IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.414 ⪽ Peer-reviewed & Refereed journal ⪽ Vol. 13, Issue 6, June 2025

DOI: 10.17148/IJIREEICE.2025.13604

IONIZATION AND ELECTROPLATING EFFECTS OF DISSOLVED SUBSTANCE IN LIQUID SLUTIONS

Onyeyili T. 1[1], Ezeagwu C.O[2], Onuzulike V.C[3], Anyigor, I. S [4], Ugwuanyi, P. O[5] and Ugwuanyi Gilbert[6]

Department of Electronic and Computer Engineering, Nnamdi Azikiwe University, Akwa.[1,2,3,6]

Department of Civil and Electrical/Electronic Engineering, Ebonyi State University, Abakaliki[4]

Department of Industrial Physics, Ebonyi State University, Abakaliki[5]

Abstract: The application of electrical conductivity in liquids in electroplating process is investigated. Electrolysis is a process of separating elements electrically. A great many liquids are decomposed when an electric current passes through them, and this process is known was electrolysis. Elements are often chemically combined with other elements and must be separated. Electrolysis is employed in the industry for electroplating of metal, purification of metals, and extraction of metals from their ores. Generally, electrolysis is a process by which electric current is passed through a substance to effect chemical change. The chemical change is one in which the substance loses or gains an electron (oxidation and reduction). The term electrolysis was first popularized in the 19^{th} century by Michael Faraday, and it is a process that helped in the study of chemical reactions in obtaining pure elements. It is further defined as a process of decomposing ionic compounds into their elements by passing a direct electric current through a compound in a fluid form (solution). In the process of electrolysis, the cations are reduced at cathode and anions are oxidized at the anode. The main components required in the electrolysis process are electrolyte, electrodes, and some form of external power sources (DC power source). The process is of course done in a vessel called the "electrolytic cell", containing two electrodes (cathode and anode), which are connected to a direct current (DC) source and an electrolyte which is an ionic compound undergoing decomposition, in either molten form or in a dissolved state in a suitable solvent (liquid). Generally, electrodes that are made from metal graphite, and semiconductor materials are used. However, the choice of a suitable electrode is done based on chemical reactivity between the electrode and electrolyte as well as the manufacturing cost. Usually, in electrolysis process, there is the interchange of ions and atoms due to the addition and removal of electrons from the external circuit. On passing current through the electrolyte via the electrodes, cations move to the cathode, take electrons from the cathode (given by the supply voltage source), and discharged into the neutral atom. If it is so the neutral atom is solid, it is deposited on the cathode, but if it is gas, it moves upwards and this process is called a reduction process, and the cation is reduced at the cathode. Similarly, anions give up their extra electrons to the anode and it is oxidized to neutral atoms at the anode. The electrons released by the carriers travel across the electrical circuit and reach the cathode, thereby completing the circuit. It is worthy to note very important role the cell voltage (potential) plays in electrolysis process which largely depends on the ability of the individual ions to absorb or release electrons. It is also sometimes referred to as the decomposition potential, which is the minimum voltage difference in electrode potential, between anode and cathode for an electrolytic cell that enables electrolysis to occur. To simplify the understanding of electrolysis, discussed in a very simple term, the electrolysis of Copper Sulphate solution.

Keywords: Conductivity, Oxidation, Electrolysis, Electroplating, Electrolyte, Electrode.

I. INTRODUCTION

Generally, conduction of electricity is the movement of the charged particles in an organized manner, resulting in a movement of charge through material. When charged particles, move in an orderly fashion through a material, we get an electric current.

Electric conduction therefore is the movement of electrically charged particles through a transmission medium. The movement can form an electric current in response to an electric field. The underlying mechanism for this movement depends on the material. Materials that conduct electric current easily are called good conductors of electricity. Examples are most metals such as copper, zinc, silver, gold.

Materials that do not allow the passage of electric current through them are called insulators and examples are wood, plastic, rubbers.

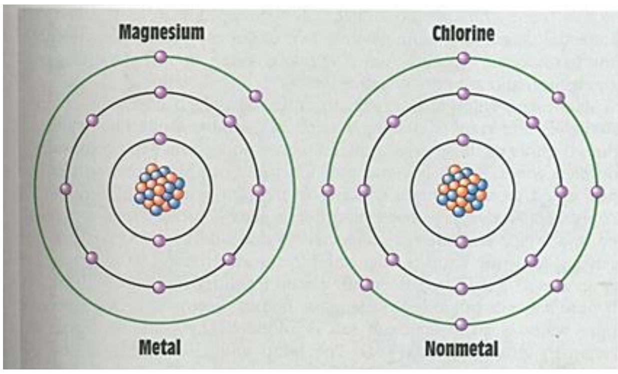
ISSN (O) 2321-2004, ISSN (P) 2321-5526
International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering
Impact Factor 8.414 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 6, June 2025
DOI: 10.17148/IJIREEICE.2025.13604

There are materials that are neither conductors, nor insulators, which can be made to conduct electrical current by addition of impurities called dopants, in a process called doping. These materials are referred to as semiconductor materials. Examples include Germanium (Ge) and Silicon (Si).

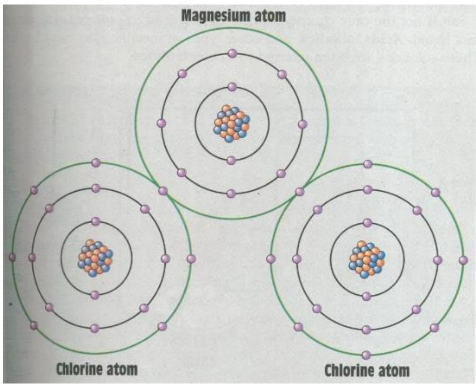
Generally, conduction of electric current was thought of as electrons moving through a wire (solids) only. However, many processes depend on electrical current flowing through gas or liquid. For instance, batteries would not work if conduction could not take place through a liquid, and fluorescent lighting operates on the principle of conduction through a gas.

Unlike in solids (metals) conduction through a gas or liquid does not depend on the flow of individual electrons. In this case conduction of electricity depends on the movement of ions. Materials are composed of atoms and when these atoms are charged, ions are formed. When atoms loose electrons, they possess excess protons and become positively charged, but if atoms gain electrons they possess excess electrons and they become negatively charged. These ions are what constitute electric conduction in liquids and gases. The process of atoms dissociating into ions is called ionization. A good example of how ionization occurs can be seen by the combination of two atoms, magnesium and chlorine.

The magnesium atom contains two valence electrons and it is considered to be a metal, while the chorine atom contains seven valence electrons and it is considered a non-metal. Figure below shows atomic structures of the magnesium and chlorine atoms.



Magnesium/chlorine atoms.
When the magnesium metal is heated in the presence of chlorine gas, a magnesium atom combines with two chlorine atoms to form a metallic salt, called magnesium chloride (MgCl).
This other figure shows the magnesium atom combining with the two chlorine atoms to form magnesium chloride.



Magnesium atom combines with chlorine atoms
This process converts the atoms to ions. So the magnesium atom gave up two electrons to become positively charged ion, while the chlorine atoms that have gained the electrons become negatively charged ions. Acids, alkalis, and other types of metallic salts can be used as wall to promote conduction in liquid. The solutions so formed by the dissolution or decomposition of these salts and compounds are called electrolytes.

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.414 ⁘ Peer-reviewed & Refereed journal ⁘ Vol. 13, Issue 6, June 2025

DOI: 10.17148/IJIREEICE.2025.13604

Generally, liquids are poor conductors of electricity, but with the dissolution of salts and other compounds in the liquids, they can conduct electricity. The electrical conduction in liquids has numerous benefits.

It has wide applications in the industries for various purposes. Batteries operate on the principles of electrical conduction in liquids. Electrolysis which is a demonstration of electrical conductivity in liquids is used in electroplating of metals, purification of metals, and the extraction of metals from their ores (Ugwu et al, 2013).

The conduction of electricity in liquids therefore takes place with the help of charges through dissolved compounds or substances in the liquids, the enormous benefits derived from the effects of electrical conductivity in liquids has led researchers and scholars to carry lots of research works and reports on the conductivity of electricity in liquid. Some of these past works and reports are reviewed here to gain more knowledge on electrical conductivities in liquids, its causes, effects and application.

Variation of Electrical Conductivity of the Different Sources of Water with temperature and concentration of Electrolyte Solution (NaCl).

A.K. Shrestha, N. Basnet, C.K. Bohora, and P. Khadka (September, 2017, 2017: https://www.researchgate.net), investigated one of the important physical parameters of water, which is “electrical conductivity.

Water is one of the most important matters in the nature and it is widely used for different purposes in a variety of applications. Water is used in various applications for electricity production, irrigation, domestic, industrial and commercial purposes.

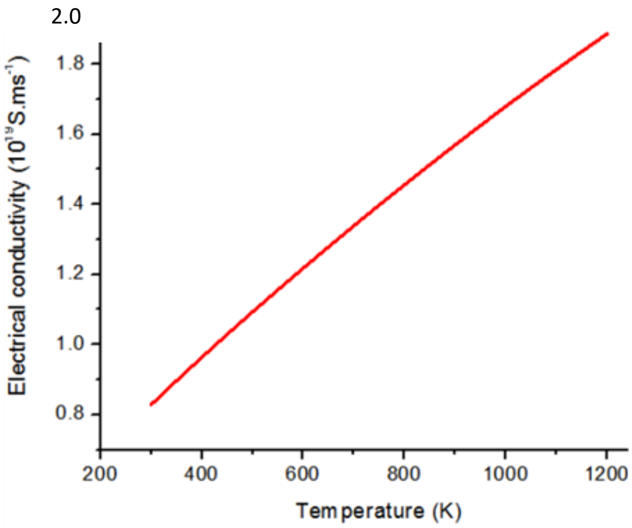
Electrical conductivity can be regarded as a crude indicator of water quality for many purposes and it has been measured in practice for more than 100years. However, its importance cannot ever be over – emphasized. It is still important and widely used to analyze the water parameters today. Electrical conductivity is one of the main physical parameters, which allow us to monitor the ionic impurities dissolved in water, and wide range of different types of water (pure drinking, and natural) water. Electrical conductivity is also used to determine the concentration of conductive chemicals. The main aim of the study was to measure and compare the electrical conductivity of different water samples and to analyze its variation with temperature and concentration of dissolved impurities. The study therefore measured the electrical conductivities of tap underground, sewage and some river, waters, along with those of different concentration of sodium chloride (NaCl) electrolyte solution and with different temperatures.

The measurement of electrical conductivity always gives the pollution level and purity of water.

The study carried out the measurement of the electrical conductivities of the water samples with the help of deluxe conductivity meter, with the data taken three tines on the interval of 15days from the sample place to find the average value of the given parameters.

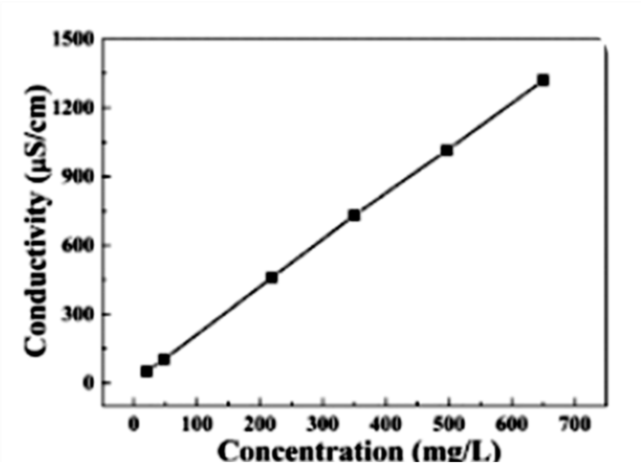
With the data generated, plots of electrical conductivity against temperature variation and concentration of NaCl were made as in figures below.

The results showed that in all samples, when temperature is increased from 40^0C to 70^0C, the electrical conductivity will increase by more than 50^0%. The increase in the electrical conductivity of the water samples were explained to be there to the increase in mobility of the ions.



Variation of electrical conductivity with temperature and that of Variation of conductivity of water with concentration of NaCl.

DOI: 10.17148/IJIREEICE.2025.13604



The result also showed that electrical conductivity of water sample ranged from 0.28 to 0.82 mS/cm, at 40^0C during the study. It showed that the maximum conductivity was found with the sewage water, while the minimum was found with one of the river waters investigated. The explanation was that sewage collects the domestic, municipal, and industrial waters. So it has high value of dissolved organic and inorganic matters. On the effect of dissolved NaCl, the study found out that the conductivity of each of the water sample gradually increased as the concentration of the NaCl gradually increase. It is due to the presence of the excess ions in the water. Since the charge ions in the solution facilitates the flow of electrical current, the conductivity of a solution is highly (but not totally) proportional to its ions concentration. Over large conductivity ranges conductivity will increase with concentration experimentally, it was found that as the concentration increased from 2.5% to 20%, the electrical conductivity increase nearly by more than 300% in samples conclusion.

An experimental study has been performed to bring out the influence of temperature and concentration of NaCl on the electrical conductivity of different water samples.
It has been observed that the electrical conductivity of different water samples have positive correlation with temperature, and concentration. It is concluded that parameters such as temperature and impurities (dissolve solids) play an importance role for the determination of the electrical conductivity.

A new System for Measuring Electrical Conductivity of Water as a function of Admittance (Hawa y Yacoob Aldosky, and Susan M.H. Shamdeen, December 12, 2011: https://www.researchgate.net).
This study presented a new and cheap system for measuring the water conductivity as a function of electrophysical property called admittance.
The electrical conductivity (EC) of a water solution is a measure of how much material is dissolved in the water Haval and Shamdeen, 2011: https://www.researchgate.net). Electrical conductivity (EC) alone is not adequate to characterize water. It has been suggested that drinking water quality can be checked effectively by measuring the conductivity of the water. EC is usually measured by a probe that applies voltage between two electrodes and records the drop in voltage. This drop reflects the resistance of the water to the flow of electric current, which is then converted to conductivity. This study revealed that electrical conductivity cannot to measured directly, but it is calculated from the measurement of the resistance of an electrolyte where the conductivity and resistance are inversely related as:

$$R = \rho(l/A) = (^1/_K)\,(^1/_A) = {}^C/_K$$

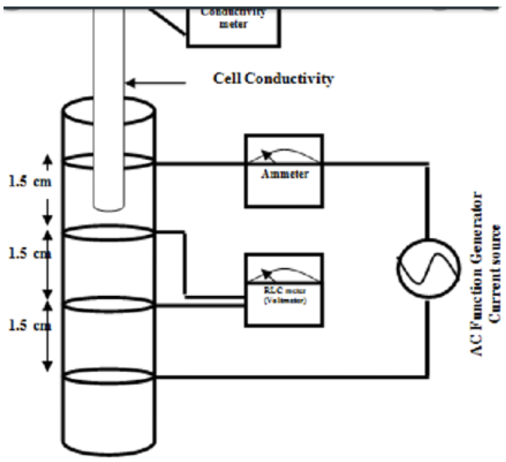
Where:
R is the resistance
ρ is the electrical resistivity
K is the electrical conductivity with Unit of Siemens/an,
L is the effective length of the current Path, and
C is the cell factor.

The study highlighted the various methods and instruments that can be used to measure the electrical conductivity of water. However, some of them are not fully appreciated by most users for a number of reasons ranging from difficulties in usage to high process cost for instance, measuring EC conventionally, requires calibration with a standard liquid and

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526
International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering
Impact Factor 8.414 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 6, June 2025
DOI: 10.17148/IJIREEICE.2025.13604

predetermination of the cell factor C, which should be set to a constant. However, using a standard liquid and setting the cell factor to a constant value is not fully appreciated by most users because it is a costly process.

The study therefore, presented a new system for measuring the electrical conductivity of water.
In the new system as proposed by the study, two basic requirement (steps of procedures) for the conductivity measures were involved. One is by inducing a small AC current through a precise volume of the liquid to be studied, and the second is by measuring small changes of electric potential across the liquid. The first step involves use of a conductivity measuring cell, which is combined with other associated external equipment such as function generator, RLC meter, an ammeter, and digital multimeter as shown.



Fabricated cell with electrical circuit.
This set up involve two main components which are the cell fabrication and impedance measurements.
The study considered two set ups which were four electrodes and two electrodes with two modes.
The impedance measurements are carried out at different frequencies ranging from 500Hz to 100KHz, by filling the tube with one water sample at a time (distilled, mineral, river, rainfall, and tap water). The voltage of the applied sinusoidal (AC) signal is about 10Vrms. The electrical conductivity of the liquid is derived from its impedance z. the admittance of the liquid is then calculated form the reciprocal of Z.

In the four electrode setup, the impedance of the water samples is determined by the ratio of the electrical current (I), Measured at the two outer electrodes and the measured potential drop ΔV between the two inner electrodes.

In the two electrodes setup one with two inner electrodes and the other with two outer electrodes, a voltage is applied to two electrodes rings immersed in the water sample. The resultant current which is related to the small changes in the electric potential across the two electrodes is measured. The impedance is then determined by finding the ratio between I and ΔV.

In the four electrode setup, a relationship between EC values measured by a commercial instrument EC meter and admittance was established for different water samples at each frequency.
In the two electrode setup, two modes were considered, namely: 2-inner, and 2-outer electrodes.

The study therefore admitted that the results showed good correlation between the measured admittance and the conductivity of all the water sources and the best correlation was found at low frequencies between 50Hz and 20Hz.
In conclusion, the study stated that in view of the aforementioned results, the admittance measured by the three different electrode setups correlates well with the conductivity of water. However it noted that best results can be achieved by performing the four electrode setup which allows more flexibility in controlling the effect of the electrode impedance, and so, it concluded that the proposed setups are suitable for measuring the conductivity of water samples within a wide range (including very low conductivity of tap water).

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.414 ⁘ Peer-reviewed & Refereed journal ⁘ Vol. 13, Issue 6, June 2025

DOI: 10.17148/IJIREEICE.2025.13604

II. MATERIALS AND METHODS

The materials instruments/apparatus, used for this investigation, and the methodology employed in the investigation are presented here.

An electrical conductivity (EC) meter

An electrical conductivity (EC) meter is a device or instrument that measures the electrical conductivity in a solution. It has multiple applications in research and engineering, with common usage in hydroponics, aquaculture, aquaponics, and fresh water systems, to monitor the amount of nutrients, salts, or impurities in the water. Its operational principles involves the placement of two probes (electrodes) in the sample under test, and a potential difference (voltage) is applied across the pates, and the current that passes through the solution is measured. So, the electrical conductivity meter (EC), is equipped with a probe usually handheld, to field or no-site measurement. After the probe is placed in the liquid to be tested, the meter applies voltage (potential difference), between two electrodes (plates) inside the probes, electrical resistance from the solution causes a drop in voltage which is read by the meter. The meter subsequently, converts the reading to milli – or micro-0hms, or milli-, or microsienmens/cm. this value indicates the total dissolved solids. Total dissolved solids (TDS) is the amount of solids that can pass through a glass-fibre filter. It is important to remember here that electrical conductivity refers to the conduction of electrical current in a solution, and the value depends largely on the liquids ionic strength. It also depend on which ions are present, in what concentration and in what form, such as what state of oxidation or mobility the ions are in. ions carry a negative or positive electrical charges. Anions are negatively charged while the cations are positively charged. In natural water bodies for instance, the ions that contribute to high conductivity results from dissolved minerals, and salts. The reading of a conductivity is however usually without a temperature correlation.

Since ionic strength, and of course conductance is temperature dependent, the reading of the conductivity meter may be inaccurate. Thus, many conductivity meters including the (Labtech digital conductivity meter), used in this investigation, have a specific conductance measurement as well.
When the conductivity meter is in the specific conductance mode, it reads the conductivity of the solution at 25^0C not at the actual temperature of the experimental environment conditions.
For a better, and accurate readings with the conductivity meter, it is always calibrated before use. The calibration procedures are usually contained in the meter's operational manual, and must be strictly followed. The EC meter used for this investigation (Labtech digital conductivity) meter has been calibrated properly according to the instruction on calibration.

The figure shows the handheld electrical conductivity meter used for the investigate.

DOI: 10.17148/IJIREEICE.2025.13604

Sodium chloride Crystal (Solid)

Sodium chloride, otherwise known commonly as table salt, is an ionic compound with the chemical formula NaCl, representing a 1:1 ratio of sodium and chloride ions. With molar masses of 22.99 and 35.45g/mol respectively, 100g of NaCl contains 39.34g Na, and 60.66g of Cl. Sodium chloride is one of the most abundant minerals on earth, and an essential nutrients for many animals and plants it is naturally found in sea water and in underground rock formations. Sodium chloride finds useful applications in various fields.

In healthcare, sodium chloride is used to help prevent patients from becoming dehydrated. It is widely used in food industries as a preservative and as a flavor enhancer.

Sodium chloride is used in manufacturing to makes plastics and other products. It is major raw material in the industrial manufacturing of variousV chemicals such as sodium carbonate, sodium hydrogen carbonate.

In cold countries, it is used to prevent the build-up of ice on the roads (de-ice roads), bridges which in important for safe driving conditions.

Sodium chloride is a white, odorless crystalline solid, and contains a density of 2.165g/ml with a melting and boiling, points of 801^0C and $1,413^0$C respectively, it is also available as aqueous solutions with different concentration which are known as saline solutions. It has a maximum solubility of 357mg/ml in water at 25^0C. sodium chloride (NaCl) is unusual in that its solubility does not increase appreciably with temperature, since at 100^0C the solubility is only 384mg/ml.

This figure shows the typical sodium chloride crystal used in this investigation.

Copper Electrodes (probe)

IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.414 ⁙ Peer-reviewed & Refereed journal ⁙ Vol. 13, Issue 6, June 2025

DOI: 10.17148/IJIREEICE.2025.13604

The copper electrodes are the sensors used in detecting the presence of ions in the solution one of the electrodes is the positively electrode (Anode) which the other forms the negative electrode (cathode). The electrodes are connected to the EC meter and to be able to detect the presence of the ions in the solution, they are completely submerged in the solution of NaCl and water.

Glass Beakers

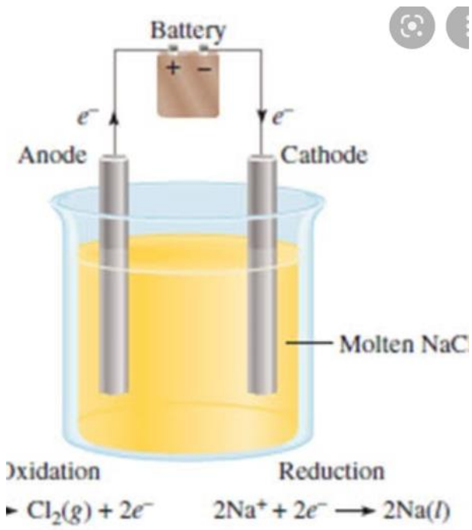
The glass beakers are used to hold the liquids. A larger beaker is used to hold liquid waters, while the smaller beaker (250mol) holds the solution of sodium chloride to be investigated.

Kimwipe Tissue Paper

This tissue paper is used to wipe dry the probes whenever necessary.

III. METHODOLOGY

Using the materials and apparatus/instruments described in section above, the setup was implemented as shown in figure



Setup for the investigation of the effects of dissolved sodium chloride distilled water

The electrical conductivity (EC) meter was turned on to calibrate the probes, in accordance with the manufacturer's instruction; using standard solution of known electrical conductivity; ensuring that the probes were thoroughly rinsed used with distilled water and dry with kinwipes in between tests.

The meter itself was calibrated for temperature compensation using temperature compensation Knob on the EC meter,

The smaller beaker (250mol) was properly rinsed with distilled water 100ml of distilled water was placed in the clean beaker and the electrodes inserted into the water so that they are submerged completely. The electrical conductivity meter was then switched on, and the meter reaching allowed to stand for about 1 minute to stabilize. The meter conductivity reaching in MS/CM was read and recorded the as the reference conductivity value (at zero concentration)

100ml distilled water was placed in another 250ml clean glass beaker. 0.1g (100mg) was dissolved in the distilled water, and EC measured and recorded. This procedure was repeated for more concentrations of the solution with 0.2g (200mg), 0.3 (300mg), 0.4g (400mg), 0.5(500mg), 0.6g(600mg) and 0.7(700mg) of sodium chloride, and in each case, the electrical conductivity reading was recorded.

IV. RESULTS OF INVESTIGATIONS

The results of the measurements obtained are presented here tabulated which shows the table of value for the electrical conductivity measured with the corresponding chloride concentrations.

Concentration of sodium chloride solution (g/100ml)	Conductivity of the solution µS/Cm
0.00	0.00
0.10g (100mg)	150.00
0.20g(200mg)	450.00
0.30g (300mg)	750.00

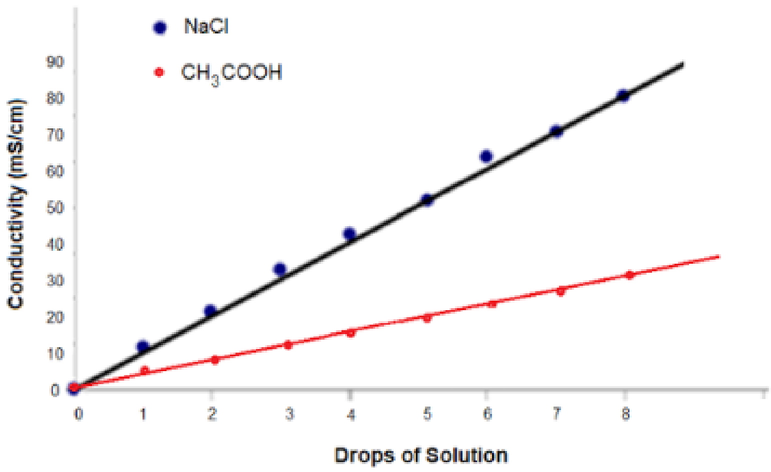
International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering
Impact Factor 8.414 ⁘ Peer-reviewed & Refereed journal ⁘ Vol. 13, Issue 6, June 2025
DOI: 10.17148/IJIREEICE.2025.13604

0.40g (400mg)	850.00
0.50g (500mg)	950.00
0.60g (600mg)	1050.00
0.70g (700mg)	1200.00

A plot of conductivity against the solution concentration was made using the data in table, figure shows the plot of the conductivity (NS/cm) against the concentration of sodium chloride solution (g/100ml)
Plot of conductivity against concentration of sodium chloride solution, number of drops added, molarity and conductivity of sodium chloride and acetic acid.

Drops added	**Molarity**	**Sodium Chloride conductivity (MS/CM)**
0	0	1
1	0.000571429	74
2	0.001142857	154
3	0.001714286	244
4	0.002285714	366
5	0.002857143	435
6	0.003428571	524
7	0.004	593
8	0.004571429	660

The plot shows the relationship between concentration and conductivity of sodium chloride and acetic acid
Conductivity as a function of concentration.



Using the plots and the data above, the study calculated.

Calculation
Volume = 1.2ML
Average volume per drop = 1.2ml/30drops = 0.04ml/dg
Molarity = (4x10^{-5}mol NaCl/drop) (1drop/70ML/Litre)

= 5.7 x 10^{-5} NaCl

The results of this study showed that as the number of drops increases and the concentration due to that increases, the conductivity increases for sodium chloride for instance from the table, it can be seen that as the drops increased from O to 8, drops the conductivity increases from O to 660µS/cm. similarly, as the drop of Acetic acid increases from O to 8, drops, the conductivity of the acetic acid increases from 2 to 97, from the graph, it can be seen that the slope of NaCl conductivity was much stepper than the slope for Acetic Acid conductivity.
In conclusion, the study noted that increasing the concentration of a solution the concentration of a solution affects the conductivity. Sodium chloride is a strong electrolyte and so, when it is dissolved in a solution, it completely dissociated into its various ions (Na^+) and (CL^-) ions.

DOI: 10.17148/IJIREEICE.2025.13604

So when more drops are added, concentration of the ions increases and the conductivity increases in response. However, Acetic acid is a weak electrolyte and when dissolved in solution, it doesn't completely dissociate, so that as the drops is increased, thereby increasing its concentration, its conductivity increased but very little. This implies that having both strong, and weak electrolytes the strong electrolyte's conductivity will increase at a faster rate than the weak electrolyte. In the current study chloride in pure water, on the electrical conductivity of the solution is being investigated.

V. DISCUSSION

The distilled water showed no electrical conduction. Pure water is a poor conductor of electricity. The distilled water contained no conductive ions and therefore showed no conductive behavior when the electrical conductive meter was connected across it, However, when salt and other impurities or contaminants in water dissociates into components called ions, the distilled water can then conduct electricity and thus, becomes a good conductor of electric current.

As it has been observed in this investigation, when sodium chloride was added to the distilled water, there was conduction as recorded by the conductivity motor. As shown in figure 4.1 (plot of conductivity against concentration increases with increasing salt concentrations in the solution. So with the presence of dissolved impurities sodium chloride (NaCl), the water's insulation resistance or dielectric constant of 80, permits the sodium ion (Na^+) and the chloride ions (Cl^-) to move freely through the liquid, and promotes an account for the change in the conductive behavior of the distilled water in the situation above, the sodium atom is converted into sodium ions and the chlorine atoms are equally converted into chloride ions.

Since the conductivity increases as the NaCl concentration in the water increase it then means that the sodium chloride (NaCl) concentration has a linear effect on the conductivity value of NaCl solution, so that the higher, the sodium chloride concentration, the higher the conductivity of the solution. Another very important revelation the study has given in the issue of solution saturation.
From the graph, it could be seen that at very higher concentration of sodium chloride (NaCl) ion the solution, say at about 700mg (0.7g), the curve tends to descend. It was no more linear as it was tending to curve down wards. This indicates that the solution was getting saturated and no more ionic increase.

VI. CONCLUSION

Liquids including water are very pore conductors of electricity. However, a lot of processes depend on the conduction of electric current through liquids. Liquids therefore need to be conditioned to enhance electrical conduction through them. This study has therefore shown that when impurities such as salts are added into liquids, it can conduct electricity very excellently.

So the effects of dissolved substances in the electrical conductivity of liquid is that such liquids become enhanced to conduct electric current when these impurities are dissolved in them.
Consequently, when sodium chloride is dissolved in distilled water, the distilled water became a conductor of electricity, and the higher the concentration of the salt, the higher the electrical conductivity of the solution.

REFERENCES

[1]. Herman S L, (1993): Delmar's standard Textbook of Electricity, published by Demar's Publishers Inc.
[2]. Schuller C. A. and Fowler, R. J, (1993): Electric Circuit Analysis, published by Glenco Divisions of Macmillian/MacGraw-Hill School publishing Co.
[3]. Theraja, B. L., and Theraja, A. K, (2005): A standard textbook of Electrical Technology, 1st multicolor edition, Vol. 1, published by Chand and Co Ltd.
[4]. Ugwu, E. I., Ugwuanyi, U. J., and Ugwu, R. N., (2013): Element of general physics, 1st edition, published by Iyke Ventures production Enugu, Nigeria.
[5]. Mehta, V. K., and Mehta, R. principles of Electronics. 2nd edition. Published by S Chanda Co. Ltd.
[6]. Geddebsb, S. M., (1981). Advanced Physics.
[7]. Sensorex, (2016): https://www.sensorex.com.
[8]. Topper: https://www.topper.com, Electric conductivity.
[9]. Assia Shita (2016): www.scholars research library.com
[10]. BYJUS (2022). https://byjus.com
[11]. Shresta et al (2017). https://www.researchgate.net
[12]. STUDOC (2020): https://www.studocu.com, Electrcal conductivity of aqueous solutions.