



Bharatiya Shikshan Prasarak Sanstha, Ambajogai



# Swa. Sawarkar Mahavidyalaya, Beed



## Internal Quality Assurance Cell

### **CRITERION 3- RESEARCH, INNOVATIONS & EXTENSION**

**3.5.1. The number MOUs, Collaborations/linkages for Faculty exchange, Internship, Field Project, On-the-job training, research and other academic activities during the last five years**

**MOU-Collaborative Activity Reports Year wise**

**2019-20**

**DVV Clarification**

Established-1995



BhartiyaShikshanPrasarakSantha's, Ambajogai

**Swa. Sawarkar Mahavidyalaya, Beed**

**(Art's, Science & Commerce)**

**NAAC- RE-ACCREDITED GRADE-B**



**Dr. P.D. Pohekar**

**M.A.,SET,M.Phil.,Ph.D.**

•Website : <https://www.sawarkarcollegebeed.edu.in>

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## Collaborative Activities

2019-20

<b>Sr. No.</b>	<b>Title of the collaborative activity</b>	<b>Name of the collaborating agency with contact details</b>
1	Psychological Counselling	Mauli Maind Care Hospital, Beed.
2	Study of complexation of divalent transition and trivalent lanthanide metal ions with Schiff's Base 2-Hydroxy-5-bromo- acetophenone-N-(2-Chloro-5-nitrophenyl) imine: thermodynamic aspect; Journal of Global Resources Volume 5 (02) July 2019.	Milliya College Beed & Balbhim College Beed.
3	Thermodynamic study of Complexation of transition metal ions with Schiff Base 2-Hydroxy 5-bromo Acetophenone –N-(4-Methyl phenyl)Imine in 50%(V/V)ethanol-water medium JOURNAL OF GLOBAL RESOURCES Biannual International peer Reviewed Journal UGC-CARE Listed Journal in Group D; ISSN: 2395-3160(print)Volume 5(02)1,p. No.220-223;	Milliya College, Beed.
4	Students participation in attainment of graduate attributes; Research Journey International Multi-disciplinary E-Research Journal, October-2019.	Milliya College, Beed.
5	Mixed ligand complexes of Cadmium metal ion with diphenhydramine and amino acids in aqueous media; Research Journey International Multi-disciplinary E-Research Journal, October-2019.	Milliya College Beed & Balbhim College Beed.
6	Low Cost Carbon Cathode For Nature Dye Sensitized Solar Cell	Crystal growth research Laboratory, Milliya College, Beed.
7	Exploring the impressive nonlinear optical and dielectric properties of cadmium thiourea acetate crystal doped with oxalic acid	Crystal growth research Laboratory, Milliya College, Beed.

8	Studies on optical properties of Potassium Chloride doped Bis-Thiourea Cadmium Acetate Crystals	Crystal growth research Laboratory, Milliya College, Beed.
9	Evaluation Of Optical Traits Of Urea Doped Thiourea Zinc Sulphate (U-ZTS) Metal Complex Crystal For NLO Applications	Crystal growth research Laboratory, Milliya College, Beed.
10	Focusing Growth and Characterization Studies of Potassium Chloride (KCL) doped Bis-thiourea Cadmium Acetate (BTCA) Single Crystals	Crystal growth research Laboratory, Milliya College, Beed.
11	Potentiometric investigation of complexation of Benazepril drug with alkaline earth metal ions in aqueous media ; Journal of Research and Development A Multidisciplinary International Journal, Volume 10,Special Issue02,Janury 2020; ISSN: 2230-9578, P. No. 40-42; 21, January 2020.	Milliya College Beed.
12	Solution of dissipative fluid flow of an Impulsively Started Infinite Vertical Plate	R. B. Attal College, Gevrai & Dept. of Mathematics , Swa. Sawarkar Mahavidyalaya, Beed.
13	Microbiology Rangoli Competition	Microbiological Biologis society India
14	Inter Loan Facility ( Library)	Milliya College, Beed.
15	Inter Loan Facility ( Library)	Pradnyachakshu Andh vidyalaya, Beed.

**Collaborative  
Activities  
2019-20**

2019 - 20 ①



**B.S.P.S. Ambajogai**



**SWA. SAWARKAR MAHAVIDYALYA, BEED**

**Counselling Center  
2019 – 2020**



**Prof. Joshi S. B.  
Head Department of Psychology  
Swa. Sawarkar Mahavidyalaya Beed**

  
**Principal**  
Swa. Sawarkar Mahavidyalaya  
Beed.

# माऊली माईन्ड केअर हॉस्पिटल

डॉ.मोगले एस.एच.

एम.बी.बी.एस., डी.पी.एम.(पुणे), एम.ए.(मानसशास्त्र)

मानसोपचार तज्ञ

रजि.नं. 80730

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संकल्प हॉस्पिटल जवळ, आदर्श नगर, डी.पी.रोड, बीड.

• वेळ : दु.1 ते 4, सायं. 7.30 ते 9 • रविवार बंद

पेशंटचे नांव : \_\_\_\_\_

दिनांक : \_\_\_\_\_

पत्ता : \_\_\_\_\_

वय : \_\_\_\_\_

वजन : \_\_\_\_\_



आभार पत्र

दिनांक : 31/05/2020

माऊली केअर सेंटर आणि मानसशास्त्र विभाग  
स्वा सावरकर महाविद्यालय बीड यांच्या दरम्यान झालेल्या  
सामंजस्य कराराप्रमाणे स्वा सावरकर महाविद्यालय बीड येथील  
मानसशास्त्र विभाग प्रमुख प्रा. जोशी यांनी वर्ष 2019-2020  
दरम्यान 12 रुग्णांना समुपदेशन केले.  
सहकार्याबद्दल आपले हार्दिक आभार.

**Dr.S.H.Mogle**  
M.B.B.S.,D.P.M.(Pune)  
Mauli Mind Care  
Hospital, Beed.

अपॉईंटमेंट साठी संपर्क - 02442-225487

## \* उपलब्ध सेवा \*

- मेंदुचा आलेख (ई.सी.जी.) ● मानसिक आजार ● व्यसनमुक्ती (दारू, गांजा, बिडी, तंबाखू) ● वैवाहिक व लैंगिक समस्या
- मतिमंद बालकासाठी सल्ला ● नैराश्य ● उन्माद ● झोपेच्या समस्या ● दुंभलेले व्यक्तिमत्व (सीझोफ्रॅनीया) ● तनाव ● डोकेदुखी
- मुलांच्या वर्तणुकीतील बदल ● भुतबाधा ● जादुटोणा, इ.आजारावर उपचार, सल्ला व समुपदेशन

Principal  
Swa.Sawarkar Mahavidyalaya  
Beed.



**Counselling Centet**  
**2019 – 2020**  
**Report**

Counseling Center is Functioning  
Science 2002 in College Premises  
with the aim of Solving  
Psychological & Social Problems.

Mantel retarded Student IQ = 08  
Anxiety = 10  
Exam Stress = 12  
Carrier Guidance = 06  
Phobia = 06

**Prof. Joshi S. B.**  
**Head Department of Psychology**  
**Swa. Sawarkar Mahavidyalaya Beed**

**Principal**  
**Swa. Sawarkar Mahavidyalaya**  
**Beed.**

## STUDY OF COMPLEXATION OF DIVALENT TRANSITION AND TRIVALENT LANTHANIDE METAL IONS WITH SCHIFF BASE 2-HYDROXY-5-BROMO ACETOPHENONE-N-(2-CHLORO-5-NITROPHENYL) IMINE: THERMODYNAMIC ASPECT

Hansaraj Joshi<sup>1</sup>, M.A. Sakhare<sup>2</sup>, S.D. Naikwade<sup>3</sup> and Shailendrasingh Thakur<sup>4</sup>

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<sup>2</sup>Department of Chemistry, Balbhim College, Beed.

<sup>3</sup>Department of Chemistry, Chhatrapati Shahu College, Lasur Station, Aurangabad.

<sup>4</sup>Department of Chemistry, Milliya College, Beed.

[hansarajjoshi307@gmail.com](mailto:hansarajjoshi307@gmail.com),

### Abstract:

The stability constant of schiff base 2-hydroxy-5-bromo acetophenone-N-(2-chloro-5-nitrophenyl) imine with divalent transition metal ions  $\text{Cu}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$  and trivalent lanthanide metal ions  $\text{La}^{3+}$ ,  $\text{Ce}^{3+}$ ,  $\text{Pr}^{3+}$ ,  $\text{Nd}^{3+}$ ,  $\text{Sm}^{3+}$ ,  $\text{Eu}^{3+}$ ,  $\text{Gd}^{3+}$ ,  $\text{Tb}^{3+}$ ,  $\text{Dy}^{3+}$  and  $\text{Ho}^{3+}$  using a pH metric titration technique in 50%(v/v) ethanol-water mixture at three different temperatures 25°C, 35°C & 45°C at an ionic strength of 0.1M  $\text{NaClO}_4$  were studied. The Calvin-Bjerrum method as adopted by Irving-Rossotti has been employed to determine metal-ligand stability constant  $\log K$  values. The trend in the formation constants for transition metal ions follows the order:  $\text{Cu}^{2+} > \text{Zn}^{2+} > \text{Ni}^{2+} > \text{Cd}^{2+} > \text{Co}^{2+} > \text{Mn}^{2+}$  and for lanthanide metal ions  $\text{La}^{3+} < \text{Ce}^{3+} < \text{Pr}^{3+} < \text{Nd}^{3+} < \text{Sm}^{3+} < \text{Eu}^{3+} > \text{Gd}^{3+} < \text{Tb}^{3+} < \text{Dy}^{3+} > \text{Ho}^{3+}$  and shows a break at gadolinium. The thermodynamic parameters such as, Gibb's free energy change ( $\Delta G$ ), entropy change ( $\Delta S$ ) and enthalpy change ( $\Delta H$ ) associated with the complexation reactions were calculated. The formations of metal complexes were found to be spontaneous, exothermic in nature and favorable at lower temperature.

**Keywords:** stability constant, transition metal ions, lanthanide metal ions, schiff base, pH metric, thermodynamic parameter etc.

### Introduction:

Metal complexes of schiff bases play a central role in the development of coordination chemistry. pH metric titration technique is a powerful and simple electro analytical technique for determination of stability constants. Most of the d-block and f-block elements form complexes. There are different kinds of ligands used for complexation. For the present investigation, we have selected schiff base 2-hydroxy-5-bromo acetophenone-N-(2-chloro-5-nitrophenyl) imine, having molecular formula  $\text{C}_{14}\text{H}_{10}\text{O}_3\text{N}_2\text{BrCl}$

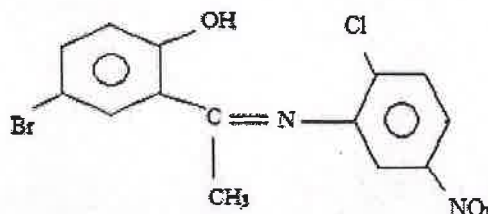


Figure: 2-hydroxy-5-bromo acetophenone-N-(2-chloro-5-nitrophenyl)imine

In continuation of our earlier work with complexation of schiff base<sup>1-11</sup> and after literature survey it was thought of interest to study the effect of temperature on thermodynamic parameters such as Gibb's free energy change  $\Delta G$ , enthalpy change  $\Delta H$  and entropy change  $\Delta S$  of complexes of 2-



## THERMODYNAMIC STUDY OF COMPLEXATION OF TRANSITION METAL IONS WITH SCHIFF BASE 2-HYDROXY-5-BROMO ACETOPHENONE-N-(4-METHYLPHENYL) IMINE IN 50%(V/V) ETHANOL-WATER MEDIUM

RajpalJadhav<sup>1</sup>, Hansaraj Joshi<sup>1</sup>, S.D.Naikwade<sup>2</sup> S.B.Ubale<sup>2</sup> and S hailendrasingh Thakur<sup>3</sup>

<sup>1</sup>Department of Chemistry, Swa.Sawarkar College, Beed.

<sup>2</sup>Principal, ChhatrapatiShahu College, Lasur Station, Aurangabad.

<sup>2</sup>Chemistry Department, R.B.Attal College, Georai

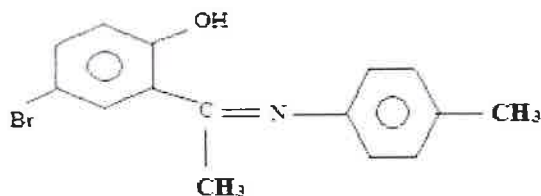
<sup>3</sup>Dept. of Chemistry, Milliya Art's Science and Management Science College, Beed.

[rajpaljadhav567@gmail.com](mailto:rajpaljadhav567@gmail.com)

**Abstract:** The stability constant of schiff base 2-hydroxy-5-bromoacetophenone-N-(4-methylphenyl) imine with divalent transition metal  $\text{Cu}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Mn}^{2+}$  and  $\text{Zn}^{2+}$  using a pH metric titration technique in 50%(v/v) ethanol-water mixture at three different temperatures 25°C, 35°C & 45°C at an ionic strength of 0.1M  $\text{NaClO}_4$  were studied. The method of Calvin-Bjerrum as adopted by Irving-Rossotti has been employed to determine metal-ligand stability constant log K values. The trend in the formation constants is as:  $\text{Cu}^{2+} > \text{Ni}^{2+} > \text{Co}^{2+} > \text{Cd}^{2+} > \text{Zn}^{2+} > \text{Mn}^{2+}$ . The thermodynamic parameters such as, Gibb's free energy change ( $\Delta G$ ), entropy change ( $\Delta S$ ) and enthalpy change ( $\Delta H$ ) associated with the complexation reactions were calculated. The formations of metal complexes were found to be spontaneous, exothermic in nature and favorable at lower temperature.

**Keywords:** Transition metal, schiff base, pH metry, thermodynamic parameter etc.

**Introduction:** pH metric titration is accepted as a powerful and simple electro analytical technique for determination of stability constants. Metal complexes of schiff bases have played a central role in the development of coordination chemistry. Most of the d-block elements form complexes. There are different kinds of ligands used for complexation. For the present investigation, we have selected schiff base 2-hydroxy-5-bromo acetophenone-N-(4-methylphenyl) imine, having molecular formula  $\text{C}_{15}\text{H}_{14}\text{ONBr}$



**Figure: 2-hydroxy-5-bromoacetophenone-N-(4-methylphenyl)imine**

After literature survey and in continuation of earlier work with complexation of schiff base<sup>11</sup>, it was thought of interest to study the effect of temperature on thermodynamic parameters such as Gibb's free energy change  $\Delta G$ , enthalpy change  $\Delta H$  and entropy change  $\Delta S$  of complexes of 2-hydroxy-5-bromoacetophenone-N-(4-methylphenyl) imine with six divalent transition metals  $\text{Cu}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Mn}^{2+}$  and  $\text{Zn}^{2+}$  using pH metrically in 50% (v/v) ethanol-water mixture.

### Experimental

**Materials and Solution:** All divalent transition metal salts, NaOH,  $\text{NaClO}_4$ ,  $\text{HClO}_4$  are of AR grade. The solutions used in the pH metric titration were prepared in double distilled  $\text{CO}_2$  free water. The NaOH solution was standardized against oxalic acid solution and standard alkali solution was again used for standardization of  $\text{HClO}_4$ . The transition metal salt solutions were also standardized

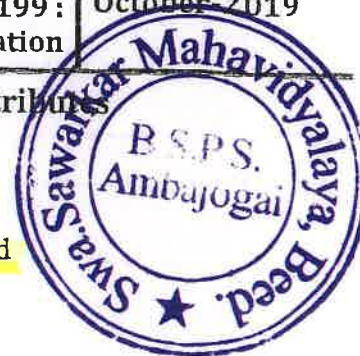


## Student Participation in Attainment of Graduate Attributes

H.U. Joshi<sup>1</sup>, S.V.Thakur<sup>2</sup>, G.M. Dhond<sup>1</sup>

1Swa. SawarkarMahavidyalaya, Beed

2 Milliya Arts, Science &amp; Management Sci. College, Beed

[hansarajjoshi307@gmail.com](mailto:hansarajjoshi307@gmail.com)**Abstract:**

Graduate attributes is the key word used now a days in the field of higher education. Higher education institutes play significant role in human resource development and thus contributing in the national development. HEIs through well planned and structured activities ensures in the attainment of these desired graduate attributes. Participation of students in decision making as well as implementation of activities and programmes in HEIs facilitates the early attainment of these attributes.

**Key words:** Graduateattributes, student participation, learning outcomes

Graduate attributes are the set of qualities, skills and understandings those the students should develop during their time with the Higher Education institution HEI. The graduate attributes means the particular quality and feature or characteristics of an individual, including the knowledge, skills, attitudes and values that are expected to be acquired by a graduate through studies at the higher education institution such as college or university. The graduate attributes include capabilities that help to strengthen one's abilities for widening current knowledge base and skills, gaining new knowledge and skills, undertaking future studies, performing well in a chosen career and playing a constructive role as a responsible citizen in the society.

The graduate attributes define the characteristics of student's universitydegree programmes, and describe a set of characteristics/competencies that are transferable beyond study of a particular subject areaand program contexts in which they have been developed. Graduate attributes are fostered through meaningful learning experiences and a process of critical and reflective thinking. Every individual student is unique and has her/his own characteristics in terms of previous learning levels and experiences, life experiences, learning styles and approaches to future career related actions. The higher education institutions help to develop thegraduate attributes by providing quality education through deep learning experiences to the students while their stay at HEI. The graduate attributes reflect both disciplinary knowledge and understanding, generic skills including global competencies that all students in different academic fields of study should acquire /attain and demonstrate.

Some of the characteristics attributes that a graduate should demonstrate are as follows:  
Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

**Communication skills:**

Ability to express thoughts and ideas effectively in writing and orally; communicate with others using appropriate media; confidently share one's views and express herself or himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

Head

Principal

**Mixed Ligand Complexes of Cadmium Metal Ion with Diphenhydramine and Amino Acids in Aqueous Media**Shailendrasingh Thakur<sup>1</sup>, H.U.Joshi<sup>2</sup>, M.A. Sakhare<sup>3</sup> and Ramesh Ware<sup>1</sup>Department of Chemistry, Milliya College Beed.<sup>2</sup>Department of Chemistry, Swa.Sawarkar College, Beed.<sup>3</sup>Department of Chemistry, Balbhim College Beed.

Email: ramesh.ware50@gmail.com

**Abstract:**

In the present study the stability constant of the mixed ligand complexes of Cd (II) ion with drug Diphenhydramine as primary ligand and eight amino acids glycine, DL-alanine, L-glutamic acid, DL-isoleucine, DL-methionine, DL-β-phenyl alanine, DL-serine and DL-valine as secondary ligands were determined potentiometric technique in 20% (v/v) ethanol-water medium at 27 °C and at an ionic strength of 0.1 M NaClO<sub>4</sub>. The formation of complex species has been evaluated by SCOGS computer program and discussed in terms of various relative stability parameters.

**Keywords:** stability constant, Diphenhydramine drug, amino acids, mixed ligand complexes.

**Introduction:**

Diphenhydramine is first generation antihistamines mainly used to treat allergies. It has a powerful hypnotic effect and often it is used as a nonprescription sleep aid and a mild anxiolytic and antipsychotics. It is also used to treat motion sickness, insomnia, cough, nausea and phenothiazine drug induced abnormal muscle movement. The physical properties of medicinal drug Diphenhydramine are shown below:

Sr.No.	Physical property	Value
1	Molecular weight	291.855 g/mol
2	Phase	Solid (at STP)
3	Melting point	188 °C
4	Boiling Point	343.7 °C
5	Density	1.024 g/cm <sup>3</sup>
6	Colour	White
7	Solubility	Soluble in water [3.06 mg/ml (at 27 °C)]

In continuation of earlier work with complexation of medicinal drug<sup>1-30</sup>, we study ternary complexes of Cd metal ion with medicinal drug Diphenhydramine {2-(diphenylmethoxy)-N,N-dimethyl ethanamine hydrochloride} as primary ligand and eight amino acids as secondary ligands in ethanol-water media at 27 °C and at 0.1M NaClO<sub>4</sub> ionic strength.

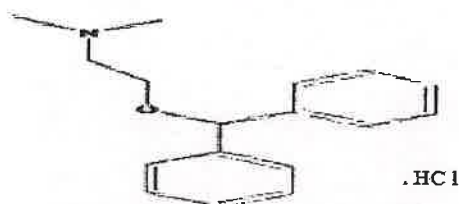


Figure 1: Diphenhydramine hydrochloride (molecular formula C<sub>17</sub>H<sub>22</sub>N<sub>2</sub>O)

**Experimental: Materials and Solution:**

Principal

Swa.Sawarkar Mahavidyalaya,  
Beed.

Head

## LOW COST CARBON CATHODE FOR NATURAL DYE SENSITIZED SOLAR CELL

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Received: 25 January 2020, Revised and Accepted: 17 March 2020

## ABSTRACT

**Objective:** Platinum film on fluorine doped tin oxide (FTO) glass surface has been used commonly in the research of dye sensitized solar cells (DSSCs). However, cost of platinum is too high to fabricate a cost effective ecofriendly DSSC. The current study has been done to replace the high cost platinum counter electrode by low cost carbon electrode.

**Material and Method:** TiO<sub>2</sub> nanoparticles has been synthesized and used to synthesize Photo anode of DSSC on fluorine doped tin oxide (FTO) glass surface. Platinum and Carbon cathodes has been synthesized on fluorine doped tin oxide (FTO) glass surface fabricated and their photovoltaic properties have been compared. Area of the cathode and anode has been maintained 1square centimeter.

**Results:** Study of DSSCs reveals, carbon cathode can successfully replace the platinum cathode as efficiencies of DSSCs have been found to be more using carbon cathode as compare to the platinum cathode. Ecofriendly Eosin Y dye sensitized TiO<sub>2</sub> nanoparticles photo anode has been used for the fabrication of DSSC.

**Conclusions:** Investigation leads to the conclusion that carbon cathode can replace the platinum cathode in dye sensitized solar cell.

**Keywords:** Dye sensitized solar cell, TiO<sub>2</sub> nanoparticles photo anode, carbon cathode, eosin Y dye

## INTRODUCTION

Dye sensitized solar cells (DSSC), are the third generation hybrid solar cells offer a particular promise as an efficient, low cost alternative to the silicon semiconductor solar cells. Since the working principle of DSSC is the mimicry of natural photosynthesis process, DSSC is the most promisingly environmental benign solar cells [1]. Unlike the silicon solar cells, DSSC uses sensing dye for light harvesting and electron transport, which allows researchers to fine tune each component separately and to optimize the device performance. Along with environmental friendliness, DSSCs poses the attractive properties like, flexibility, multicolored and hence aesthetics [2].

In a typical DSSC, light photons are absorbed by a sensitizer, which is adsorbed to the surface of wide band gap semiconductor oxide. The sensitized nano particles of semiconductor in combination with the electrolyte and counter electrode produce the regenerative cycle of photo electrochemical cell [3]. Literature study reveals, most often Titanium oxide (TiO<sub>2</sub>) photo anode sensitized by ruthenium complex dye and the platinum counter electrode is the typical components of Dye Sensitized Solar Cells (DSSCs) [3]. In our previous studies, Al doped TiO<sub>2</sub> photo anode proved to be fruitful to increment the photovoltaic parameters i.e., photo current and efficiency of the DSSC along with organic Eosin Y dye [4-6]. Eosin Y dye is one of the xanthene dye exhibiting the properties like large absorption and luminescence; low toxicity in-vivo and relatively high solubility in water [7-10].

Counter electrodes (Cathodes) have usually been prepared by depositing a thin layer of platinum (Pt) onto the FTO substrates. The FTO substrate without platinum coating can also work as the counter electrode, however, its charge transfer resistance is very high on the order of mega ohm per square centimeter in iodine-triiodide electrolyte and hence, the platinum layer is deposited on the FTO to work as the catalyst. It reduces the oxidized form of the redox couple in the electrolyte so that the cathode material must be adapted to the redox system in the electrolyte. Although platinum is the most

efficient catalyst for counter electrode to date, rarity and high cost of platinum makes it unsuitable for low cost DSSC. Hence, several other materials have also been adopted for the preparation of the counter electrode in DSSCs, such as conducting polymers such as poly (3,4-ethylenedioxythiophene) doped with toluene sulfonate anions, carbon materials and cobalt sulphide, carbon black [8]. Moreover, the platinum being heavy metal costs too high and elevates the overall cost of DSSC [11-12]. Whereas, DSSC comprised of carbon cathode has also found to be exhibiting comparable results to that of the platinum cathode [13-17].

Considering support of these studies, the current study of DSSC comprised of TiO<sub>2</sub> nanoparticles photo anode sensitized by eosin Y dye has been further explored towards the cost effective and environmentally benign DSSC by employing the carbon cathode.

## MATERIALS AND METHODS

## Materials

Titanium Tetra iso-propoxide (TTIP) (Otto Chemicals, Germany), Eosin Y dye and Chloroplatinic acid (H<sub>2</sub>PtCl<sub>6</sub>) (Ward Hill, U.S.A.), Aluminium Nitrate (Al(NO<sub>3</sub>)<sub>3</sub>) and Poly-ethylene Glycol (Otto Chemicals, India), Lithium iodide and iodine all reagents were used without further purification.

Synthesis and characterization of TiO<sub>2</sub> nanoparticles

TiO<sub>2</sub> nanoparticles have been synthesized as described in previous studies [6] and characterized using FTIR spectra.

## DSSC Fabrication and Testing

The DSSCs were assembled as follows: cleaned fluorine-doped tin oxide (FTO, Sigma- Aldrich) conductive glasses of size 2\*2 cm<sup>2</sup> have been used as the substrate. The TiO<sub>2</sub> nanoparticles anode has been prepared using doctor blade method and has been sintered at 450°C for 1 h to enhance the bonding between the semiconductor and the FTO glass. After cooling to 80°C, the prepared photo anodes have



ICMES-2018

## Exploring the impressive nonlinear optical and dielectric properties of cadmium thiourea acetate crystal doped with oxalic acid

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<sup>b</sup>Crystal Growth Laboratory, Department of Physics, Milliya Arts, Science & Management Science College, Beed-431122, Maharashtra, India.

### Abstract

The present communication is aimed to investigate the remarkably improved properties of oxalic acid (OA) doped bis cadmium thiourea acetate (CTA) crystal. The commercial slow solvent evaporation method has been employed to grow the pure and OA doped CTA crystal. The structure and unit cell parameters of grown crystal were determined by means of powder X-ray diffraction technique, which confirmed orthorhombic crystal structure. The optical transparency of OA doped CTA crystal (78%) has been ascertained in the visible region (200-900 nm) using the UV-visible spectral analysis. The assertive influence of OA on the dielectric behavior of host CTA crystal was investigated in the temperature range 35-120 °C by means of dielectric studies. Doped crystal showed lower dielectric nature than parent. The nonlinear response of OA-CTA crystal was confirmed by Kurtz-Perry test. The SHG efficiency of OA-CTA crystal is found to be higher than potassium dihydrogen phosphate (KDP) crystal. Obtained results confirmed suitability of OA doped CTA crystal for photonic device applications.

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Peer-review under responsibility of the scientific committee of the International Conference on Materials and Environmental Science, ICMES 2018.

**Keywords:** - Crystal growth, Optical studies, Dielectric studies, Nonlinear optical materials

### 1. Introduction:

Crystals lie at the root of technology. Materials offering excellent optical, electrical and non-linear optical (NLO) coefficient has been sustained for past few decades due to their wide application in the field of optical signal processing, laser fusion and ultrafast laser systems, UV-tunable lasers, optoelectronics and NLO-assisted photonic devices [1]. Thiourea metal complex (TMC) crystals offer high non-linearity, huge threshold to laser damage, fast electronic response, high mechanical strength and good thermal stability. These qualities qualify this organometallic bond channel possessing materials for designing high edge integrated optical devices [2]. Amongst the various reported TMC crystals like ZTS, ZTC, BTZA, BCTF etc. cadmium thiourea acetate (CTA) is an interesting NLO crystal. The structural, UV-visible, SHG efficiency, photoconductivity, dielectric, photoluminescence, mechanical

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## Studies On Linear Optical Properties Of Potassium Chloride Doped BIS Thiourea Cadmium Acetate Crystals.

Siddique Aneesa Fatema<sup>a</sup>, R.N. Shaikh<sup>a</sup>, R.B Kulkarni<sup>b</sup>, Mahendra D. Shirsat<sup>b</sup>, S. S. Hussaini<sup>a\*</sup>

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### Abstract

Single crystal of Potassium Chloride (KCL) doped Cadmium Thiourea Acetate (CTA) has been grown by slow evaporation solution growth technique. The UV-visible study reveals that doped CTA crystal has high transmission with lower cut off wavelength of 250 nm. The optical band gap was found to be 4.2(eV). The linear optical properties such as refractive index, reflectance, extension coefficient and optical conductivity was calculated which shows the applicability of grown crystal for various solar thermal devices and opto-electronic applications.

### 1) Introduction :-

The search for new and efficient NLO materials has resulted in the development of new class of materials called semi organic materials. Thiourea is centrosymmetric material when it is incorporated in organic materials. It is also an interesting inorganic matrix modifier due to its large dipole moment. Recently researches are focusing on growing metal complexes thiourea related crystals [1]. Thiourea based organic metallic crystal like thiourea doped triglycine zinc chloride (TGZC) [2], Urea thiourea chloride zinc chloride, cadmium chloride doped zinc tris thiourea sulphate [3], L-Alanine added cadmium thiourea acetate [4], Calcium Bis thiourea chloride (CBTC), Zinc thiourea sulphate (ZTS), zinc thiourea chloride (ZTC), BIS thiourea cadmium formate (BTCF), BIS thiourea cadmium Chloride (BTCC), BIS thiourea Zinc

## Evaluation of Optical Traits of Urea Doped Thiourea Zinc Sulphate (U-ZTS) Metal Complex Crystal for NLO Applications

Siddique Aneesa Fatema<sup>a</sup>, Rupali B. Kulkarni<sup>b</sup>, S. S. Hussaini<sup>a\*</sup>,  
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**Abstract:** Present research work focuses on evaluation of the impact of urea doping on thiourea zinc sulphate metal complex crystal (ZTS). Traditional slow evaporation solution growth technique was preferred at ambient temperature for the growth of Urea doped thiourea zinc sulphate (U-ZTS) metal complex crystal. This investigation deals with the study of optical properties transmittance, band gap, refractive index, reflectance, extinction coefficient of Urea doped thiourea zinc sulphate (U-ZTS) metal complex crystal. Kurtz-Perry SHG test pointed the nonlinearity of Urea doped thiourea zinc sulphate (U-ZTS) metal complex crystal.

**Keywords:** Crystal growth, Urea, Thiourea Zinc Sulphate Kurtz-Perry SHG test, extinction coefficient

Date of Submission: 03-03-2020

Date of Acceptance: 18-03-2020

### I. Introduction

Non linear optical (NLO) materials have attracted much attention due to their major role in emerging photonic and opto electronic technology [1-2]. The recent search is concentrated on organo-metallic NLO materials due to remixing of large non linearity, high resistance to laser induced damage with good mechanical hardness [3-4]. The NLO properties of some complexes of thiourea have attracted significant attention in the last few years because both organic and inorganic compound in it contribute specifically to the process of second harmonic generation [5-7]. Examples of these complexes are Bis thiourea zinc acetate (BTZA) [8] and cadmium thiourea acetate (CTA) [9]. Urea thiourea mercuric sulphate and Urea thiourea mercuric chloride have been already reported. Nonlinear optical (NLO) material Zinc tris (thiourea) sulphate (ZTS) is a best alternative for potassium dihydrogen phosphate crystals in frequency-doubling and laser fusion due to their properties high optical transparency, low refractive index, low reflectance low extinction coefficient, widened band gap, Second harmonic generation efficiency 1.2 times of KDP, growth from solution by slow evaporation [10-20]. Urea thiourea mercuric sulphate and urea thiourea mercuric chloride [21], Urea thiourea copper have been already reported [22]. In the present investigation attempt have been made to grow optical clear crystal of ZTS doped 0.3M% urea (U-ZTS) by slow evaporation technique.

### II. Experimental Procedure

Zinc Thiourea Sulphate (ZTS) salt was synthesized using AR grade zinc sulphate and thiourea in 1:3 molar concentration. Prepared salt was further purified by repeated crystallizations. The calculated amount of salt was dissolved in the deionized water to achieve the super saturated solution. 0.3M% urea was doped to the super saturated solution of ZTS and Stirred for 5 hours at constant speed to achieve homogeneity throughout the volume. The purity of 0.3M% urea doped ZTS (U-ZTS) is achieved by successive recrystallization. Good quality crystals were grown over period of 30 days. The grown crystal is shown in Fig 1.

**Focusing Growth and Characterization Studies of Potassium Chloride (KCL)  
Doped Bis Thiourea Cadmium Acetate (BTCA) Single Crystals**

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**Abstract:-**

The crystal of Potassium Chloride doped Bis thiourea Cadmium Acetate (KCL-BTCA) was grown by slow evaporation solution growth technique. The functional groups of grown crystal KCL-BTCA have been identified by FT-IR spectral analysis. The second harmonic generation efficiency of grown KCL-BTCA crystal was analyzed by Kurtz Perry powder test. Third order nonlinearity was estimated using Z-scan technique respectively.

**Keywords:-**Crystal growth, FT-IR spectral analysis, SHG, Z-scan.

**1. Introduction:-**

From last two decades, large number of thiourea based organic-metallic crystals with good nonlinear optical, mechanical, thermal properties has been reported. Metal complexes of thiourea are extensively explored due to the Centro symmetric thiourea molecule incorporated into respective salt gives non centro symmetric material. Zinc thiourea chloride (ZTC), Zinc thiourea sulphate (ZTS), Bis thiourea cadmium acetate (BTCA), bis thiourea calcium chloride (BTCC) etc are the famous crystals reported in the literature [1-2]. Also various properties of BTCA crystal has been investigated by doping variety of amino acids (L-Cystine, L-Alanine etc) [3-4]. S. Selvakumar et al. have reported the influence of Zn<sup>2+</sup> doping on nonlinear properties and crystalline perfection of CTA crystal [5]. Effect of KCL doping on linear properties of BTCA single crystal have been reported recently in our early communication [6]. In present investigation we report KCL doped CTA to study the SHG efficiency and Z-scan to find its better alternative to other non linear materials. The grown crystal was characterized by various characterization techniques, such as FT-IR studies, SHG tests and Z Scan studies.

**2. Experimental Procedures:-**

**2.1 Synthesis and Crystal Growth:-**

The pure crystal of BTCA was synthesis by reacting stoichiometric amount of cadmium acetate and thiourea in the molar ratio 1:2 in deionized water at room temperature. The mixed solution was continuously stirred using magnetic stirrer for 8hrs and then filtered by whatman filter paper to increase purity of the solution. This filtered solution was kept in glass vessel covered with a perforated paper for slow evaporation in dust free atmosphere. The good quality BTCA crystal was harvested. The saturated solution of pure BTCA salt was taken in a clean baker and then 1Mole% of KCL solution was added to BTCA solution for the growth doped



## Potentiometric investigation of complexation of Benazepril drug with alkaline earth metal ions in aqueous media.

Rajpal Jadhav<sup>1</sup>, Ramesh Ware<sup>2</sup> and Shailendrasingh Thakur<sup>2</sup>

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<sup>2</sup>Department of Chemistry, Milliya Arts, Science and Management Science College, Beed.

### Abstract :

In the present work we investigate the stability constant of Benazepril hydrochloride drug with alkaline earth metal ions Mg(II) and Ca(II) using potentiometric titration technique in 20 % (v/v) ethanol-water mixture at 27 °C temperature and at an ionic strength of 0.1M NaClO<sub>4</sub>. {Metal to ligand ratio = 1:5 and 1:1} The method of Calvin and Bjerrum as adopted by Irving and Rossotti has been employed to determine proton ligand (pK<sub>a</sub>) and metal-ligand stability constant (log K) values. It is observed that alkaline earth metal ion forms 1:1 and 1:2 complexes.

**Key Words :** Stability constant, alkaline earth metal ions, Benazepril drug, Potentiometric etc.

### Introduction :

Chemistry of drugs attracts many researchers because of its application in medicinal study. The stability of metal complexes with medicinal drugs plays a major role in the biological and chemical activity. Metal complexes are widely used in various fields, such as biological processes pharmaceuticals, separation techniques, analytical processes etc. To understand the complex formation ability of the ligands and the activity of complexes, it is essential to have the knowledge about solution equilibria involved in the reactions. The extent to which the ligand binds to metal ions is normally expressed in terms of stability. Potentiometric titration is accepted as a powerful and simple electro analytical technique for determination of stability constants. Most of the s-block elements form complexes. Mg (II) ions form complexes with several enzymes which are essential for energy release. They are also important for transmission of impulses along the nerve fibres. Ca (II) is important in bone, teeth and blood clotting. It maintains the regular breathing of hearts, contraction of muscles<sup>1</sup>.

There are different kinds of ligand used for complexation. For the present investigation, we selected Benazepril hydrochloride (BEN). Benazepril (3-[(1-ethoxy carbonyl-3-phenyl-(1S)-propyl)-amino]-2,3,4,5-tetrahydro-2-oxo-1-(3S)-benazepine-1-acetic acid hydrochloride), is a prod rug type angiotensin-converting enzyme (ACE) inhibitor, which is proved effective in treating congestive heart failure and hypertension. The family of ACE inhibitors inhibits the angiotensin-converting enzyme, which is involved in the conversion of angiotensin I to angiotensin II. The physical properties of medicinal drug Benazepril hydrochloride are shown below:

Sr. No.	Physical property	Value
1	Molecular weight	460.98.g/mol
2	Phase	Solid (at STP)
3	Melting point	189 °C
4	Boiling Point	691.2 °C
5	Density	1.269 g/cm <sup>3</sup>
6	Colour	White
7	Solubility	Soluble in water (>100 mg/mL)

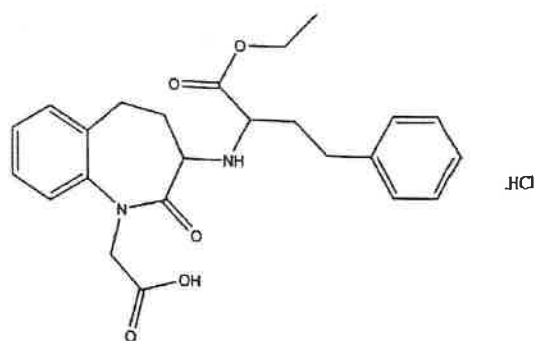


Figure 1: Benazepril hydrochloride ( molecular formula is C<sub>24</sub>H<sub>29</sub>N<sub>2</sub>O<sub>5</sub>Cl )

After a review of literature survey and in continuation of our earlier work with complexation of medicinal drugs<sup>2-29</sup>, we have carried out a solution study on the complexation of Benazepril drug with alkaline earth metal ions Mg(II) and Ca(II) using pH metrically in 20 % (v/v) ethanol-water mixture at constant ionic strength of 0.1M NaClO<sub>4</sub>.



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ISSN: 0474-9030 Vol-68, Special Issue-12



National Conference on Recent Trends in Physics, Chemistry and  
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## Solution Of Dissipative Fluid Flow Of An Impulsively Started Infinite Vertical Plate.

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\* Swa. Sawarkar Mahavidyalaya,  
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### Abstract

A finite difference solution of dissipative fluid flow past an impulsively started infinite vertical plate in a rotating fluid. Axial and transverse velocity profiles, temperature profiles are shown for different values of Ekman number  $E_k$ , the Prandtl number  $Pr$  and the Eckert number  $Ec$ . The numerical values of Axial and transverse skin friction and the rate of heat transfer are entered in a table. It is observed that rotating speed increase axial velocity decrease and the transverse velocity is also decrease for all Prandtl number and there is rise in the temperature for low density fluid ( $Pr < 0.71$ ) but when  $Pr$  is large temperature increase due to more rotation of the system near the plate and decreases far away from the plate.

### Introduction

An exact solution of Navier-stokes equation which was concerned for the flow of viscous incompressible fluid past an infinite horizontal impulsively started plate, in a stationary mass of fluid was first presented by Stokes in 1851. Hall (1969) was presented by A finite difference solution to the flow past an impulsively started semi- infinite horizontal plate. However instead of horizontal plate, if an impulsive motion is given to an infinite vertical plate which is surrounded by an infinite mass of viscous incompressible fluid, how the flow is affected by free convection currents? This was first studied by Soundalgekar (1977) who presented an exact solution to coupled partial differential equations by the Laplace-transfer technique. The effect of heating or cooling of the plate by the free convection currents was studied by neglecting viscous dissipative heat. If the impulsive motion given to the plate is such that the velocity is rather high or the surrounding liquid is of high Prandtl number or the situation considered at high gravitational field, then the viscous dissipative heat cannot be neglected has been shown by Gabhart (1962). Soundalgekar et.al.(1979) considered this problem by taking the effect of viscous dissipative heat on the motion past an impulsively started infinite vertical isothermal plate. Now during last few years the flow around the

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**Immunology Rangoli Competition**  
(Wednesday, 14th August 2019)



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Organized

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(Wednesday, 14th August 2019)

## Report

On Wednesday, 14th August 2019, the Department of Microbiology, Sawarkar College, Beed, in collaboration with Microbiologists Society India organized an 'Immunity' themed Rangoli (a traditional Indian art form using colorful patterns) competition. The participants in this competition creatively depicted various concepts related to Immunity through Rangoli.

The aim was to study various components of the curriculum with a holistic approach. The participants were encouraged to present their acquired knowledge in an engaging and innovative manner. The program, organized by the Department of Microbiology, had the objective of showcasing the manifestation of knowledge with enthusiasm among the competitors. A total of 11 students participated in the competition. During the event, students, teachers, and staff members had the opportunity to gain insights from the students on the subject. The event was graced by esteemed dignitaries, including Hon. Dr. Surendraji Alurkar, Chairman of the Bhartiya Shikshan Prasarak Sanstha, Ambajogai and Hon. Shree. Chadrakant Mule, President of the College Development Committee, who offered their appreciation to the students.

Principal Dr. Sanjay Shirodkar, Vice-Principal Dr. Laxmikant Bahegavankar, and Dr. Rajesh Dhere encouraged the students during the event. The program was coordinated by the faculty members of the Microbiology Department, Dr. Krishna Bartakke, and Mr. Anant Deshpande, along with laboratory assistant Smt. Manisha Dharurkar. The first, second, and third prizes were awarded to Miss Vaishnavi Patki (3rd-year B.Sc.), Miss Aboli Beedkar (2nd-year B.Sc.), and Miss Snehal Kamble (3rd-year B.Sc.) respectively. The winning Rangoli designs have been displayed at the entrance of the New Arts, Science, and Commerce College in Ahmednagar, organized jointly by the Microbiologists' Society of India, Maharashtra."

  
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**Immunology Rangoli Competition**

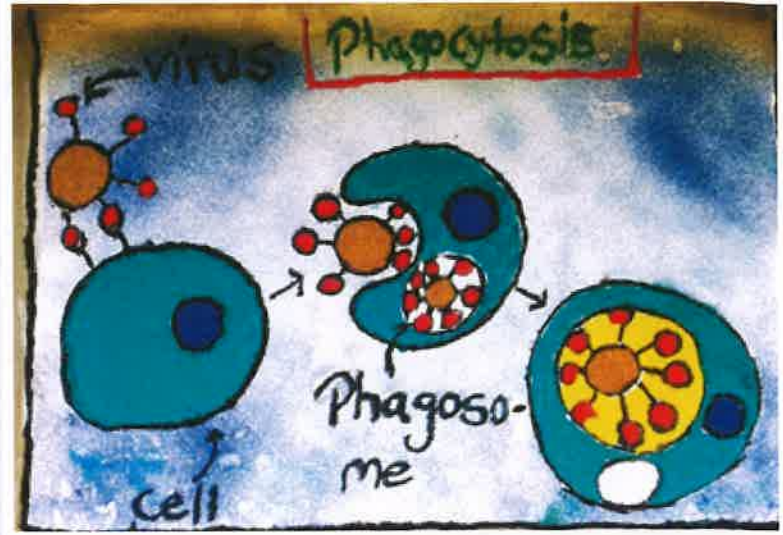
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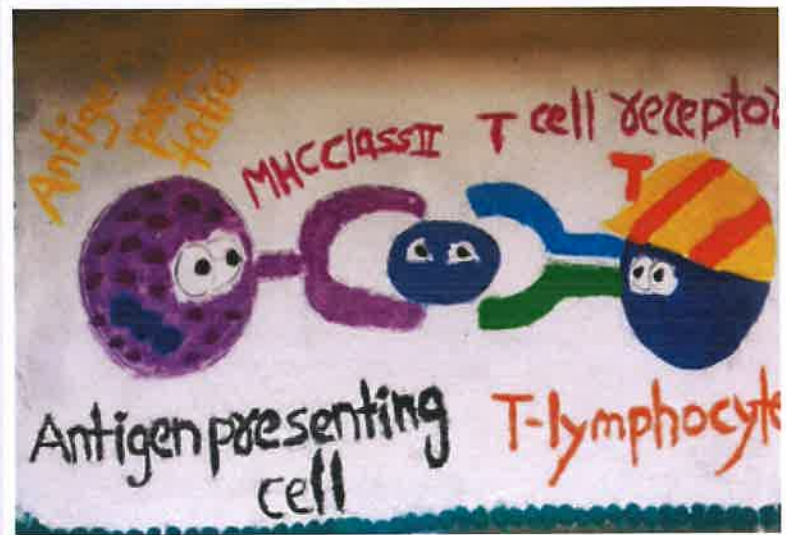
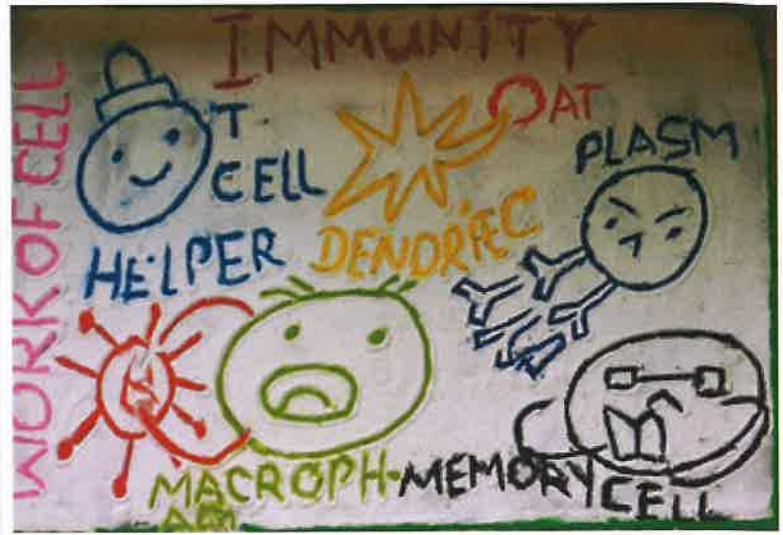
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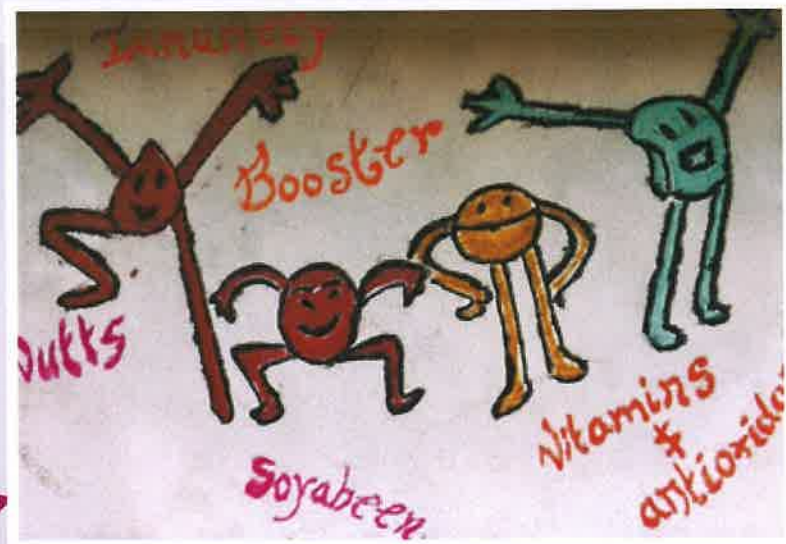
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