

# Lead Nitrate–Nitric Acid–Water System

L. M. FERRIS

Oak Ridge National Laboratory, Oak Ridge, Tenn.

**PHASE EQUILIBRIA** in the system lead oxide–nitrogen pentoxide–water were investigated at 25° and 50° C. by Denham and Kidson (1). Additional data on the solubility of lead nitrate in nitric acid at temperatures below 50° C. were reported by Kazantsev (3). Similar solubility determinations were made in this laboratory, extending the range of measurement to 80° C.

## EXPERIMENTAL

**Reagents.** All solutions were prepared with c.p. grade lead nitrate and nitric acid.

**Procedure.** An excess of solid lead nitrate was added to a series of nitric acid solutions ranging in concentration from 0 to 15*M*. The stoppered borosilicate glass flasks containing the solutions were kept in a constant temperature bath for several days with periodic shaking to ensure equilibrium. In each case, the temperature was constant to within 0.1° C. Samples of the liquid phase at each temperature were removed for density measurement and chemical analysis. At 80° C., the wet residue was also analyzed to allow determination of the equilibrium solid phase by the method of Schreinemakers (4). The composition of the wet residue is between that of the saturated solution and the equilibrium solid phase. Extrapolation of all lines obtained from solution and wet residue analyses results in their intersection at the composition of the equilibrium solid phase. At 25° C., the solid phase was identified by x-ray analysis.

**Results.** Four isotherms were obtained: 26°, 40°, 59.5°, and 80° C. (Table I and Figure 1). At 26° C., the only tempera-

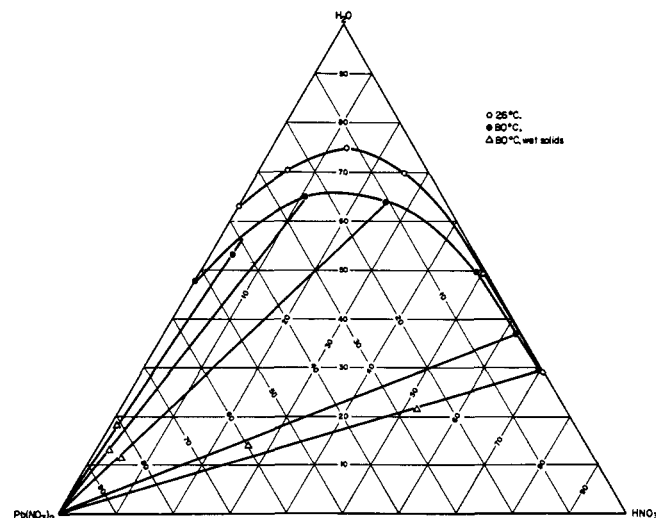


Figure 1. The system lead nitrate–nitric acid–water at 26° and 80° C.

Table I. The System  $\text{Pb}(\text{NO}_3)_2\text{--HNO}_3\text{--H}_2\text{O}$  at 26°, 40°, 59.5°, and 80° C.

Temp., ° C.	Compn. of Satd. Soln., Wt. %		Density of Satd. Soln., G./L.
	$\text{Pb}(\text{NO}_3)_2$	$\text{HNO}_3$	
26	37.41	0	1434
	24.75	4.93	1253
	12.22	12.96	1162
	4.26	25.99	1183
	0.53	50.26	1266
	0.06	63.84	1333
	0.008	71.35	1387
40	42.16	0	1516
	29.24	4.78	1350
	16.46	12.23	1224
	5.86	26.37	1201
	0.78	48.94	1278
	0.10	61.98	1345
	59.5	33.77	4.04
20.82		11.39	1284
1.01		49.08	1268
0.15		62.40	1323
0.03		70.54	1360
80	52.45	0	1692
	43.41	3.92	1528
	24.52	10.72	1352
	11.17	25.54	1209
	1.70	48.55	1233
	0.25	62.65	1290
	0.05	70.71	1321

ture where data can be readily compared to those of Denham and Kidson (1), the isotherm is about that expected. Solubilities of lead nitrate in water at various temperatures are in excellent agreement with reported values (2, 3, 5). As expected (1), the solid phase at equilibrium was lead nitrate.

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