the lanthanides by paper chromatography in $LiNO_3$ media. Since the rare earths are extracted by alcohols from concentrated nitrate solutions[5] we based our investigations on this kind of solvent. The results obtained in a typical experiment are given in table 1. This data was obtained by descending development in 72 hours of a chromatogram in $LiNO_3$ 7 M, HNO_3 2 M and butanol (80%) at room temperature ($25 \pm 3^{\circ}$ C). The rare earths were detected with 8-hydroxyquinoline followed by examination of the fluorescence of the spots in ultraviolet light. The values of R_f obtained in these conditions are referred to the second (dark) front of the solvent.

Table 1

Element	La	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Er	Y	Sc
R_f	0.40	0.46	0.51	0.54	0.55	0.55	0.56	0.62	0.64	0.58	1.00

The separation of trace amounts of actinium from lanthanum was investigated with Ac 228(MsTh II, β, γ, 6.13 hours period). This radioelement was extracted from a Ra 228 source (MsTh I) and its purity was controlled by period measurements in a scintillation counter. The results obtained in a developement of 30 hours are shown in fig.2.

The results from table 1 demonstrate that the experimental conditions are not suitable for the separation of the neighbour lanthanides, except for La, Ce and Pr. No improvement in the separations

was found by using other solvents such as ethyl, propyl, amyl and iso-amyl alcohol or by developing the chromatograms at higher temperatures.

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4. Y. Marcus and F. Nelson - J. Phys. Chem. 63, 77 (1959).

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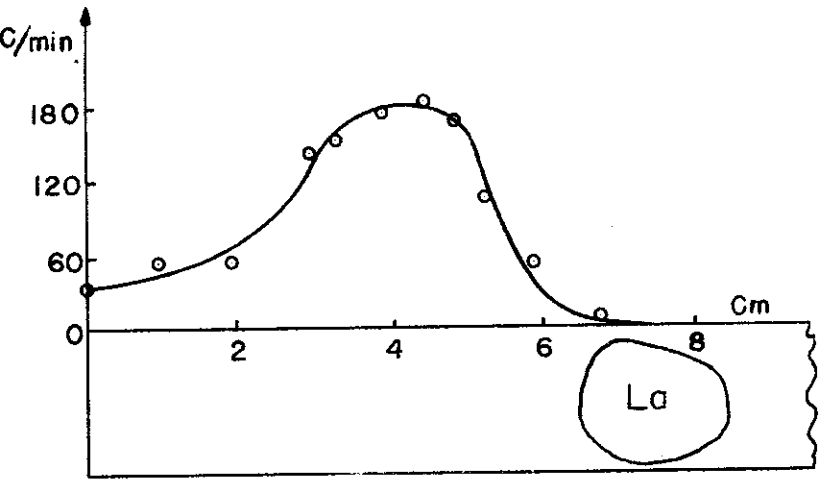

FIG. 2

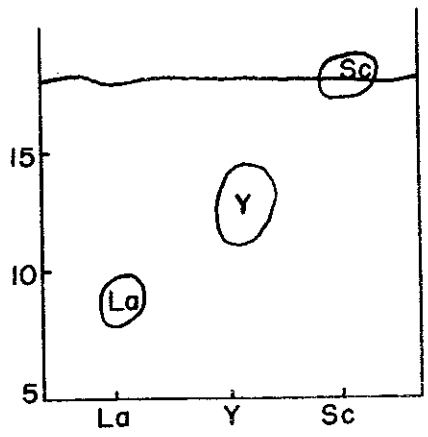

FIG. 1

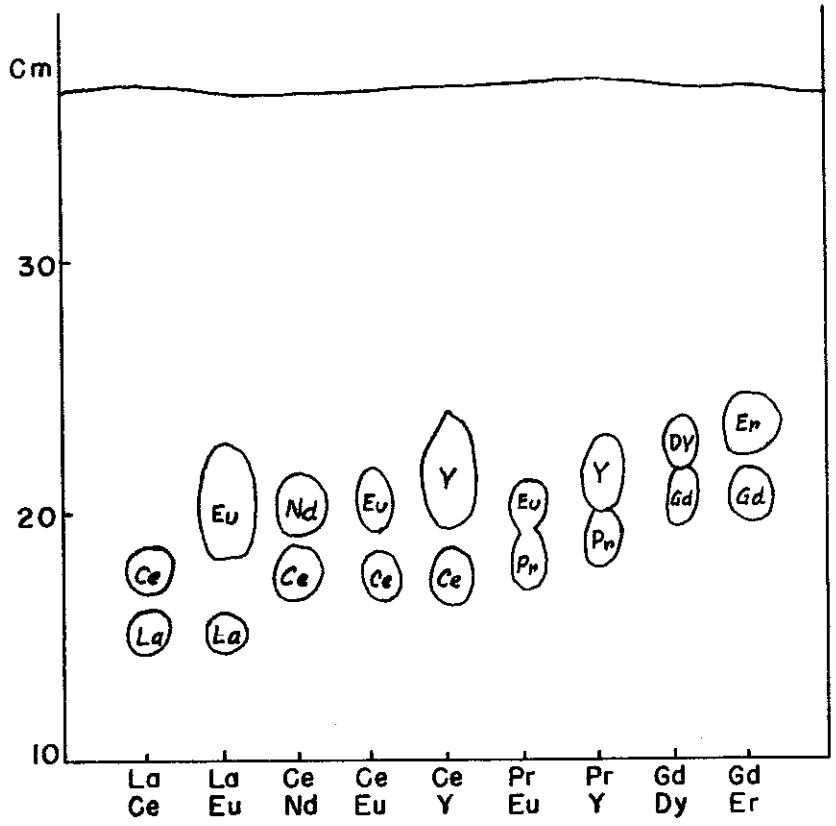

FIG. 3