Determination of Ksp
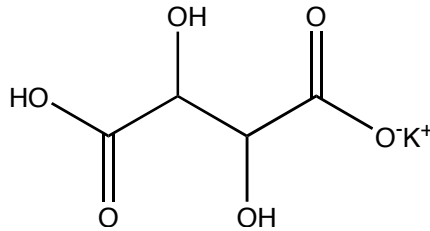
Potassium hydrogen tartrate, $KHC_4H_4O_6$, is a slightly soluble salt isolated from sediments in wine casks. It dissociates in solution as a potassium ion and the largely undissociated hydrogen tartrate ion (see below). The proton on the hydrogen tartrate ion is easily titrated with hydroxide using phenolphthalein as an indicator.
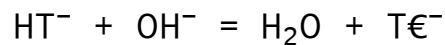

Potassium Hydrogen Tartrate (KHT)

The dissolution equation is:

$$KHT = K^+ + HT^-$$
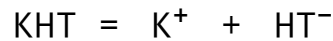
If a saturated aqueous solution of KHT is titrated with OH^-, the amount of HT^- in solution is equal to the moles of OH^- required to reach the equivalence point:

$$HT^- + OH^- = H_2O + T\text{€}^-$$

and the $[K^+]$ must be equal to $[HT^-]$.

Once $[K^+]$ and $[HT^-]$ are known K_{sp} is calculated as follows:

$$K_{sp} = [K^+][HT^-]$$

Experimental

Prepare a saturated KHT solution by adding 10 g of potassium hydrogen tartrate to 1 L of water in a plastic bottle. The solution should be prepared a week in advance and shaken frequently. At the same time, prepare another solution in the same manner, except prepare the solution in a 1 L volumetric flask and add 1.00 moles of KNO_3 in addition to 10 g of KHT.

Filter 75 mL of the saturated solution of KHT and pipette 10 ml aliquots of the filtrate into three or four 250 mL titration flasks. Titrate to the equivalence point using 0.02xxx M NaOH and phenolphthalein as indicator.

From the titration data, calculate $[HT^-]$ for each aliquot. Knowing that $[K^+]=[HT^-]$, calculate a value for K_{sp} for each determination and determine the mean value and standard deviation.

Repeat the experiment using the KNO_3 containing solution and calculate K_{sp} for KHT in the presence of the common ion (remember that in this case $[K^+]$ does not equal $[HT^-]$.