

When freshly prepared these jellies are perfectly transparent. They however gradually gain opalescence and finally become opaque when kept for a long time. They are perfectly stable, undergo no syneresis and are thixotropic in nature.

Further work on these jellies is in progress. Grateful thanks of the author are due to Dr. Satya Prakash for his kind interest in this work.

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1. Handl, *Jahresbericht uber die Fortschritte der Chemie*, 1859, 279.

COLORIMETRIC DETECTION AND ESTIMATION OF THORIUM

A NUMBER of reagents have been reported for the detection of thorium,¹ but few are specific and interference from rare-earths is a common disadvantage. Germuth and Mitchel reported that sodium alizarinsulphonate (Alizarin-S) yields a red colour with the thorium ion which is neither sensitive nor specific. Details of the conditions in which the investigators arrived at these conclusions are not available. Nevertheless, it has been found that under the conditions detailed below, the reagent provides not only a fairly sensitive test, but may as well be used for the colorimetric estimation of moderate quantities of thorium. As the following data shows, the method may be applied for the rapid assay of monazite for thorium. The reagent is not specific for thorium only as zirconium, titanium, and tetravalent cerium interfere.

EXPERIMENTAL

(a) *Detection*.—The reagent is prepared by dissolving 0.01 gr. of alizarin-S in 100 c.c. of 0.125 N. hydrochloric acid and diluting the solution to one litre. One drop of the reagent gives with one drop of thorium solution, containing not less than 0.01 mg. of the element per c.c., a distinctive pink colouration. Cerite earths to the extent of 3 to 4 mg per c.c., cause no interference.

(b) *Estimation of thorium*: The following data obtained with a simple Dubosq colorimeter represent the average of a number of observations, which in the extreme did not differ by more than 5 per

cent. It has been found that a standard made from 0.4 mg. of thorium and 10 c.c. of the reagent diluted to 20 c.c. gives the best results and thorium in amounts 0.2 to 0.5 mg. may be very conveniently estimated, although at the higher concentrations the results are a little low.

Thorium taken mg.	Cerite earths added mg.	Thorium found mg.	Thorium taken mg.	Cerite earths added mg.	Thorium found mg.
0.20	..	0.212	0.40	..	0.39
0.30	..	0.308	0.40	2.00	0.38
0.30	1.50	0.304	0.40	4.00	0.37
0.30	3.00	0.302	0.45	..	0.36
0.35	..	0.360	0.50	..	0.35
			0.50	2.50	0.34

(c) *Estimation of thorium in monazite*: A sample of monazite solution from which zirconium has been removed was treated with hydrogen peroxide to remove tetravalent cerium and after boiling to decompose the excess peroxide, the solution was diluted to have a thorium content of 0.08 mg. per c.c. Aliquots of this solution were employed to determine the thorium content and the following results were obtained.

Amount of thorium present mg.	Amount of thorium estimated mg.
0.240	0.252
0.320	0.320
0.400	0.388
0.480	0.464

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1. Moeller, Schweitzer and Starr, *Chem. Abstr.* 1948, 42, 63. 2. Germuth and Mitchel, *Jour. Pharm.*, 1929, 101, 46.

SEPARATION OF TETRAVALENT CERIU FROM THORIUM AND OTHER TRIVALENT RARE EARTHS—THE USE OF POTASSIUM PERIODATE

A METHOD for the separation of tetravalent cerium from thorium and other rare earths including trivalent cerium has so far not been reported, although the separation of ceric cerium as $CeHIO_6$, H_2O on the addition of concentrated sodium paraperiodate has been reported by Ray Chaudary. The method involves the careful adjustment of the acidity of the solution and the relative proportion of the ceric and IO_4^- ion concentrations in solution.

have succeeded in separating ceric cerium not only from thorium but also from other rare earths including cerous cerium.

Ceric Cerium: Ten c.c. of the ceric solution containing not more than 0.5 gm. of ceric oxide and other elements are mixed with 120 c.c. of dilute (1:5) nitric acid and 70 c.c. of the periodate reagent in the cold (the periodate reagent is prepared by saturating 1:5 dilute nitric acid with the salt). The mixture is heated for 10 to 15 mins. on a vigorously boiling water-bath and left to settle. On cooling, it is filtered through a sintered glass crucible No. 4, and partially washed with 1:10 nitric acid. The precipitate is returned to the original beaker, dissolved in the minimum of concentrated nitric acid and diluted so that the acid concentration is approximately 2N., when the cerium periodate is reprecipitated. The precipitate is filtered and washed first with about 200 c.c. of dilute nitric acid (1:10) and finally with 100 c.c. of cold water. It is then dried for three to four hours at 100 to 110°C and weighed as $CeHIO_6, H_2O$.

Thorium: The filtrate is made distinctly alkaline with ammonia when thorium and other rare earths are precipitated as periodates. The precipitate is dissolved in dilute hydrochloric acid, potassium iodide is now added in sufficient quantity to decompose the periodate and the liberated iodine is boiled off. The oxalates of the elements are now precipitated after suitably adjusting the acidity, filtered, washed, and decomposed with nitric acid. The solution is neutralised until but faintly acidic to Congo Red, and the thorium is separated by any of the known methods (preferably adopting a double precipitation) ignited, and weighed as ThO_2 .

Rare Earths: Oxalic acid is added in sufficient excess to the filtrate and the precipitated rare earths are washed, ignited, and weighed as R_2O_3 .

In the absence of thorium however, the acid and the periodate ion concentrations may vary within wider limits.

In the following table are shown some typical results in which cerium, thorium and other rare earths are separated and individually estimated.

The importance of the strength of the acid during the analysis is shown by the following experiments. When nitric acid diluted in the ratio 1:4 is employed the amount of ceric periodate precipitated is only 0.4093 and 0.4119 gm. in two determinations and with

Taken: CeO_2 0.1884 gm. + ThO_2 0.1906 gm. + other rare earths including cerous cerium R_2O_3 0.5700

Weight of $CeHIO_6, H_2O$ found	Weight of CeO_2 calculated	Weight of ThO_2 found	Weight of R_2O_3 found
gm.	gm.	gm.	gm.
0.4178	0.1882	0.1902	0.5698
0.4180	0.1883	0.1904	0.5694
0.4184	0.1884	0.1903	0.5698
0.4179	0.1882	0.1902	0.5696

nitric acid diluted in the ratio 1:6 the same is 0.4240 and 0.4251 gm. in the place of the correct amount 0.4184 gm. The precipitant in both cases was a saturated solution of potassium periodate in nitric acid of corresponding dilution.

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1. Ray Chaudary, *J. I. C. S.*, 1941, 18, 335.

TICK-BORNE RELAPSING FEVER IN KASHMIR

THE existence of Relapsing fever in Kashmir was first detected early in 1948. Previously the disease had remained unrecognised due to its mild symptoms, no fatality, and resemblance with Malaria. Two species of *Ornithodoros* ticks, *O. crossi* and *O. lahorensis*, were found widespread in the State, particularly infesting the animal quarters. *O. crossi* were found infected in nature and the disease conveyed to guinea pigs by their bite was similar to that produced by human-strains from local cases. It attacked man far more readily than *O. lahorensis*, also the bite marks on patients resembled those of the former. On the other hand, naturally infected specimens of *O. lahorensis* have not been found here so far, and lice could not be infected with the local strains. Therefore, it was considered that the vector of Relapsing fever in Kashmir was *O. crossi*. Detailed investigations will be published elsewhere.

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