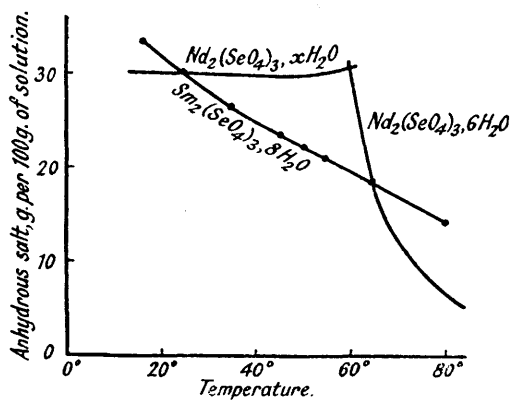
25. *Samarium Selenate and its Solubility in Water.*

By J. Newton Friend.

The solubility of the octahydrate in water has been determined between 16° and 80°.

The selenates of lanthanum, praseodymium, and neodymium have already been studied (Friend, J., 1931, 1802; 1932, 1597, 2410) with a view to their use in the separation of the rare-earth elements by fractional crystallisation. Two hydrates of samarium selenate were described by Cleve (*Bull. Soc. chim.*, 1885, **43**, 162), *viz.*, the octahydrate, which crystallised from solution at room temperature, and the dodecahydrate, which separated below 10°. Cleve stated that the octahydrate was more soluble than the corresponding sulphate, with which it is isomorphous, but no systematic determination of its solubility appears to have been made.



Experimental.

The selenate used was prepared by dissolving the oxide in dilute selenic acid and crystallising it on the water-bath, the salt being much less soluble in hot water than in cold.

The octahydrate, $Sm_2(SeO_4)_3,8H_2O$, separates from aqueous solution at all temperatures

between about 10° and 100°, and is stable in dry air. The following analyses were made on specimens prepared as follows: (1) Concentration of an acidified solution over concentrated sulphuric acid at 18°; the crystals were crushed and dried between filter-paper. (2) An acidified solution was heated on the water-bath; the crystals separating were drained on a sintered-glass funnel and dried between filter-paper. (3) and (4) Crystals prepared as in (2) and dried over sulphuric acid for 4 days and several weeks respectively. (5) A neutral solution was taken to dryness in a platinum dish on a water-bath: partial dehydration appears to have occurred. (6) The decahydrate was exposed to air at 18° until constant in weight.

	1.	2.	3.	4.	5.	6.	Calc. for octahydrate.
Sm_2O_3, %	39·65	39·85	40·14	40·16	40·32	40·13	39·92
$3SeO_3$, %	43·13	43·54	43·86	43·73	44·05	44·80	43·59
H_2O (by diff.), % ...	17·22	16·61	16·00	16·11	15·63	16·07	16·49
Ratio Sm_2O_3 : 3Se ...	1·478	1·472	1·472	1·473	1·472	1·440	1·473

The solubility of the octahydrate in water was determined in the apparatus already described (Friend, J., 1930, 1633), a sintered-glass funnel of the finest grade, No. 4, being used. The samaria and selenium were estimated by methods analogous to those employed for the neodymium salt (Friend, J., 1931, 1802); they were found to give closely concordant results. It was necessary to work with slightly acidified solutions in order to prevent precipitation of basic salt, particularly at the higher temperatures. This rendered accurate reproducibility of the results extremely difficult.

The results were as follows, *S* giving the solubility as *g.* of anhydrous samarium selenate per 100 g. of solution:

Temp.	*S.*	Sm_2O_3 : Se.	Temp.	*S.*	Sm_2O_3 : Se.
16·6°	33·60 *	1·395	50·0°	22·15 *	1·327
17·0	34·30	1·488		22·07	1·281
25·0	31·01	1·468		21·93	1·260
	30·21 *	1·351	55·0	21·13 *	1·321
	28·31	1·274		19·35	1·022
35·2	27·52	1·456	64·6	20·38	1·613
	26·42 *	1·322		18·62 *	1·207
45·0	24·85	1·386	65·0	17·65	0·953
	23·56 *	1·276		16·46	0·905
	23·28	1·293	80	14·00 *	1·353
				14·03	1·263

The asterisked data are shown in the figure together with the results previously obtained with neodymium selenate. The curves show that fractional crystallisation of the selenates does not offer a good method of separating samarium from neodymium. Excess of selenic acid reduces the solubility of the salt.

THE TECHNICAL COLLEGE, BIRMINGHAM.

[*Received, October 21st,* 1940.]