

The Equivalent Conductances of Europium Chloride and of Europium Nitrate

I. M. Klotz

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The Equivalent Conductances of Europium Chloride and of Europium Nitrate

In recent notes in this journal^{1, 2} some experiments on the spectra of solutions of trivalent europium have been reported. From these experiments it was noted³ "that the salts of europium are revealing bonds which are permanently oriented;" yet from the close resemblances among the rare earths in general, it would not be too much to assume that the salts of europium are just as strong electrolytes as those of lanthanum. Unfortunately, however, since no thermodynamic data, such as freezing-point lowering or conductance measurements, existed on europium salts, this assumption could not be checked. As has also been pointed out,¹ we wish to "look upon europium as an indicator for the symmetries of the fields about the other rare earth ions." It was considered advisable, therefore, to carry out electrical conductance measurements on solutions of europium salts. These results could then be compared with the corresponding data on other rare earth salts, so that in case of conformance, any phenomena connected with the electrical character of the europium ion could be considered characteristic of the rare earth ions in general. Comparison with the conductances of the corresponding lanthanum salts should be particularly significant since lanthanum salts have always been considered typical trivalent electrolytes.

The europium salts used were prepared from samples of europium oxalate presented by Dr. H. N. McCoy for our researches. The oxalate was ignited to the oxide, a slight excess of nitric or hydrochloric acid added, and the substances were heated on a hot plate for at least three hours after all of the excess acid had evaporated. In this way large masses of crystals of europium nitrate and europium chloride, respectively, were obtained.

The data obtained (Table I) have been plotted in Fig. 1

TABLE I. *Equivalent Conductances at 25°C.*

EUROPIUM NITRATE		EUROPIUM CHLORIDE	
N	Λ	N	Λ
.07277	91.6	.07100	101.0
.03639	100.0	.03550	108.2
.01820	108.1	.01775	115.3
.00910	115.2	.00888	121.6
.004550	122.1	.004438	127.4
.002275	128.0	.002219	132.1

together with values for the corresponding lanthanum salts at 25°C converted from Öholm's data⁴ at 20°C. Inspection shows that the europium curves are "normal" in all respects. In fact in the case of europium chloride the conductances are so similar to those of lanthanum chloride, that on the scale to which the graph is drawn, it is impossible to distinguish the curves. If lanthanum chloride is a strong electrolyte, europium chloride must certainly be one also. If lanthanum chloride is "completely ionized," europium chloride must also be "completely ionized."

Similarly in the case of the nitrate curves, the graph of the europium salt is similar both in magnitude and shape to that of the lanthanum salt. Furthermore, the europium nitrate conductivities, carried out over the range of con-

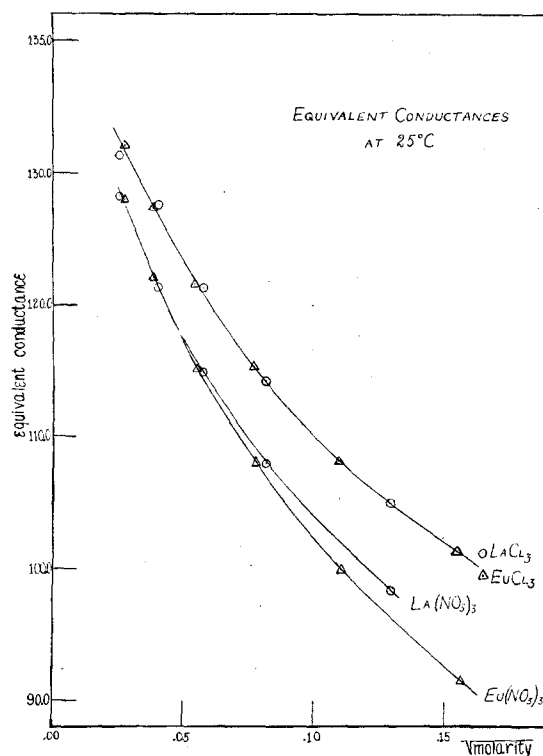


FIG. 1.

centration from 0.02N to 0.0007N, show no abnormalities, yet it is during this region that the spectrum of the nitrate shows the change from the "nitrate-structure" to the "chloride-structure."

Comparison of the experimental results with rough data on the electrical conductivities of rare earth salts besides those of lanthanum shows similar agreement.

Conductance data thus show that in electrical properties the europium ion is typical of the rare earth ions. It is thus quite reasonable to assume that the electrical properties of europium ion revealed by its spectra are characteristic of the other rare earth ions also.

I. M. KLOTZ

Jones Chemical Laboratory,
University of Chicago,
Chicago, Illinois,
October 27, 1938.

¹ S. Freed and S. I. Weissman, J. Chem. Phys. 6, 297 (1938).

² S. Freed and H. F. Jacobson, J. Chem. Phys. 6, 654 (1938).

³ S. Freed, J. Chem. Phys. 6, 655 (1938).

⁴ L. W. Öholm, Soc. Sci. Fennica, Acta and Comm. Phys. Math. 9, 2 (1936).

Correction: The Effect of Structure upon the Reactions of Organic Compounds. Temperature and Solvent Influences

(J. Chem. Phys. 4, 613 (1936))

On page 615, in the eighth line from the bottom of column 1 the word small should be substituted for the word large.

LOUIS P. HAMMETT

Columbia University,
New York City,
September 14, 1938.