

Learning Objectives

The objectives of this experiment are to ...

- learn to analyze a solid unknown with volumetric techniques.
- standardize a solution of NaOH.
- determine the percentage of KHP in solid mixture of KHP and a soluble salt.

Background

In this experiment students will use an acid-base titration to determine the composition of a solid mixture, containing potassium hydrogen phthalate (KHP) and an inert, soluble salt (such as NaCl). The analysis will be carried out by weighing out a portion of the unknown solid, dissolving it in water, and titrating the resulting solution with a standard solution of sodium hydroxide. KHP is an organic weak acid with the formula $\text{KHC}_8\text{H}_4\text{O}_4$ with acidic hydrogen.

The four titrations will be conducted in two different ways: (1) two using an acid-base indicator (phenolphthalein) and two using the *MicroLAB* interface to monitor pH, in order to compare the methods. The point at which the indicator turns color represents **endpoint**, and **should** be close to **equivalence point, or stoichiometric point** of the reaction, if the proper indicator was selected.

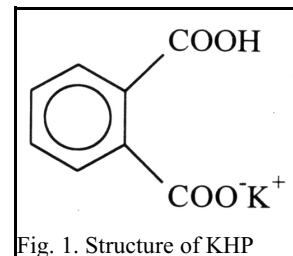


Fig. 1. Structure of KHP

Experimental Procedure

Instructions are given for making the 0.100 M NaOH, standardizing it against pure KHP, and using it to analyze an unknown containing KHP.

Data Analysis

Guidance is given in the calculations and interpretation of the titration curves using first and second derivatives.

Resources Provided

- Sample Report Sheets providing the format to organize the data collection with sample data.
- Questions to consider, answer and turn-in with suggested answers.
- Tips and Traps section to assist the instructor with potential problems and solutions.
- Sample *MicroLAB* screen shots and graphs.
- Laboratory preparation per student station.

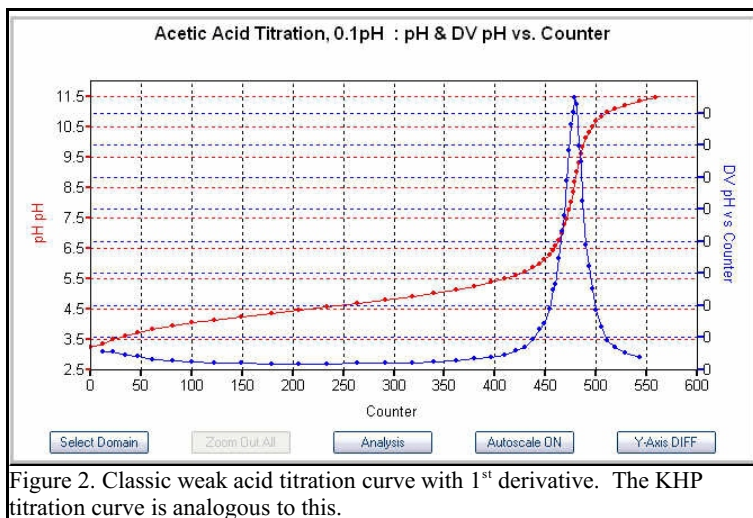


Figure 2. Classic weak acid titration curve with 1st derivative. The KHP titration curve is analogous to this.