



## Janki Devi Bajaj Government Girls College, Kota



### Self-Study Report

#### Criterion -3

#### 3.3.1. Number of research papers published per teacher in the Journals notified on UGC care list during the last five year

S. N.		Content	Page No
1	Jan 2017-Dec 2017	Number of research papers published per teacher in the Journals notified on UGC care	1-10

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Research Article

#### KINETICS AND MECHANISM OF PERMANGANATE OXIDATION OF ENROFLOXACIN IN AQUEOUS ALKALINE MEDIUM

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#### ABSTRACT

The reaction kinetics of oxidation of enrofloxacin by potassium permanganate has been investigated in aqueous alkaline medium using spectrophotometric technique at  $30 \pm 1^\circ\text{C}$  at constant ionic strength of  $0.10 \text{ mol L}^{-1}$ . The reaction exhibits 2:1 stoichiometry (2  $\text{KMnO}_4$ :1 Enrofloxacin). The order with respect to oxidant and substrate is found to be unity in each, whereas fractional order with respect to alkali concentration. The oxidation products were identified by using FTIR, LCMS spectral studies. The effects of added products, ionic strength and dielectric constant have been studied on the rate of reaction. Based on the experimental results a suitable mechanism is proposed. There is no evidence of intermediate complex formation, thus, the outer-sphere mechanism is proposed as the mechanism for this reaction.

**Keywords:** Permanganate ion, Enrofloxacin, Kinetics, Oxidation, Mechanism.

#### INTRODUCTION

Potassium permanganate used widely as oxidizing agent and plays a dynamic role in the kinetics of number of organic and biological active compounds.<sup>1-5</sup> Oxidation reactions by Potassium permanganate are of great academic and technological importance because of its variable oxidation states. Permanganate is a powerful multi-electron oxidant which can exist in numerous oxidation states, among which +7 is its highest oxidation state, which occurs in the Oxo compounds like  $\text{MnO}_4^-$ ,  $\text{Mn}_2\text{O}_7$ ,  $\text{MnO}_3\text{F}$ . Out of which  $\text{MnO}_4^-$  is the most commonly used oxidant species to carry out kinetic studies in acidic, neutral and alkaline media. Oxidations by permanganate ion find widespread applications in organic syntheses,<sup>6-11</sup> especially as the introduction of phase transfer catalysis<sup>8, 9, 11</sup> which permits the use of solvents like methylene chloride and benzene. An important sources of mechanistic information on these reactions are kinetic studies, as certified by result stating to unsaturated acids in both aqueous<sup>1, 6-12</sup> and non-aqueous media.<sup>12</sup> Previous studies reveals that the permanganate ion oxidizes a number of organic compounds in aqueous alkaline medium, which are very slowly, attacked in acidic or neutral medium.<sup>2, 3, 13-15</sup> The oxidation mechanism depends on the nature of the substrate and pH of the reaction mixture.<sup>16</sup> In strongly alkaline medium, permanganate ion gives the manganate ion,  $\text{MnO}_4^{2-}$  as the stable reduction product.<sup>17-19</sup> No mechanistic information is available to differentiate between a direct one-electron reduction to  $\text{Mn(VI)}$  and a mechanism in which a hypomanganate ion formed in a two-electron reduction followed by its rapid re-oxidation.<sup>20, 21</sup> The multistep redox reactions are major source of information as when the manganese intermediates have sufficiently long life time, it's quite easy to identify them and the possible reaction mechanism were presumed by the oxidation states of the intermediates.

Fluoroquinolones are broad-spectrum antibacterial agents used to treat the bacterial infections in human beings. Pharmaceuticals, of which antibacterial groups are important,

have been identified as growing environmental pollutants.<sup>22</sup> Fluoroquinolones are partially metabolised in human body due to which a major fraction of it pass into the domestic sewage. This signifies the main route for entry of such pharmaceutical compounds into natural aquatic environment. So the transformations of fluoroquinolone in suitable water treatment process definitely play a major role.<sup>23</sup> Enrofloxacin (ENR) with molecular formula  $\text{C}_{19}\text{H}_{22}\text{FN}_3\text{O}_5$ , {1-Cyclopropyl-7-(4-ethyl-1-piperazinyl)-6-fluoro-1,4-dihydro-4-oxo-3-quinolone carboxylic acid} (Figure 1), is a broad-spectrum antibacterial agent from the class of fluoroquinolones, is the antibiotic most frequently used for the treatment of domestic animals. The structure of ENR is similar to the fluoroquinolone ciprofloxacin, with an additional ethyl substituent in the N4 atom on the piperazine ring, which contains the tertiary aromatic group and tertiary aliphatic amine groups. A previous investigation has shown that minor substitutions on the piperazine ring might affect the degradation products.<sup>24</sup> ENR might illustrate a different degradation pathway with  $\text{Mn(VI)}$ . The literature survey reveals that there are few study reports on the oxidation of enrofloxacin in either alkaline or acidic medium.<sup>24-30</sup> Due to pharmaceutical importance and lack of literature on the kinetic and mechanistic study of oxidation of this drug, prompted us to kinetic study of oxidation of the enrofloxacin by permanganate in aqueous alkaline medium.

#### MATERIALS AND METHODS

##### Materials

All chemicals used were of analytical grade and doubly distilled water was used throughout this study. An aqueous solution of enrofloxacin (Cipla Limited) was prepared by dissolving known amount of drug in double distilled water. Permanganate solution was obtained by dissolving potassium permanganate (BDH Analar) in water and standardized by titrating against oxalic acid.<sup>31</sup> Freshly prepared & standardized permanganate solutions were always used in kinetics experiments. The  $\text{Mn(VI)}$  solution was made by boiling the aqueous solution of  $\text{KMnO}_4$  [ $100^\circ\text{C}$ ]



## Activation of peroxydisulfate and peroxymonosulfate by green synthesized copper nanoparticles for Methyl Orange degradation: A kinetic study



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### ARTICLE INFO

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Copper nanoparticle  
Neem (*Azadirachta indica*) leaves broth  
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### ABSTRACT

The study was primarily focused on novel, simple and environmentally benign technique for the synthesis of copper nanoparticles (CuNPs) and comparing the catalytic activity in CuNPs/Peroxydisulfate (PDS) and CuNPs/Peroxymonosulfate (PMS) process for degradation of Methyl Orange (MO). Green synthesized CuNPs were characterized by different instrumental techniques and results indicate synthesized NPs are in crystalline nature and cubical shape with 48 nm size. The increasing concentration of nanocatalyst, peroxydisulfates, Dye, initial pH and high temperature rapidly promoted the degradation kinetics of MO. The degradation of MO in CuNPs/Peroxydisulfates system is modeled as pseudo-first order kinetics and activation parameters were also determined. The maximum degradation efficiency of MO reached 92% in 60 min for CuNPs/PDS system and 98% in 30 min for CuNPs/PMS system at optimum reaction condition. Sulfate radicals ( $SO_4^{\cdot -}$ ) were identified as oxidative species using specific alcohols. Furthermore, LC-MS analysis and results of UV-vis spectral changes were used to determine the structure of intermediates arising from MO by CuNPs/Peroxydisulfates degradation. The degradation products revealed that the degradation mechanism proceeds through an oxidative cleavage of the azo linkage in the formation of  $SO_3^{\cdot -}$  and  $NO_2^{\cdot -}$  as end products. Employing CuNPs to enhance oxidation capacity of peroxydisulfates for degradation of MO is a novel, efficient, promising and environmental-friendly method since it does not require costly reagents.

### 1. Introduction

Azo dyes, which contribute to about 70% of all applied dyes, are difficult degraded by conventional treatment methods, due to their complex structure and the stability. The common techniques available for dye effluents such as adsorption and flocculation are not efficient methods because they result in solid waste, thus creating other environmental problems requires further treatment [1]. The advanced oxidation technology is the most effective chemical oxidation method and currently gaining significant application in water treatment process [2]. Driven by the need and seeking for a process, that introduces strong oxidants than hydroxyl radicals ( $OH^{\cdot}$ ), ozone, Fenton based process [3], this work explores the generation of very strong oxidizing species (sulfate radicals) through the transition metal mediated activation of peroxydisulfates [4]. The process is the modification of Fenton reagent since an oxidant is coupled with a transition metal in a similar manner. Although earlier study reports [5] that sulfate radicals are not universally more efficient than hydroxyl in degrading organic compounds. Either way, however, the fact that the sulfate contains compounds were proven the most effective oxidants to prove that sulfate radicals,

generated by heat [6], ultrasound [7] and transition metal [8] are very powerful oxidizing species. Since transition metal coupled oxidative process show greater removal efficiency for the degradation of carcinogenic contaminants into lower molecular weight and lower toxicity. The formed reactive species sulfate radicals depend on the catalytic activity and oxidation state of transition metals. The copper catalyzed decomposition follows a sulfate radical based mechanism, the same was suggested when nickel, cobalt, iron, ruthenium and silver transition metals were used [8–11].

Nanosized metal nanoparticles are attracting the attention of present science field nanometer scale leads to particular intrinsic properties for the materials that render them very promising for application in catalysis. The application of transition metal NPs as a catalyst for hydrogenation [12], hydrosilylation [13] as well as redox [14] and other electron transfer process [15] were reported. Among the metal nanoparticles, copper nanoparticles are very attractive due to their excellent physical and chemical properties and low cost of synthesis, have been of great interest. Copper nanoparticles have wide applications in heat transfer system [16], anti-microbial materials [17], super strong materials [18] and catalysis [19].

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## Oxidative degradation of levofloxacin by water-soluble manganese dioxide in aqueous acidic medium: a kinetic study

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**Abstract** Pharmaceuticals, especially fluoroquinolone antibiotics, have received increasing global concern, due to their intensive use in the environment and potential harm to ecological system as well as human health. Degradation of antibiotics, such as oxidative degradation by metal oxides, often plays an important role in the elimination of antibiotics from the environment. The kinetics of oxidation of levofloxacin by water-soluble manganese dioxide has been studied in aqueous acidic medium at 25 °C temperature. The stoichiometry for the reaction indicates that the oxidation of 1 mol of levofloxacin requires 1 mol of manganese dioxide. The reaction is second order, that is first order with respect to manganese dioxide and levofloxacin. The rate of reaction increases with the increasing  $[H^+]$  ion concentration. A probable reaction mechanism, in agreement with the observed kinetic results, has been proposed and discussed. The energy and enthalpy of activation have been calculated to be 30.54 and 28.07 kJ mol<sup>-1</sup>, respectively.

**Keywords** Levofloxacin · Manganese dioxide · Kinetics · Mechanism · Oxidation

### Introduction

In the past few decades, there has been great concern on pharmaceuticals waste which is a key source of impurities in the aquatic ecosystem, ground water and soil, and which leads to the bacterial resistance against antibiotics even at their low concentrations (Elmolla and Chaudhari 2010). Fluoroquinolones are anthropogenic contaminants which are comprehensively used as pharmaceuticals for both human and veterinary purposes (Kusari et al. 2009; Sturini et al. 2012). Levofloxacin (LEV), (-)-(*S*)-9-fluoro-2,3-dihydro-3-methyl-10-(4-methyl-1-piperazinyl)-7-oxo-7H-pyrido [1,2,3-de]-1,4-benzoxazine-6-carboxylic acid hemihydrates, is one of the commonly used third-generation fluoroquinolone antimicrobials, being the active *S*-isomer isolated from racemic ofloxacin and is twice as active as the parent drug. LEV is a broad-spectrum drug of activity against various bacteria, including Gram-positive and Gram-negative microorganisms (Croisier et al. 2004; Roblin and Hammerschlag 2003). Because of its effective antibacterial activity and low frequency of adverse effects on oral administration, it has been widely used for the treatment of infectious diseases, such as community-acquired pneumonia and acute exacerbation of chronic bronchitis (Owens and Ambrose 2000). Waste water discharge from conventional waste water treatment plants is the main source of LEV in the aquatic environment (Kummerer 2009; Fatta-Kassinos et al. 2011). Removal of LEV residue from aquatic environment is, therefore, considered as a priority and serves as an important study. The oxidative study of LEV has been effectuated by various oxidants such as alkali permanganate (khan et al. 2010), acidic Chloramine-T (Khan et al. 2012), ozone and hydroxyl radicals (Najjar et al. 2013), aqueous chlorine (Kulkarni et al. 2013), acidic permanganate (Jain et al.

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# Oxidation of Ciprofloxacin by Hexacyanoferrate(III) in the Presence of Cu(II) as a Catalyst: A Kinetic Study

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**ABSTRACT:** The Cu(II)-catalyzed oxidation of ciprofloxacin (CIP) by hexacyanoferrate(III) (HCF) has been investigated spectrophotometrically in an aqueous alkaline medium at 40°C. The stoichiometry for the reaction indicates that the oxidation of 1 mol of CIP requires 2 mol of HCF. The reaction exhibited first-order kinetics with respect to [HCF] and less than unit order with respect to [CIP] and [OH<sup>-</sup>]. The products were also identified on the basis of stoichiometric results and confirmed by the characterization results of LC-MS and FT-IR analysis. All the possible reactive species of the reactants have been discussed, and a most probable kinetic model has been envisaged. The activation parameters with respect to the slow step of the mechanism were computed, and thermodynamic quantities were also determined. © 2017 Wiley Periodicals, Inc. *Int J Chem Kinet* 49: 534–542, 2017

## INTRODUCTION

A large number of the clinically prescribed antibacterial drugs are discharged into wastewater systems, which indicates the entry of useful antibacterial agents into aquatic environment [1]. Fluoroquinolones have been detected at various concentration ranges from  $\text{dm}^{-3}$  to  $\text{ng dm}^{-3}$  in wastewater [2]. Antibacterial resistant bacteria have been detected in wastewater effluents from sewage treatment plant and in drinking water. Recent research has verified the presence of numerous antibacterial compounds in the aquatic environment [3]. These antibacterial compounds have emerged as a new class of pollutants because

of their adverse effects on human health [4]. The oxidative transformation of fluoroquinolone antibacterial agents in a water treatment process definitely plays a major role in this concern. Ciprofloxacin (CIP) {1-cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-7-(piperazine-1-yl)-quinolone-3-carboxylic acid} is a second-generation fluoroquinolone antimicrobial agent with a wide spectrum of activity against many Gram-positive and Gram-negative aerobic and anaerobic bacteria. CIP is a member of the fluoroquinolone group and is used worldwide as a human and veterinary medicine [5]. There are studies on the modified pharmacological and toxicological properties of these drugs in the form of metallic complexes [6–8]. To properly assess the risk of CIP in aqueous solution and better understand its environmental fate and the transformation of fluoroquinolone pharmaceuticals in water systems, an oxidative kinetic study could be

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## CATALYTIC OXIDATION OF LEVOFLOXACIN BY HEXACYANOFERRATE (III) IN AQUEOUS ALKALINE MEDIUM: A KINETIC STUDY

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### ABSTRACT

*The Cu(II) catalyzed oxidation of levofloxacin by hexacyanoferrate(III) has been investigated spectrophotometrically in an aqueous alkaline medium at 25°C. The stoichiometry for the reaction indicates that, the oxidation of one mole of levofloxacin requires two moles of hexacyanoferrate(III). The reaction exhibited first order kinetics with respect to [hexacyanoferrate(III)] and less than unit order with respect to [levofloxacin] and [OH<sup>-</sup>]. The products were also identified on the bases of stoichiometric results and confirm by the characterization results of LC-MS analysis. All the possible reactive species of the reactants have been discussed and a most probable kinetic model has been envisaged. The activation parameters with respect to the slow step of the mechanism were computed and thermodynamic quantities were also determined.*

**Keywords:** *Cu(II) catalysis, Hexacyanoferrate(III), Kinetics, Mechanism, Oxidation.*

### I. INTRODUCTION

In the past few decades, there has been great concern on pharmaceuticals waste which is a key source of impurities in the aquatic ecosystem, ground water and soil, and which leads to the bacterial resistance against antibiotics even at their low concentrations [1]. Fluoroquinolones are anthropogenic contaminants which are comprehensively used as pharmaceuticals for both human and veterinary purposes [2]. Due to their extensive usage, fluoroquinolones may enter in the environment via waste water effluent and bio solids from sewage treatment plants. The presence of pharmaceuticals including in the surface water is an emerging environmental issue and provides a new challenge to engineers and scientists dealing with drinking water, waste water and water reuse systems [3]. There are studies on the modified pharmacological and toxicological properties of these drugs in the form of metallic complexes [4-6].

Levofloxacin (LF), (-)-(S)-9-fluoro-2,3-dihydro-3-methyl-10-(4-methyl-1-piperazinyl)-7-oxo-7H pyrido [1,2,3-de]- 1,4-benzoxazine-6-carboxylic acid hemihydrates "Fig. 1", is one of the commonly used third-generation fluoroquinolone antimicrobials, being the active S-isomer isolated from racemic ofloxacin and is twice as active as the parent drug.

## SYNTHESIS, CHARACTERIZATION OF COPPER NANOPARTICLES AND THEIR CATALYTIC APPLICATION

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### ABSTRACT

*In this paper, we report on the synthesis of copper nanoparticles (Cunps) through a single route of chemical reduction method. The effect of different concentration of reducing agent on the morphology of Copper nanoparticles was investigated. The synthesized copper nanoparticles were characterized by UV-Visible spectrophotometer, Fourier Transform Infrared (FTIR) Spectrophotometer, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) analysis. The average size of copper nanoparticles was found to be 12 nm and spherical in shape at the optimal experimental conditions. The catalysis by colloidal copper nanoparticles was studied kinetically in the oxidation of L-Valine (Val) by peroxodisulphate (PDS) in acid aqueous medium. The copper nanoparticles catalyst exhibited very good catalytic activity.*

**Keywords:** *Ascorbic Acid, Copper Nanoparticles, Kinetics, L-Valine, Peroxodisulphate.*

### I. INTRODUCTION

The field of nanocatalysis has undergone an explosive growth during the past decades, both in homogeneous and heterogeneous catalysis [1, 2]. Since nanoparticles have a large surface to volume ratio compared to bulk materials, they are attractive to use as catalyst [3, 4]. Metal nanoparticles with high specific catalytic activity are ubiquitous in modern synthetic organic chemistry during the recent decades [5]. However how to reduce their dosage is one of the most exciting challenges due to the limiting reserves of noble metals. Some selective oxidation reactions are reported involving transition metal ions of Ag, Rh, Cr, Ru, Mn etc. are reported to act as catalyst for amino acids oxidations [6-10] with the emergence of metal nanoparticles possessing appreciable stability and high surface area per particle, their potential use as catalyst for organic biochemical relevant reactions [11-12]. Amongst them Copper nanoparticles are paid more attention due to their low cost and easy availability. Copper nanoparticles have also been considered [13-14] as an alternative for noble metals in many applications such as heat transfer and microelectronics [15]. In this study, highly stable colloidal dispersion of copper nanoparticles has been synthesized by chemical reduction method, using ascorbic acid as a reducing agent as well as capping agent. The particle size has been effectively controlled by the variation of reducing agent and temperature during the synthesis. The synthesized Cunps were characterized by UV-Visible Spectrum, SEM, TEM etc. techniques.

## Kinetics and mechanism of permanganate oxidation of nalidixic acid in aqueous alkaline medium

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Kinetics, oxidation, mechanism, nalidixic acid, permanganate ion.

### ABSTRACT

The kinetics and mechanism of oxidation of nalidixic acid (NA) by permanganate ion in alkaline medium have been studied at  $40 \pm 1^\circ\text{C}$ . The Stoichiometry was observed to be 2:1 in terms of mole ratio of permanganate ion and nalidixic acid consumed. The reaction shows first order with respect to oxidant and fractional order in both the substrate and alkali concentration. The oxidation reaction proceeds via an alkali permanganate species that forms a complex with nalidixic acid and the complex then decomposes to give the product. The effects of added products and ionic strength have also been investigated. The main products identified were hydroxylated NA and Mn(VI). A mechanism was proposed on the basis of experimental results. Investigation of the reaction at different temperature allowed the determination of the activation parameters with respect to the slow step of the proposed mechanism.

### INTRODUCTION

Potassium permanganate widely used as oxidizing agent play vital role in the kinetics of number of organic and biological active compounds (Fatiadi, 1987; Ladbury and Cullis, 1958; William, 1958; Banerji, 1988; Baljeet and Kothari, 1997). Oxidation reactions by Potassium permanganate are of considerable academic and technological importance because of variable oxidation states. Permanganate is one such powerful multi-electron oxidant which can exist in various oxidation states, among which +7 is its highest oxidation state, which occurs in the Oxo compounds like  $\text{MnO}_4^-$ ,  $\text{Mn}_2\text{O}_7$ ,  $\text{MnO}_3\text{F}$ . Out of which  $\text{MnO}_4^-$  is the most commonly used well known oxidant species to carry out kinetic studies in acidic, neutral and alkaline media. Oxidation by permanganate ion find extensive applications in organic syntheses (Fatiadi, 1987; Stewart and

Wiberg, 1965; Freeman, 1976; Lee, 1980; Lee and Tranhanovsky, 1982; Simandi *et al.*, 1983; Lee *et al.*, 1987) especially since the introduction of phase transfer catalysis (Lee, 1980; Lee and Tranhanovsky, 1982; Lee *et al.*, 1987) which permits the use of solvents like methylene chloride and benzene. Kinetic studies are vital sources of mechanistic information on these reactions, as validated by result stating to unsaturated acids in both aqueous (Fatiadi, 1987; Stewart and Wiberg, 1965; Freeman, 1976; Lee, 1980; Lee and Tranhanovsky, 1982; Simandi *et al.*, 1983; Lee *et al.*, 1987; Wiberg *et al.* 1973) and non-aqueous media (Wiberg *et al.* 1973). As is known, in aqueous alkaline medium the permanganate ion oxidizes a number of organic compounds, which are not, or only very slowly, attacked in acidic or neutral medium (Ladbury and Cullis, 1958; William, 1958), (Drummond and Waters, 1935). The mechanism of oxidation depends on the nature of the substrate and pH of the reaction mixture (Stewart *et al.* 1997). In strongly alkaline medium, the stable reduction product (Simandi *et al.*, 1985; Timmanagoudar *et al.*, 1997; Nadimpalli *et al.*, 1993) of permanganate is manganate ion,  $\text{MnO}_4^{2-}$ .  $\text{MnO}_2$  appears only after long time, i.e., after the complete consumption of  $\text{MnO}_4^-$ .

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# **Comparative Studies of Micelles in Photogalvanic Cell: for Solar Energy Conversion and Storage**

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**ABSTRACT:** The photogalvanic effect was studied in photogalvanic cell containing dye, reductant and surfactants. The maximum potential were observed 1065mV and 1005mV in EDTA-TB-NaLS and EDTA-TB-CPC system respectively. The fill factors, Photocurrent, conversion, efficiency and storage capacity were also determined. The effect of different parameters on electrical output of the cell is observed. The mechanism of cell reaction was proposed for the generation of photocurrent in photogalvanic cell.

**KEYWORDS:** Photopotential, Photocurrent, fill factor, Conversion efficiency

## **I. INTRODUCTION**

The consumption of non renewable source of energy like oil, gas and coal is increase at alarming rate. The time has finally come to look some other renewable sources of energy i.e. solar wind and geothermal energy. Solar energy is most important renewable source of energy for life forms. The main benefit of solar energy is that it does not produce any pollutant and is one of the cleanest and free source of energy. Conversion of solar energy into electrical energy through photogalvanic cell is the most important and desirable route for obtaining electricity. The photogalvanic cell works on photogalvanic effect. The effect was reported by Rideal and Williams[1] but it was systematically studied by Rabinowitch[2-3] and later by various other workers time to time[4-5]. Ameta et al.[6-7]. Gangotri et al.[8-12] have developed photogalvanic cells for solar energy conversion and storage. Genwa et al.[13-14] have reported the effect of micelles on the performance and conversion efficiency of photogalvanic cells. Role of surfactant in photogalvanic cell for solar energy conversion and storage studied by Gangotri and Meena[15]. Some more dyes have been used in photogalvanic cell containing micelles reductant and photosensitizers and reported the good amount of electrical output in photogalvanic cell with remarkable storage capacity. The photochemical conversion of solar energy into electrical energy was observed by[16-20]. The study of photogalvanic cell consisting dyes with reductant and surfactant work done[21]. Toluidine blue is stable and low cost dye among the dyes, therefore Toluidine blue dye with surfactant has been selected in the present investigation. The variation of different parameters on electrical output of photogalvanic cell was studied in detail.

## **II. MATERIALS AND METHOD**

Toluidine blue (LOBA), EDTA (s.d.fine), CPC(LOBA) and Sodium Hydroxide(E.Merck) were used in present work. All the solutions were prepared in double distilled water. A mixture of the solutions of the Dye, Reductant, Surfactant and Sodium hydroxide was taken in an H-Shaped glass cell. A platinum electrode (1.0×1.0 cm<sup>2</sup>) was dipped into one limb of the cell and saturated calomel electrode (SCE) was kept in the other limb. The whole system was first placed in dark till stable potential was obtained, then the platinum electrode was exposed to a 200W tungsten lamp (ECE) and the limb containing the SCE was kept in dark. A water filter was placed between the exposed limb and the light source to

## “कवि की प्रेयसी” उपन्यास का मनोवैज्ञानिक विश्लेषण

डॉ. विनीता कौशिक \*

**प्रस्तावना** - ‘कवि की प्रेयसी’ श्री इलाचन्द्र जोशी के ऐतिहासिक परिवेश से अवगुंठित उपन्यास है। उपन्यास की प्रस्तावना में ही लेखक ने इसके लिखे जाने के पूर्व की स्थिति चित्रित की है - ‘प्राचीन महानगरों में उज्जयिनी ही मेरे मन के अनुकूल बैठ सकती थी। उसको केन्द्र बनाकर नाना प्रकार की कल्पनाएँ मन में उठीं और अन्त में एक फेन्टेसी के भीतर सभी कल्पनाएँ केन्द्रित हो गईं।’<sup>1</sup>

सोमिलक लेखक का प्रिय पात्र है। सोमिलक के घर में यवनी कनिष्ठा माता का प्रवेश उसके तथा परिवार की सभी स्त्रियों के व्यवहार को बदल देता है। जहाँ सोमिलक का बालक मन उसके प्यार से आप्लावित होकर उसे ही अपनी सगी माता के रूप में स्वीकारता है, वहीं उसकी अपनी कही जाने वाली माता व अन्य स्त्रियों के मन में घृणा व ईर्ष्या के भाव भर देता है।

सोमिलक आरंभ से ही स्वतंत्र प्रकृति का बालक था। उसे अपने पितामहों द्वारा साधारण व निम्न वर्ण के बच्चों के साथ खेलने से रोका जाता था लेकिन वह उन्हीं के साथ खेलता और यहाँ तक कि यदि कोई सुन्दर बच्चा होता तो उसे अपने अंक में भर लेता था। उसका यह कार्य समलिंगी आकर्षण ही था। यदि उसके पितामह, चचेरे भाई की प्रशंसा उसके सम्मुख कर देते तो वह ईर्ष्या करने लगता और अपने किसी भी कार्य को उस चचेरे भाई की अपेक्षा अधिक लगाने से करता था। यहाँ बाल मनोविज्ञान को लेकर फायड का प्रभाव देखा जा सकता है। बाल मनोविज्ञान की इन पंक्तियों में शेखर एक जीवनी के शेखर के बाल वर्णन में अज्ञेय द्वारा उद्धाटित मन स्पष्ट हुआ है। बालक सोमिलक अपनी जिज्ञासा शांति अपनी स्वयं की तीव्र कल्पनाओं के माध्यम से करता है तो अज्ञेय का शेखर यथार्थ धरातल पर पुस्तकें पढ़कर या बहिन के बातें करके करता है।

सोमिलक शिक्षा प्राप्ति के पश्चात् अनुभव प्राप्त करने देशाटन पर निकलता है और वहीं इन्दौर में उसकी भेंट राजकुमारी वेश में छिपी शिरीषा से होती है। यद्यपि शिरीषा के अवचेतन मन के किसी कोने में सोमिलक की पूजा है, लेकिन वह अपने घोर अहंकार के कारण उसे डांट देती है। शिरीषा को देखते ही सोमिलक की दमित-बास कामना उबल रूप धारण कर लेती है। वह कहता है-

“कुछ ही घड़ियों के लिए निकट सम्पर्क में आकर उसने मुझे मेरे अंतर को बुरी तरह झकझोर दिया था। अपने जीवन का प्रथम प्रेम में उसी के चरणों में अर्पित करने के लिए उतावला हो उठा था.....”

इस अनिरुद्ध आकर्षण के विरुद्ध मेरे मन की कोई नियंत्रक शक्ति कारगर नहीं हो पा रही थी।<sup>2</sup> लेखक के द्वारा यहाँ काम-मूलक बांधि का सफल अंकन किया गया है।

बहुत दिनों प्रवास पर रहने के पश्चात् सोमिल को अपनी कनिष्ठा माँ

‘इज्जा’ के पास जाने की इच्छा हुई तब उसने शिरीषा को अपने मित्र प्रहर्ष वर्मा के यहाँ छोड़ा जहाँ प्रहर्ष की बहन रत्नप्रिया भी थी। रत्नप्रिया के भी अवचेतन में सोमिलक का निवास था लेकिन जब उसने देखा कि सोमिलक शिरीषा के प्रति आकर्षित है तब वह न ईर्ष्या ही करती है और न ही कोई कटु वचन बोलती है, बल्कि दोनों के विवाह को तत्पर होती है। यहाँ रत्नप्रिया के मनोभाव लेखक जोशी जी के भारतीय आदर्श की भूमि पर आते हुए दिखाई पड़ते हैं। यहाँ पर जोशी जी की टप्टि पाश्चात्य मनोविज्ञान से अलग हुई है। पूर्व जन्म के संस्कारों का वर्तमान जीवन में प्रभाव डालने का विश्वास, लेखक का इस उपन्यास में जिन्दा है। रत्नप्रिया के निम्न वाक्य भी लेखक के इन विचारों को पुष्ट करते हैं -

“प्रतिभा की कोई वय नहीं होती। वह जन्म-जात होती है। पूर्व जन्म की देन छुटपन में ही अधिक विकसित होती है, अनुभवी विद्वान परीक्षकों ने बड़ी सूक्ष्म खोज के बाद इस स्वयं सिद्धि का पता लगाया है।”<sup>3</sup>

सोमिलक ने जब भी कभी अपने प्रेम का प्रदर्शन शिरीषा के सम्मुख करना चाहा, तभी शिरीषा ने अपने अहंवादी स्वभाव के कारण समुदाय तक में उसका अपमान कर दिया। इसी से कुंठित होकर सोमिलक ने अपने सोचने की राह बदल ली। अब वह शिरीषा के लिए केवल इतना ही सोचता था कि वह नाट्य-क्षेत्र में प्रसिद्धि पाए। यवनी कनिष्ठा माता जिसे वह ‘इज्जा’ कहता था उससे पुनर्मिलन होने पर वह इज्जा के नाट्य संबंधी संस्मरण भी सुनता है। इज्जा भी अभिनेत्री बनने की इच्छुक रहती थी और जब मंच पर सुन्दर-सुन्दर स्त्रियों को अभिनय करते देखती थी तो उसके मन में उनके प्रति ईर्ष्या की भावना जागृत हो जाती थी। इस दयित-इच्छा की पूर्ति वह घर पर अभिनय करके ही पूजा करती थी।

सोमिलक का नाटक का मंचीयकरण शिरीषा ने किया, उसे देखने के पूर्व की सोमिलक के मनोविश्लेषण को लेखक ने लिखा “गर्मी के बावजूद भी हिमालय सी बर्फीली ठंड लगने लगी थी। देह प्रकंपित हो रही थी।”<sup>4</sup>

अंत में आते-आते शिरीषा का दमित प्रेमोद्देग फट पड़ता है और वह सभी के उपस्थित रहने पर भी सोमिलक से लिपट कर क्षमा-याचना करती है। स्वप्न मनोविज्ञान की भी एक झलक मिलती है जिसमें भविष्य में घटने वाली घटना का पूर्व ज्ञान प्राप्त हो जाता है। “कवि की प्रेयसी” उपन्यास का अंतिम सोपान है - “रात्रि के स्वप्न में सोमिलक ने देखा वह एक नाव पर बैठा जा रहा है और उसके पार्श्व में एक स्त्री बैठी है जो निश्चय ही शिरीषा थी।”<sup>5</sup> यही स्वप्न प्रतीक रूप में उसके भविष्य का यथार्थ बना।

वस्तुतः जोशी जी की कृति “कवि की प्रेयसी” पढ़ने पर उसका पूर्व भाग अज्ञेय के मनोवैज्ञानिक उपन्यास “शेखर : एक जीवनी” की याद दिलाता है तो मध्य भाग तथा अंतिम भाग डॉ. हजारी प्रसाद द्विवेदी के

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## राजस्थानी हरजसों में लोक जीवन एवं लोक संस्कृति

डॉ. विनीता कौशिक \*

**प्रस्तावना** - जीवन का हरेक क्षण संस्कृति की दुनिया से जुड़ा होता है। जिनमे जीवन के वे सभी प्रमुख पक्ष जुड़े हैं जैसे - लोक धर्म, लोक विश्वास, लोक वार्ता, लोक परिवार, लोक निवास, लोक पोषाक, रहन-सहन, खान-पान, रीति-रिवाज एवं लोक कलाएं आदि।

एक डाल दोय पंक्षी बैठया, कुण रे गुरु कुण चेला।  
यो संसार माया की नगर, वो दिन को सो खेला।<sup>1</sup>

लकड़ी रे काटत हा लकड़ी रे बोली तू ही रे खातीडा म्हारो संगसाधी  
अच्छी अच्छी लकड़ी काट ले रे खातीडा इक दिन मोहे संग जल नासी  
फूलडा रे तोडत हों कलियों रे बोली तू ही रे मालीडा म्हारों संगसाधी  
अच्छी अच्छी कलियों तोड ले मालीडा इक दिन मोहे संग कुमलासी।<sup>2</sup>  
अन्य और भी उदाहरण इस प्रकार दृष्टव्य है -

जिस रे काया पर बंदा दूब उगेगी, जे में गऊ रे घरेगी मस्तानी  
जिस रे काया पर वंदा महल बनेगा, जे में रे बारी रहेगी आसमानी।<sup>3</sup>

इसी प्रकार गुरु व संतो के प्रति जो श्रद्धा विश्वास मध्यकालीन धार्मिक आंदोलन के भक्तों व चिंतकों ने दिया उसका प्रत्यक्ष प्रभाव राजस्थानी हरजसों में निहित है :-

धींका घरण पकडती जाऊँ म्हारा ग्यानी गुरुजी  
इण तो संसार सागे रे बहती सी नवियों  
पांव चूके तो वह जाऊँ म्हारा ग्यानी गुरु जी।<sup>4</sup>

राजस्थानी हरजसों में यहां के लोक विश्वास, मान्यताएँ व रुढ़ियां समग्र रूप से समाहित हैं। लोक देवता के रूप में जिण पाबूजी की पूजा की जाती है। उनका जीवन बलिदान की प्रेरण संजोये हुए है। गाय को माँ के समान पूज्य भाव से देखना, उसकी रक्षा करना तथा पाबूजी द्वारा कहा गया कथन कि 'वीर पुरुष' स्त्री पर शस्त्र नहीं उठाते। ये सभी बातें राजस्थान की लोक संस्कृति की परिचायक हैं जो हमें यहां गाये जाने वाले भक्ति गीतों में स्पष्ट होती हैं।

उदाहरणार्थ -

धारी रो गाय्या में ये खींची धोग फेरिया,  
कायां रे मूड मारियों को सुगरध धारा स्यामेन।<sup>5</sup>

सोडी का कथन -

'चढो जी रणबांका पाबू भल गाय्यां री बार।<sup>6</sup>

इसी प्रकार स्त्री पर प्रहार नहीं करने के संबंध में -

'कोई मरद तो नारी पर रे डामाजी ससतर ना धरे।<sup>7</sup>

'लोक विश्वास' व 'शकुन-अपशकुन' लोक समाज में प्रत्येक कदम पर उनके साथ रहते हैं। आंख फडकने से संबंधित लोक मत हैं कि - बार्थी आंख फडकना शुभ संकेत होता है और दायी आंख के लिपय कहा जाता है कि -

'आंख फडके दाहिनी लात-ममूका सहनी।

इसी संदर्भ में एक लोक भजन में शुभ शकुन की सूचना दी जा रही है।

'आज घुराऊँ धूंधडो बिच बीजली घमके ए'

म्हारा सतगुरु वीखे आवता म्हारो डावी आंख फरोखे है।<sup>8</sup>

अन्य -

'मैं निश दिन रहूँ उदासी, म्हारो वो शुभ दिन कब आसी'  
म्हारी आंख फरुखे भाई कोई संत मिलेला कांई।<sup>9</sup>

इसी तरह पितरो की पूजा का भी वर्णन है। चौदस व अमावस को ही पितरो का आवाहन, रातिजगा व वीया जलाया जाता है।

छोटी सह तलाई जो दुधां से भराई आयो,  
पितरां की लसकर पीयेगो।

चौदस ने थे आणो जी, अमावास ने थे आवो जी,  
धरी वाडी की बेल बघाय ज्यो।<sup>10</sup>

अतः देखने में आता है कि राजस्थान के हरजसों में लोक विश्वास व लोक मान्यताएं बिखरी पड़ी हैं। राजस्थान के हरजसों में पारिवारिक संबंधों का भी कई स्थानों पर वर्णन है।

'सास बहू ने दूँदी मोरी मान और छेर जिठाण्यां ने दूँदी मोरी माय,  
गाणत बाल्या ने दूँठर है भवानी आप सभी जी धींका वीध जी।।'<sup>11</sup>

अनेक हरजस में घरों व दीवारों को गोबर से लीपने का जिक्र है।

जैसा कि :- गोबर भरियो छाबडो ए बहु लेपर थे सिंध घाल्या,

माता शीतला भंद्र विजराजिया ये सासुगढ नीपढ म्हे घाल्यां।।<sup>12</sup>

कुछ हरजसों ने पोशाकों का भी वर्णन देखने को मिलता है।

'ऐडी टेडी पगडी बांधे, गोडा सूधी धोती रे,

कांधे पर औजार बसोती, हाथ में लियो कियोती रे।'<sup>13</sup>

म्हाराँ बोरंग चूनड एक बाई रो वां ओडिली

म्हाराँ दातो बावियो चुडलो एक बाई रीवा पहर लियो।<sup>14</sup>

चूनडी रंगा दे ये मेरी रातावेयी माय

आई ये सावणियारी तीज बाई ओदसी।<sup>15</sup>

खान-पान का भी जिक्र इन हरजसों में देखने को मिलता है।

करमा खीचडो का करल्यायी उपर घी की धार लगायी,

कुडवी खाटा की भरल्यायरी बेटी जातां री।<sup>16</sup>

आज चूरमों कर देसी, तडके सीरो पूडी कर देस्यूं,

परसूं राबडी कर देस्यूं बेटी जाता री।<sup>17</sup>

अतः कहा जा सकता है कि लोक-साहित्य में हरजस एक महत्वपूर्ण विधा है जिसके माध्यम से हमें राजस्थान के धार्मिक वातावरण, लोक विश्वास, खान-पान, आभूषण, वेशभूषा आदि की व्यापक जानकारी

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