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COMPARISON OF THEORETICAL AND EXPERIMENTAL VALUES OF THE KINETICS OF HYDROLYSIS OF ETHYL ACETATE

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ABSTRACT

The principles of chemical kinetics apply to purely physical processes as well as to chemical reactions. Study of chemical kinetics is concerned with understanding the rates of chemical reactions. It is to be contrasted with thermodynamics, which deals with the direction in which a process occurs but in itself tells nothing about its rate. Present paper reveals the Chemical kinetics, of some chemicals such as ethyl acetate with the help of conductometeric titration. Thermodynamics is time's arrow, while chemical kinetics is time's clock. Chemical kinetics relates to many aspects of cosmology, geology, biology, engineering, and even psychology and thus has far-reaching implications.

Besides being of intrinsic scientific interest, knowledge of reaction mechanisms is of practical use in deciding what is the most effective way of causing a reaction to occur. Many commercial processes can take place by alternative reaction paths, and knowledge of the mechanisms makes it possible to choose reaction conditions that favour one path over others. One reason for the importance of kinetics is that it provides evidence for the mechanisms of chemical processes.

Keywords: *slow reaction, velocity, saponification, conductivity, hydrolysis.*

I. INTRODUCTION

A description of a reaction mechanism must therefore deal with the movements and speeds of atoms and electrons. The detailed mechanism by which a chemical process occurs is referred to as the reaction path, or pathway[1].To review the experimental aspects of ethyl acetate ,Hydrolysis of ethyl acetate by sodium hydroxide was performed and result so obtained were observed using conductometer[2]. A chemical reaction is, by definition, one in which chemical substances are transformed into other substances, which means that chemical bonds are broken and formed so that there are changes in the relative positions of atoms in molecules[3]. At the same time, there are shifts in the arrangements of theelectrons that form the chemical bonds.

The vast amount of work done in chemical kinetics has led to the conclusion that some chemical reactions go in a single step; these are known as elementary reactions. Other reactions go in more than one step and are said to be stepwise, composite, or complex. Measurements of the rates of chemical reactions over a range of conditions can show whether a reaction proceeds by one or more steps. If a reaction is stepwise, kinetic measurements provide evidence for the mechanism of the individual elementary steps. Information about reaction mechanisms is also provided by certain nonkinetic studies, but little can be known about a mechanism until its kinetics has been investigated. Even then, some doubt must always remain about a reaction mechanism. An investigation, kinetic or otherwise, can disprove a mechanism but can never establish it with absolute certainty[4].

II. MATERIALS AND METHODS

Hydrolysis of ethyl acetate was carried out using sodium hydroxide .this reaction is known as saponification.20 ml of 0.05M NaOH was taken and diluted to 100 ml with distilled water. Conductance of this prepared solution were observed with the help of conductometer. After that 20 ml of 0.05 M NaOH in other beaker was taken followed by

the addition of 75 ml distilled water and the other 5 ml of 0.2 M ethyl acetate solution was taken and observations of hydrolysis through the conductometer were made using stop watch[6].

Figure 1. Experimental set up[7]

III. RESULT AND DISCUSSION

- Molecular weight of Ethyl Acetate is 88.11 gm/mol
- Density of Ethyl Acetate is 0.895 gm/ml
- Molecular wt. of Sodium Hydroxide is 40 gm/mol

At Temperature-55^0 C

Time	conductivity
5	7.7
10	7.2
15	6.7
20	6.2
25	5.7
30	5.2
35	4.8

At Temperature-45^0 C

Time	conductivity
5	9.89
10	9.00
15	8.45
20	8.32
25	8.18
30	7.5
35	6.7

The velocity constant of hydrolysis ethyl acetate by sodium hydroxide found to be slower than expected theoretical value. The best way to study exceedingly slow reactions is to change the conditions so that the reactions occur in a reasonable time. Increasing the temperature, which can have a strong effect on the reaction rate, is one possibility[7]. If the temperature of a hydrogen-oxygen mixture is raised to about 500 °C (900 °F), reaction then occurs rapidly, and its kinetics has been studied under those conditions. When a reaction occurs to a measurable extent over a period of minutes, hours, or days, rate measurements are straightforward[8]. Amounts of reactants or products are measured at various times, and the rates are readily calculated from the results. Many automated systems have now been devised for measuring rates in this way[9].

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IV. CONCLUSION

It has been observed that the reported data exhibit wide scatter, our data are in agreement with some of the literature data. From these data, thermodynamic parameters such as activation energy, activation enthalpy, activation entropy, and activation free energy have been evaluated. With the introduction of this novel conductometric measurement technique, the determination of rate constants at various solution temperatures becomes much simpler and faster but the rate of saponification of the chemical under observation was much slower than that expected from theoretical data.

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