

Solubility of Telluric Acid in Aqueous Nitric Acid

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A very common step in the preparation of telluric acid, $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$, is to precipitate it from aqueous solutions by adding strong nitric acid or by crystallizing it from nitric acid solutions. This small solubility of telluric acid in nitric acid makes possible a satisfactory separation from all of the impurities or by-products whose nitrates are sufficiently soluble in aqueous nitric acid; this is especially true of potassium nitrate and manganese nitrate which result from the oxidation of tellurium dioxide in nitric acid solution with potassium permanganate.

In researches on the preparation of telluric acid, data on the solubility given in this paper had to be determined as it could not be found in the literature. This solubility data was determined by saturating various concentrations of nitric acid with an excess of carefully purified telluric acid. Glass stoppered bottles, containing the materials, were suspended in a water bath at $25^\circ \pm .2^\circ \text{C}$. and were gently agitated for twelve hours. The telluric acid in these saturated solutions was determined by evaporating a one ml. sample and weighing. The nitric acid in each saturated solution was determined by titrating one ml. using methyl orange as an indicator. Telluric acid is so slightly ionized that this titration is accurate.

TABLE I. Values Obtained for the Determination of the Solubility of Telluric Acid in Nitric Acid.

Wt. of $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$ in 100 cc. of Solution	Grams of HNO_3 in 100 cc. of Solution
0.06 gms.	93.93 gms.
0.36	75.16
0.97	57.39
10.22	27.40
19.42	18.52
35.8	8.63

In plotting these data, curves for potassium nitrate, with data taken from the literature, were included to show that a separation of telluric acid from potassium nitrate should be successful. The data on manganese nitrate show very great solubility in nitric acid.

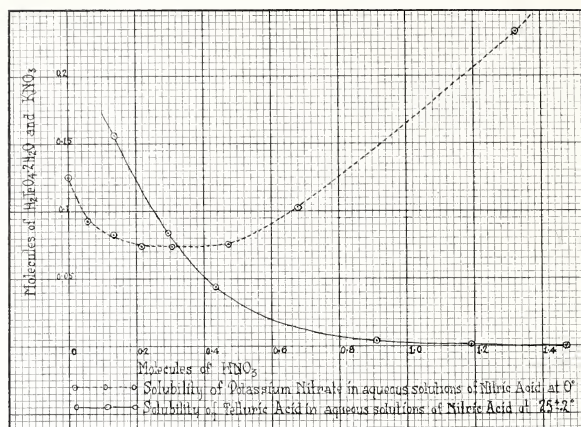


Fig. 1.

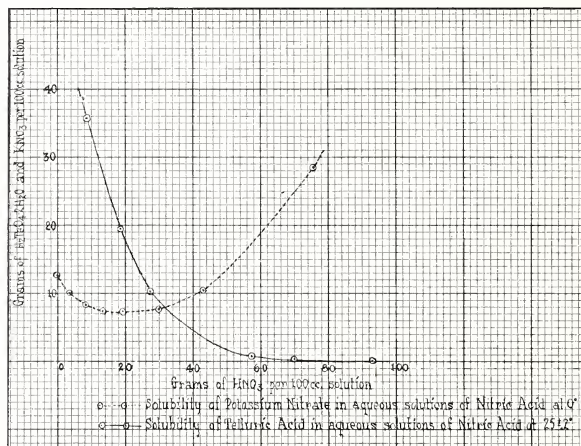


Fig. 2.

Conclusion

In ordinary concentrated nitric acid, the solubility of telluric acid is less than 1 gm. per 100 ml., and, in 40% HNO_3 , the solubility is about 5 gms. per 100 ml.

Very complete recovery of telluric acid is easily accomplished by adding concentrated nitric acid to concentrated aqueous solutions of telluric acid. The solubility of telluric acid in water is quite high—40 gms. per 100 ml. at 25°C.

The impurities in the adhering mother liquor can be removed by washing with concentrated nitric acid without the loss of appreciable quantities of the telluric acid.