Acidity of water lab report

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Heat Exchanger

1. Abstract

The objective of this experiment is to study the function and the working of shell and tube heat exchanger. Calculations on the heat transfer and heat loss were carried out for energy balance study. LMTD and heat transfer coefficient also calculated for this experiment. From the data collected, we found out that configuration of Shell and Tube heat exchanger in counter current flow has a higher effectiveness than the co-current flow.

2. Introduction

A heat exchanger is an equipment in which heat exchange takes place between 2 fluids that enter and exit at different temperatures. The main function of heat exchanger is to either remove heat from a hot fluid or to add heat to the cold fluid. The direction of fluid motion inside the heat exchanger can normally categorised as parallel flow, counter flow and cross flow. In this experiment, we study only the parallel flow and counter flow. For parallel flow, also known as co-current flow, both the hot and cold fluids flow in the same direction. Both the fluids enter and exit the heat exchanger on the same ends. For counter flow, both the hot and cold fluids flow in the opposite direction. Both the fluids enter and exit the heat exchanger on the opposite ends. In this experiment, we focused on the shell and tube heat exchanger.

3. Experiment Methods and Materials

The apparatus used in this experiment include a Shell and Tube heat exchanger, a cold water circuit consists of a 50L tank and centrifugal pump, a hot water circuit consists of a 50L tank and centrifugal pump, temperature and flow rate indicators.

The experiment procedures include:

General Start-up Procedure

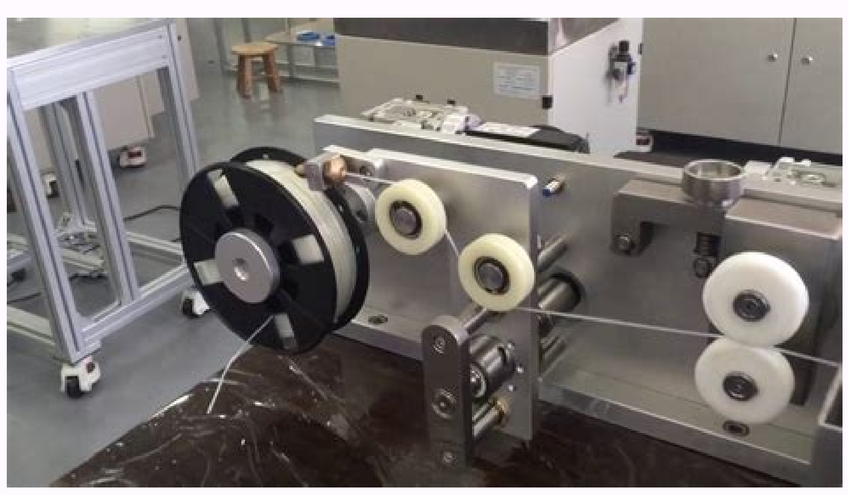
A quick inspection was done to make sure the equipment is in a proper working condition. All the valves are made sure to be initially closed except V2 and V12. The hot water tank was filled up via a water supply hose connected to V27. The valve was closed once the tank is full. The cold water tank was filled up by opening valve V28 and the valve was left opened for continues water supply. A drain hose was connected to the cold water drain point. Then, the main power and the heater for the hot water were switched on. The temperature controller was also set pointed to 50°C. The water temperature in the hot water tank was allowed to reach the set point. After that, the equipment is ready to be run.

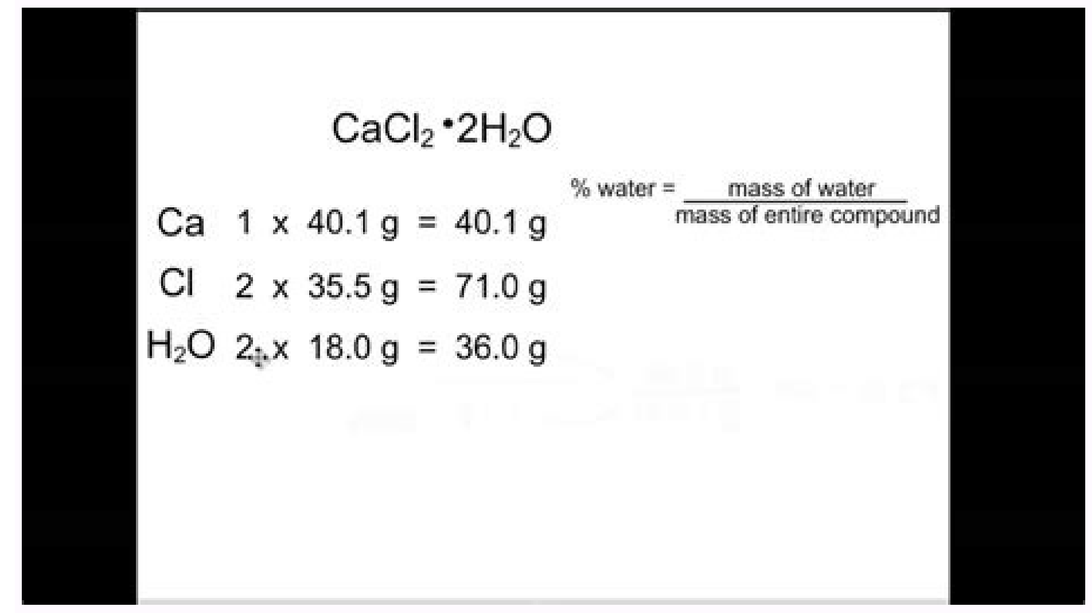
General Start-down Procedure

The heater was switched off and the hot water temperature was waited until it drops below 50 °C. Then, pump P1 and P2 were switch off. After that, the main power was switched off and all water in the process lines were drained off. The water in the hot and cold water tanks was retained. Finally, all the valves were closed.

Counter-current

A first, general start-up procedure was performed before the experiment begins. The arrangement of the valve of Shell and Tube heat exchanger was switch to counter-current as the experiment begins. Pump P1 and P2 were also switched on. Then, valves V3 and V14 were opened and adjusted to obtain the desired flow rates for hot water and cold water stream respectively. The system was allowed to reach steady





 1. 5.0 EXPERIMENT ON DETERMINATIONOF ACIDITY OF WATER AIM To determine the acidity of given water sample INTRODUCTION Acidity is a measure of the capacity of water to neutralise bases. Acidity is the sum of all titrable acid present in the water sample. Strong mineral acids, weak acids such as carbonic acid, acetic acid present in the water sample contributes to acidity of the water. Usually dissolved carbon dioxide (CO2) is the major acidic component present in the unpolluted surface waters. The volume of standard alkali required to titrate a specific volume of the sample to pH 8.3 is called phenolphthalein acidity (Total Acidity). The volume of standard alkali required to titrate a specific volume of the water sample (wastewater and highly polluted water) to pH 3.7 is called methyl orange acidity (Mineral Acidity). PRINCIPLE Hydrogen ions present in a sample as a result of dissociation or hydrolysis of solutes reacts with additions of standard alkali (NaOH). Acidity thus depends on end point of the indicator used. The colour change of phenolphthalein indicator is close to pH 8.3 at 25ºC corresponds to stoichiometric neutralisation of carbonic acid to bicarbonate. MATERIALS REQUIRED APPARATUS REQUIRED 1. Burette with Burette stand 2. porcelain tile 3. 500 mL conical flask 4. Pipette with elongated tips 5. Pipette bulb 6. Conical flask 7. Measuring cylinders 8. Wash Bottle and Beakers CHEMICALS REQUIRED 1. Sodium Hydroxide 2. 2. Phenolphthalein 3. Methyl Orange 4. Ethyl alcohol 5. Distilled Water 3. PRECAUTIONS Colored and turbid samples may interfere in end point. Those samples may be analyzed electrometrically, using pH meter. Do not keep the indicator solution open since it contains the alcohol which tense to evaporate. The mixed indicator solution is containing die in it. Care should be taken so that it is not spill to your skin. If it spills on your skin the scare will remain for at least 2 to 3 days. Presence of residual chlorine may interfere in the colour response, which can be nullified by addition of small amount of sodium thiosulphate or destroy it with ultraviolet radiation. Presence of iron and aluminum sulphate may interfere in the colour response while titrating in room temperature, which can be nullified by titrating the sample at boiling temperature. Dissolved gases contributing to acidity such as CO2, H2S may interfere in the titration, hence avoid vigorous shaking. Samples suspected to have hydrolysable metal ions or reduced forms of polyvalent cations need hydrogen per oxide treatment. TESTING OF SAMPLE Rinse the burette with 0.02N sodium hydroxide and then discard the solution. Fill the burette with 0.02N sodium hydroxide and adjust the burette. Fix the burette to the stand. A sample size is chosen as the titre value does not exceed 20mL of the titrant. For highly concentrated samples, dilute the sample. Usually, take 100 mL of a given sample in a conical flask using pipette. Add few drops of methyl orange indicator in the conical flask. The colour changes to orange. Now titrate the sample against the 0.02N sodium hydroxide solution until the orange colour faints. Note down the volume (V1) consumed for titration 0.4mL. This volume is used for calculating the mineral acidity. To the same solution in the conical flask add few drops of phenolphthalein indicator. Continue the titration, until the colour changes to faint pink colour. Note down the total volume (V2) consumed for titration 2.3 mL. This 4. volume is used for calculating the total acidity. Repeat the titration for concordant values. CALCULATION TABLE Table -1 Mineral Acidity: Sl.No. Volume of Sample (mL) Burette Reading (mL) Volume of NaOH (mL)Initial Final 1. 2. 3. Burette Solution: Sodium Hydroxide Pipette Solution: Sample Indicator: Methyl Orange End Point: Faintof Orange Color Table -2 Total Acidity: Sl.No. Volume of Sample (mL) Burette Reading (mL) Volume of NaOH (mL) Initial Final 1. 2. 3. Burette Solution: Sodium Hydroxide Pipette Solution: Sample Indicator: Phenolphthalein End Point: Faint Pink Color Model Calculation: Volume of NaOH for Mineral Acidity (V1) = mL Volume of NaOH for Total Acidity (V2) = mL Normality ofSulphuricAcid = N VolumeofSample =mL 5. Equivalent weight ofCaCO3 =50 6. Mineral Acidity=Volume ofNaOH(V1)*N*50*1000 Volume ofsample taken To convertthesamplesizefrommLtoL,multiplytheresultby1,000mL/L Mineral Acidity asCaCO3 equivalent (mg/L) = x x 50x1000/100 = mg/L asCaCO3equivalent TotalAcidity = Volume ofNaOH(V2)*N*50*1000 Volume ofsample taken To convertthesamplesizefrommLtoL,multiplytheresultby1,000mL/L Total Acidity asCaCO3equivalent (mg/L) =x 0.02x50x1000/100 = mg/L asCaCO3equivalent INTERPRETATION OF RESULTS The Mineral Acidity as CaCO3 equivalent is = mg/L The Total Acidity as CaCO3 equivalent is = mg/L. INFERENCE Acidity is a measure of an aggregate property of water and can be interpreted in terms of specific substances only when the chemical composition of the sample is known. Acidity may contribute to corrosiveness and influence chemical reaction rates, chemical speciation and biological process. The measurement also reflects a change in the quality of the source water. Strong mineral acids, weak acids such as carbonic acid, acetic acid and hydrolyzing salts such as iron or aluminum sulphates may contribute to the measured acidity . 7. EVALUATION 1. Acidity is . a) Base neutralizing capacity b) Acid neutralizing capacity c) Quantity of acid present d) Quality of acid present 2. An Indicator is a substance that facilitate colour change at the end point. a) True b) False 3. The indicators used in the titration are a) Methyl orange and phenolphthalein b) Methyl red and phenolphthalein c) Methyl orange and Methyl red d) Bromocresol green and Methyl red 4. To prepare 100 mL of 0.02 N of NaOH from 1 N NaOH, dilute of NaOH. a) 20 mL b) 2 mL c) 0.2 mL d) 0.02 mL 8. 5. The major acidic component of surface water is a) Dissolved oxygen b) Dissolved carbon di oxide c) Dissolved sulphur di oxide d) Dissolved nitrous oxide 6. The end point determination in titration will be based on the . a) Temperature b) Hardness c) Residual Chlorine d) Conductivity 7. The methyl orange acidity is at pH _. a) 3.7 b) 3.9 c) 4.5 d) 4.7 8. The phenolphthalein acidity is at pH is 8.3 a) 8.3 b) 9.3 c) 4.3 d) 7.3 9. For dilution purposes, type of distilled water is used. a) Organic free b) CO2 free c) O2 free d) Ordinary 10. Acidity can be electrometrically measured by a) pH meter b) Conductivity meter c) Turbidity meter d) Spectrometer 9. ENVIRONMENTAL SIGNIFICANCE Acidity interferes in the treatment of water. Carbon dioxide is of important considerations in determining whether removal by aeration or simple neutralisation with lime /lime soda ash or NaOH will be chosen as the water treatment method. The size of the equipment, chemical requirements, storage spaces and cost of the treatment all depends on the carbon dioxide present. Aquatic life is affected by high water acidity. The organisms present are prone to death with low pH of water. High acidity water is not used for construction purposes. Especially in reinforced concrete construction due to the corrosive nature of high acidity water. Water containing mineral acidity is not fit for drinking purposes. Industrial wastewaters containing high mineral acidity is must be neutralized before they are subjected to biological treatment or direct discharge to water source The acidity of water is its quantitative capacity to react with a strong base to designated pH or it can be defined as the base neutralizing capacity (BNC).In this article, we are going to read about the determination of acidity of water. Strong mineral acids, weak acids such as carbonic acids and acetic acid and hydrolyzing salt such as ferric and aluminium sulfates may contribute to

the sources of acidity in water. Dissolved CO2 is usually a major acidic component of unpolluted surface water. Industrial wastes usually contain mineral acidity. Determination of acidity is important because acids contribute to corrosiveness and influence certain chemical and biological processes.These are the main sources of acidity in water. Theory based on acidity of water sample calculation Hydrogen ions present in a sample as a result of dissociation hydrolysis of solutes is neutralized by titration with standard alkali. The acidity thus depends on endpoint pH or indicator used. CO2 is usually a major acidic component of unpolluted surface water. In a sample containing only CO2 – bicarbonate – carbonates, titration to pH 8.3 at 25oC corresponds to stoichiometric neutralization of carbonic acid to bicarbonate. As the colour change of phenolphthalein indicator is close to pH 8.3, this value is generally accepted as a standard endpoint for titration of total acidity including CO2 and mineral acids. Mineral acids are measured by titration to a pH of about 4.5 using methyl orange as indicator. Mineral acidity is also called methyl orange acidity. Apparatus used for the acidity test of water Burette Pipette Erlenmeyer flask Reagents used in the acidity test of water CO2 free distilled water 0.02 N standard NaOH Methyl orange indicator Phenolphthalein indicator Procedure for determination of acidity of water Pipettes V mL (say 50 ml) of the sample to the flask. Added 1 or 2 drops of methyl orange indicator. The sample is then titrated against 0.02N standard NaOH. The endpoint is noted as colour changed from orange-red to yellow. The titrate value is recorded as V1. Added one or two drops of phenolphthalein indicator. Titration is continued until the colour changed to faint pink. The volume of titrant used is noted as V2. Acidity of water Determination of acidity test of water Read More The below video shows the determination of acidity of water by titration

Acidic water can also affect the functioning of fish gills. Some fish species tolerate acidic water better than others. Brook trout tolerate water with a pH as low as 5.0 while small mouth bass feel the effects at a pH of 6.0. Low water acidity can stress or stunt the growth of some fish making them less able to compete for food. We assess, develop, and deploy workflows ranging from sample collection through the final report. Our profession ensures the ... Drinking water, portable water, Filtered Water, Groundwater ... Testing Parameters: Chemical Characteristics – e.g. dissolved oxygen, acidity (pH), salinity, nutrients and other contaminants ... Frooti is a mango-flavoured drink sold in India.It is made with natural flavours and mango-concentrate. It is the flagship product and most successful drink product made by Parle Agro.Frooti was launched in 1985 in Tetra Pak packaging, and is now also sold in PET bottles and rectangular shaped packs. Frooti is exported to the United States, Canada, the United Kingdom, ... The Chemistry. When carbon dioxide (CO 2) is absorbed by seawater, chemical reactions occur that reduce seawater pH, carbonate ion concentration, and saturation states of biologically important calcium carbonate minerals.These chemical reactions are termed "ocean acidification" or "OA" for short. Calcium carbonate minerals are the building blocks for the skeletons and … 25/11/2021 · PRO-LAB Complete Water Analysis test kit is the most complete and accurate instant water test available to ... Pesticides, Total Chlorine, Free Chlorine, Total Hardness, Hydrogen Sulfide, pH (Acidity), Total Alkalinity, Copper, Iron Bacteria, Nitrates, Nitrites, Iron; All tests are instant and do not ... Report Review. Jun 19, 2022. 29/10/2021 · This is the EPA's Report On the Environment (ROE) which compiles the most reliable indicators currently available to answer 23 important questions that EPA believes are critical to it's mission of protecting human health and the environment. Routine Soil Analysis. Soil samples are analyzed for pH, phosphorus, potassium, magnesium, and calcium. Customer information form.A soil test report detailing soil test values, ratings and, lime and fertilizer recommendations is sent to the customer by e-mail and/or regular mail within 3-7 days after the samples are received by the lab by e-mail and/or regular mail. Then titrate 100.0 ml of deionized water with your 0.16N acid as follows: Make sure your digital titrator is working and reset to zero. Add 10 digits of acid, record digits and pH, increase acid to 20 digits, record pH; repeat until you have added 100 digits of acid and stop. Send the results to us and we will send you a report. 08/12/2017 · These sensors gauge the light availability in water bodies depending on the water level and indicate the concentration of dissolved organic matter (DOM). 2. Chlorophyll Fluorescence Analysis. When the surface water in ponds and lakes is rich in minerals, namely phosphorus and nitrogen, algae flourish.

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