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Determination of Calcium in Limestone

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Abstract A redox titration is based on oxidation-reduction reaction between analyte ($\text{Na}_2\text{C}_2\text{O}_4$) and titrant (KMnO_4). It determines the concentration of an analyte containing either an oxidizing or a reducing agent by measuring it against a standardized titrant. Potassium permanganate is a powerful oxidizing agent and serves as a self-indicator in the titration with reducing agent. The analyte in a redox titration must be in a single oxidation state at the outset. The steps that precede the titration the sample preparation and elimination of interferences which usually involve converting the analyte to a mixture of oxidation states. Prereduction is done to ensure that the analyte is present in a single oxidation state. Limestone usually contains a mixture of calcium carbonate and magnesium carbonate, which is called dolomitic limestone. Calcium is conveniently determined by precipitation with oxalate ion and it was found out that its average percent weight is 38.14% while its percent error is 16.48%. Errors in coprecipitation and loss of precipitate are just some of the few errors that account for this experiment discuss in the conclusion part.

Keywords: redox titration, calcium, limestone, oxidation states

INTRODUCTION

An oxidation/reduction (redox) reaction is one in which electrons are transferred from one reactant to another. It can be analogous to the Brønsted-Lowry concept of acid/base reactions. Both involve the transfer of one or more charged particles from a donor to an acceptor – the particles being electrons in a redox reaction and protons in an acid-base reaction.

A substance that has a strong affinity to electrons is called oxidizing agent, or an oxidant. A reducing agent, or reductant, is a specie that easily donates electrons to another specie. When a reducing agent donates an electron, it becomes an oxidizing agent that can accept an electron. Conversely, when an oxidizing agent gains an electron, it becomes a reducing agent that

can donate an electron. Consider, for example, a titration in which a titrant in a reduced state, A_{red} , reacts with a titrant in an oxidized state, B_{ox} .



Limestone is usually described as rock made from calcium carbonate, CaCO_3 , but in fact most limestone rock contains significant amounts of magnesium, silicates, manganese, iron, titanium, aluminum, sodium, potassium, sulphur (as sulphides or sulphates) and phosphorus. In this experiment, a sample of limestone is to be analyzed to determine how much calcium it contains.

In common with a number of other cations, calcium is conveniently determined by precipitation with oxalate ion. The solid calcium oxalate is filtered, washed free of

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