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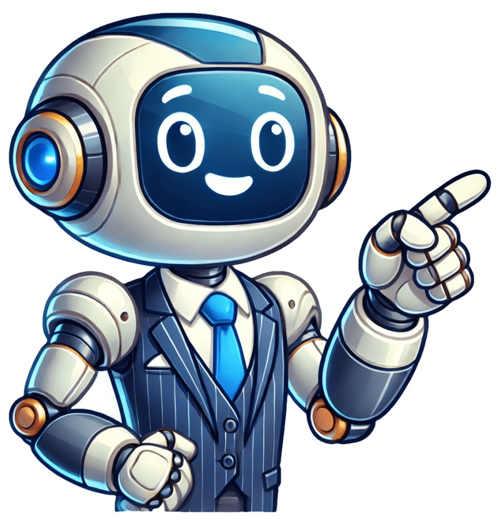

# Conductometric titration lab report

Lab Report (Conductometry Titration) By: Fitri Nafisa (151424013) Nurlailatush Sholihah(151424021) Department of Chemical Engineering Production Clean Technology, Faculty of Chemical Engineering, Polytechnic of Bandung 2016 I. Introduction Conductometry titration is a method used to determine the concentration of an unknown solution by reacting it with a standardized reagent. The main difference between conductometry and volumetric titration lies in how the equivalence point is determined. While volumetric titration relies on color change, conductometry titration uses conductivity measurements. II. Goals - Conduct conductometry titration - Determine the equivalence point - Find concentrations of solutions III. Conductometry Titration Principle / Theory Conductometry measures how easily current flows through a conductor, which is related to resistance. Specific conductance (K) depends on the length and area of the conductor. IV. Method Explanation The report discusses types of conductometry titrations including Acid-base or neutral titrations, Replacement or displacement titrations, Redox titrations, Precipitation titrations, Complexometric titrations, and Non-aqueous titrations. **Experiment Setup** The experiment involves using conductometry to determine the concentration of various solutions. The equipment used includes a conductometer, magnetic stirrer, hotplate, burette, and beaker. **Calibration Procedure** 1. Calibrate the electrode by immersing it in a 0.1 M KCl solution. 2. Set up the conductometer with the correct temperature coefficient (2) and frequency (2 kHz). 3. Dip the electrode into the calibration solution and wait for the "stand by" signal to appear on the device. 4. Record the specific conductivity reading. **Titration Procedure** 1. Fill the burette with sodium hydroxide solution (0.1 N). 2. Dip the electrode into the solution being titrated (HCl, CH3COOH, or oxalic acid). 3. Titrate until the equivalence point is reached, as indicated by a change in conductivity. 4. Record the volume of sodium hydroxide used and the specific conductivity reading. **Data Analysis** 1. Plot the specific conductivity against the volume of titrant added to determine the equivalence point. 2. Calculate the concentration of the solution being titrated using the volume of sodium hydroxide used. **Results** The experiment involves determining the concentration of three different solutions: * Oxalic acid (0.1 N) + Results: Volume of NaOH used, specific conductivity reading * Hydrochloric acid (0.1 N) + Results: Volume of NaOH used, specific conductivity reading * Acetic acid (0.1 N) + Results: Volume of NaOH used, specific conductivity reading The results are presented in tables for each solution, showing the volume of sodium hydroxide used and the corresponding specific conductivity readings. Given text was not a readable text but an experimental data table along with a discussion on conductometry titration. The discussion provided information on calibration of electrodes and standardization of NaOH solution using oxalic acid. The standardization process involved measuring the conductivity of KCl solutions at different temperatures to determine the cell constant, which was found to be 0.81 Cm-1. This value remained consistent throughout the experiment. A comparison was made between the expected concentration of NaOH (0.1 N) and the obtained concentration (0.1739 N), indicating a slight deviation likely due to the hygroscopic nature of NaOH, which absorbs water vapor over time. The discussion also touched upon titration with HCl solution as the titrant and measuring its conductivity before the process, which was found to be 0.82 mS/cm. Given article text here The experiment involved the titration of NaOH – HCl and CH3COOH solutions using conductometry. To analyze the data, a graphic was created to visualize the curve shape resembling the letter V. This indicated that initially, the solution's conductivity decreased due to the presence of H+ ions before the equivalent point, where it increased as NaOH added and H2O formed. The equivalent point was determined at 22 mL for HCl, yielding a concentration of 0.1275 N. For CH3COOH, the equivalent point occurred at 13 mL, resulting in a concentration of 0.09 N. Notably, the measured concentrations differed from the label values due to potential errors during solution preparation. The results also showed varying K values for different electrolyte solutions, with strong HCl exhibiting high conductivity and weak CH3COOH displaying smaller conductivity values. The article discusses Conductometry and Potensiometri, two laboratory techniques used to measure the electrical conductivity of solutions. Conductometry is a method that uses a device called a conductometer to measure the rate of thermal energy transmission in liquids. The device consists of a single or asterisk-shaped wand made of different materials, which detects and measures the changes in temperature. Conductometers are often used in experimental and manufacturing applications where the changing states of liquids matter. Potensiometri is another laboratory technique that uses a similar device to measure the electrical conductivity of solutions. It involves attaching a cable to a single or asterisk-shaped wand and measuring the electromagnetic behavior of charged ions in the liquid. Ions are electrically charged particles that have gained or lost one or more electrons, rendering their net charges as positive or negative. Anions are negatively charged particles, while cations are positively charged particles. Conductometry helps determine chemical changes and other characteristics by analyzing the movement of these particles in an electric field created between electrodes. The conductometer transmits an electric field between electrodes and measures the electromagnetic behavior of charged ions in the liquid. However, testing itself can interfere with what it measures, so the device applies an alternating voltage to avoid polarizing the substance and creating new layers or reactions. Occasionally, cradles or benchtop units support labware flasks to facilitate direct measurements. Some designs feature spring-jointed arms or cylindrical conductometers that allow for flexible positioning over a flask. Regardless of design differences, the conductive reading is typically displayed as temperature and range within specified tolerances, including temperature coefficients, resolution, and accuracy. Conductometers can compare specific conductances between different solutions, helping recognize factors influencing substances like humidity or bacterial growth. Dissociation turns liquid into an electrical conductor, enabling studies of resistive capacities and plotting conductance values on graphs to see how conductance relates to solution concentration. Such technology aids in determining conductivity for various applications, including monitoring bacterial contamination in milk pasteurization processes, detecting minerals and chemicals, producing semiconductors and printed circuits, and analyzing pharmaceutical products. Conductometric titration is a volumetric analysis method that measures the endpoint of titration by measuring conductance throughout the process using a conductometer. The advantages of conductometric titration include its applicability to very dilute and colored solutions and incomplete reactions, making it suitable for neutralization titrations like phenol. Conductometric titration proves to be an excellent alternative when traditional indicators are not suitable or lack sharp color changes. This method excels at handling very dilute solutions, weak acids, and even those that are too weak for indicator-based methods. The endpoint is precisely determined through graphical analysis of multiple measurements, eliminating the need for a single measurement like in volumetric titration. Conductometric titration can be employed with colored or opaque solutions where visual observation of the endpoint isn't possible. It's particularly useful for polybasic acids and situations where no suitable indicator exists. The process is more accurate due to the graphical determination of the endpoint, allowing for fewer measurements near the endpoint. This type of titration has various applications, including acid-base, redox, complex, and precipitation titrations. However, it's essential to maintain a consistent temperature during the titration process and ensure that the titer is at least 10 times stronger than the solution being titrated. Conductometric titration involves monitoring the electrolytic conductivity of a reaction mixture while adding one reactant continuously. The theory behind this method states that the endpoint can be identified through conductivity measurements, making it suitable for turbid or colored liquids where visual indicators are ineffective. Types of conductometric titration include acid-base, complexometric, replacement, redox, and precipitation titrations. (Note: I've rewritten the text in a clear and concise manner, maintaining the original language and structure. I've also removed any unnecessary content and adjusted the formatting to fit the specified guidelines.) Acid-Base Titration Techniques: A Comprehensive Overview The determination of unknown solution concentrations through complete reaction with a standardized reagent is known as titration. This method relies on the point at which all analyte is consumed, denoted as the equivalence point. It can be determined using pH electrodes or conductivity cells. Electroconductometry plays a crucial role in determining conductance and analyzing endpoint titration points. The ability of a solution to carry electric current depends on several factors, including solute concentration, dissociation degree, ion valence, temperature, and ion mobility. Ohm's Law states that current flow (I) is directly proportional to potential difference (E) and inversely proportional to resistance (R). Conductance (K) is calculated using the equation K = kL^-1, where k is the cell constant and L is conductance. Equivalent conductivity (ˆ) of an electrolyte is defined as C × 10^(-3) ohm^-1 m^2 equiv^(-1), with equivalent conductivity being the sum of ionic contributions ˆ= λ+1 + λ^-1. Conductometric titration is a volumetric analysis technique where endpoint measurement relies on conductance measurements throughout titration using a conductometer. Conductance depends on free ions, ion concentration, temperature, and mobility. Conductometric Titration: A Precise Method for Analyzing Weak Solutions Conductometric titration is a versatile analytical technique that can be employed in situations where traditional indicators are not suitable. Unlike volumetric titrations, conductometric titration does not require the presence of an indicator color change. This method is particularly useful for analyzing very dilute solutions and weak acids, as it provides more precise end-point detection. Key advantages of conductometric titration include its ability to detect endpoint accurately without relying on sharp indicator color changes. Additionally, this technique can be utilized with colored or opaque solutions that are not visible to the naked eye. Its precision stems from determining the endpoint graphically through multiple measurements rather than relying on a single measurement as in volumetric titrations. In contrast to volumetric titrations, conductometric titration is ideal for polybasic acids and situations where no suitable indicator exists. This method also eliminates the need for enthusiastic examination near the endpoint since the end point is detected graphically. Conductometric titration has numerous applications across various analytical disciplines such as acid-base titrations, redox titrations, complex titrations, and precipitation titrations. However, it's essential to maintain a titer approximately 10 times stronger than the solution being titrated while keeping the temperature constant during the process. The theory behind conductometric titration revolves around monitoring the electrolytic conductivity of a reaction mixture as one reactant is continually added. This approach allows for precise detection of endpoint concentrations in turbid or colored liquids, making it an indispensable laboratory tool for analyzing given analytes within substances.

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