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

2018-19

DVV Clarification

Established-1995

BhartiyaShikshanPrasarakSantha's, Ambajogai

Swa. Sawarkar Mahavidyalaya,Beed

(Art's, Science & Commerce)

NAAC– RE-ACCREDITED GRADE-B

Dr. P.D. Pohekar

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Collaborative Activities 2018-20

Sr. No.	Title of the collaborative activity	Name of the collaborating agency with contact details
1	Psychological Counseling	Mauli Maind Care Hospital, Beed.
2	Tuning optical properties of cadmium thiourea acetate nonlinear optical crystal exploiting organic ligand of L-proline	Crystal growth research Laboratory, Milliya College, Beed.
3	Illustrious influence of amino acid L-threonine(LT) on structural and optical insights of Zinc Thiourea Sulphate (ZTS) crystal"	Crystal growth research Laboratory, Milliya College, Beed.
4	Crystal growth, spectral, optical and thermal studies of thiourea ammonium acetate doped potassium dihydrogen phosphate crystal for NLO applications	Crystal growth research Laboratory, Milliya College, Beed.
5	Magnificent transmutation in optical traits due to methionine doping on zinc thiourea sulphate (zts) metal complex crystal	Crystal growth research Laboratory, Milliya College, Beed.
6	Focusing superiority of s-r method grown crystal over conventionally grown thiourea zinc acetate (tza) metal complex crystal	Crystal growth research Laboratory, Milliya College, Beed.
7	Stability study of complexation of transition metals with Sciff-Base 2-Hydroxy-5-bromoacetophenone-N-(4-methoxyphenyl) imine: thermodynamic aspects; Research Journey International Multi-disciplinary E-Research Journal, March-2019.	Milliya College Beed & Balbhim College Beed.
8	Solution of Forced & Free Convection Flow Of Dissipative Fluid Past An Infinite Vertical Plate	R. B. Attal College, Gevrai & Dept. of Mathematics, Swa. Sawarkar Mahavidyalaya, Beed
9	17th Regional Level Seminar Competition	Marathwada Mathematical Society
10	Inter Loan Facility (Library)	Pradnyachakshu Andh vidyalaya, Beed
11	Guest Lecture	Milliya College, Beed
12	Fuzzification of Linear Spaces	R. B. Attal College, Gevrai & Dept. of Mathematics, Swa. Sawarkar Mahavidyalaya, Beed

Collaborative Activities 2018-19

2018-19 (1)

B.S.P.S. Ambajogai

SWA. SAWARKAR MAHAVIDYALYA, BEED

Counselling Center
2018 – 2019

Prof. Joshi S. B.
Head Department of Psychology
Swa. Sawarkar Mahavidayalaya 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
मो.9422240930

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 : 31/05/2019

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 2018-2019 दरम्यान 07 रुग्णांना समुपदेशन केले.

सहकार्याबद्दल आपले हार्दिक आभार.

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M.B.B.S.,D.P.M.(Pune)
Mauli Mind Care
Hospital,Beed.

Principal
Swa.Sawarkar Mahavidyalaya
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Counselling Centet
2018 – 2019
Report

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

Mantel retarded Student IQ = 10

Anxiety = 09

Exam Stress = 09

Carrier Guidance = 04

Prof. Joshi S. B.
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Collaborative publication 2018-19 (2)

Modern Physics Letters B
1850424 (11 pages)

DOI: 10.1142/S0217984918504249

Tuning optical properties of cadmium thiourea acetate nonlinear optical crystal exploiting organic ligand of L-proline

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Modifying optical properties of crystal is very fundamental need for designing various photonic devices, hence in the current investigation, the L-proline (LP) has been firstly doped in cadmium thiourea acetate (CTA) crystal with the aim to optimize the UV–Visible, second harmonic generation (SHG) efficiency, luminescence and third-order nonlinear optical (TONLO) properties of CTA crystal. The pure and doped CTA crystals have been grown by slow solvent evaporation technique at 35°C. The structural parameters of grown crystals have been determined using the single crystal X-ray diffraction technique. The incorporation of LP in CTA crystal matrix has been confirmed by Fourier transforms infrared analysis. The UV–Visible studies have been employed within the wavelength range of 200–900 nm to explore the enhancing impact of LP on CTA crystal. The LP doped CTA crystals were subjected to Kurtz–Perry test and Z-scan analysis to identify the nonlinear nature of studied crystals. The SHG efficiency of LP-CTA crystal shows significant increase owing to enhanced charge transfer over the organic ligand of LP. The laser-induced TONLO properties of LP-doped CTA crystal have been determined at 632.8 nm. The nature of nonlinear refraction and absorption has been explored by close and open aperture Z-scan configuration. The magnitude of nonlinear refraction (n_2), absorption coefficient (β), cubic susceptibility (χ^3) and figure of merit has been determined using the transmittance data. The color-centered luminescence studies have been carried out which established the prominent redshift in peak maxima of emission wavelength of CTA crystal due to doping of LP. Comparative analysis of pure and doped crystal confirmed the dominance of LP doping.

Keywords: Crystal growth; optical studies; Z-scan analysis; TONLO parameters.

§Corresponding author.

Collaborative publication 2018-19 (3)

International Journal of Modern Physics B
Vol. 33 (2019) 1950010 (15 pages)

DOI: 10.1142/S0217979219500103

Illustrious influence of amino acid L-threonine (LT) on structural and optical insights of Zinc Thiourea Sulphate (ZTS) crystal

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Published 12 February 2019

Mentioned communication explores the modification in properties of Zinc Thiourea Sulphate (ZTS) crystal due to L-Threonine (LT) addition. Superior quality LT-doped ZTS crystal with 0.5 M% concentration of LT was grown by the slow evaporation solution growth technique. Powder X-ray diffraction technique was applied to study the cell parameters which confirmed orthorhombic crystal structure of both pure and LT-ZTS crystal with slight variation in cell parameters. Shimatzu make spectrophotometer confirmed the UV-Visible spectral analysis in the range of 200–900 nm which affirmed the 94% transmittance, enhanced bandgap value (4.72 eV), lower cut-off value (246 nm) and lower optical constants viz. extinction coefficient, polarizability, refractive index, and reflectance of LT-ZTS crystal. The higher second harmonic generation (SHG) efficiency of LT-doped ZTS was pointed by Kurtz Perry powder method (3.06 times of pure ZTS crystal and 3.62 times of KDP crystal) using Nd: YAG laser. The colour centered emission and electronic purity of parent and doped ZTS crystals were examined which resulted in the violet emission in visible region for both pure and LT-ZTS crystals. Z-scan technique is used to identify the Kerr lensing nonlinearity in pure and LT-doped ZTS crystal. Close aperture Z-scan curve demonstrated negative refraction nonlinearity (self-defocusing nature) for pure and positive refraction nonlinearity (self-focusing nature) for LT-ZTS crystal. Calculated value of refraction nonlinearity $n2$ is -2.2×10^{-11} cm^2/W for pure ZTS and $+4.99 \times 10^{-12}$ cm^2/W for LT-ZTS crystal. Open aperture Z-scan showed reverse saturable absorption effect (RSA) in pure ZTS and saturable absorption effect (SA) in LT-ZTS crystal. The β value is 2.85×10^{-5} cm/W for pure ZTS and 3.92×10^{-5} cm/W for LT-ZTS crystal. The $\chi 3$ of ZTS crystal is 6.133×10^{-5} cm/W and 1.655×10^{-4} cm^2/W for LT-ZTS crystal. The transition in TONLO parameters is observed due to doping of

§Corresponding author.

8

Collaborative publication 2018-19 (4)

FERROELECTRICS
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Crystal growth, spectral, optical and thermal studies of thiourea ammonium acetate doped potassium dihydrogen phosphate crystal for NLO applications

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ABSTRACT

The non-linear optical single crystal of thiourea ammonium acetate doped potassium dihydrogen phosphate was grown by slow evaporation solution technique of size $19 \times 11 \times 4\,mm^3$. The crystallographic unit cell parameters of grown crystal were determined by single crystal X-ray diffraction study. The optical study revealed that the doped KDP crystal has high transmittance, low cut off wavelength and high optical band gap. The enhanced second harmonic generation efficiency of doped KDP crystal was determined by employing Kurtz-Perry powder technique. The third order non-linear absorption coefficient (β), non-linear refractive index (n_2) and susceptibility [$\chi^{(3)}$] were calculated using Z-scan technique. The laser damage threshold of grown crystal has been determined. The thermal properties of the grown crystal were carried out by thermogravimetric and differential thermal analysis.

ARTICLE HISTORY

KEYWORDS
Crystal growth; NLO material; Z-scan; laser damage threshold; thermal studies

1. Introduction

The nonlinear optical single crystal plays important role in the different applications of optical technologies like communication, switching, laser, optical storage etc. The nonlinear optical material possesses fascinating properties like a low optical loss, enhanced optical parameters and high laser damage threshold; dissipate thermal and mechanical stability with lower dielectrics [1–3]. In last decade new methods were introduced to grow novel materials in the different frequency spectrum with enhanced parameters for high technical optical applications [2, 4, 5]. The semi-organic materials are attracted by many researchers due to their high optical nonlinearity and chemical flexibility. The thiourea metal complexes show enhanced second order and third order nonlinear properties with higher optical, dielectric, thermal and mechanical properties [6,7]. The thiourea and urea forms inclusion compounds with variety of the salts and organic compounds having host-guest relationship which forms a stable compound. In this process of formation of compound thiourea and guest forms a layered structure. These

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Collaborative publication 2018-19 (5)

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MAGNIFICENT TRANSMUTATION IN OPTICAL TRAITS DUE TO METHIONINE DOPING ON ZINC THIOUREA SULPHATE (ZTS) METAL COMPLEX CRYSTAL

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ABSTRACT
Present investigation explores the change in properties of Zinc Thiourea Sulphate (ZTS) crystal due to amino acid Methionine addition. Superior quality Methionine Zinc Thiourea Sulphate (M-ZTS) crystal with 0.1 M% concentration of Methionine was grown from aqueous solution by the slow evaporation method. Shimatzu make spectrophotometer was used to confirm the UV-visible spectral analysis in the range of 200–900 nm which affirmed the 88% transmittance, enhanced band gap value, lower cut off and lower optical constants viz. extinction coefficient, , refractive index, and reflectance of M-ZTS crystal. The obtained linear optical constants parameters showed the superiority of M-ZTS for application in distinct optoelectronics and laser stabilization systems.

Keywords: Crystal growth, Extinction coefficient, Refractive index

1. INTRODUCTION

Nonlinear optical materials like thiourea metal complexes offering improved optical, electrical and non-linear optical (NLO) coefficient has been sustained for past few decades due to their wide applications **[1-4].** 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 **[5-15].**

The impressive and significant influence of amino acid on the optical and electrical response of ZTS crystal **[16-24]** has attracted the attention of authors **[25-27].** As an output of literature study, authors want to acknowledge that authors are firstly elaborating the optical studies of Metheonine doped ZTS confirming its superiority for optical device applications.

2. EXPERIMENTAL PROCEDURE

Zinc Thiourea Sulphate (ZTS) metal complex salt was prepared by taking Zinc Sulphate and thiourea in 1:3 molar concentration. Prepared salt was further purified by repetitive recrystallization. 0.1M% Methionine was doped in ZTS supersaturated solution and the prepared solution was filtered in a sterilized beaker and kept for slow solvent evaporation in a constant temperature bath at 37°C. After UV-visible study, it was evident that 0.1M% Methionine doped ZTS express high prominent and good crystal planes and higher transmittance The 0.1 M% Methionine doped ZTS crystal is shown in **Fig. 1.**

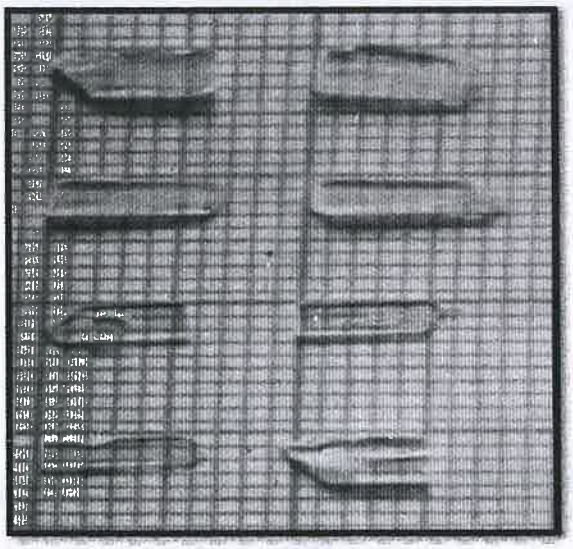

Fig-1: Metheonine doped ZTS crystals

collaborative publication 2018-19 (6)

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Volume 6, Issue 1 (XIX): January - March, 2019 : Part - 1
ISSN 2394 - 7780

ELECTROCHEMICAL IMPEDANCE SPECTROSCOPIC STUDY OF DYE SENSITIZED SOLAR CELL WITH AL DOPED TiO_2 NANOPARTICLES PHOTO ANODE SENSITIZED BY EOSIN Y DYE

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ABSTRACT

In the present investigation the electrochemical impedance spectroscopy has been applied to analyse the dye sensitized solar cells (DSSCs). The characteristics of the dye sensitized photo anode has been investigated using various techniques like Atomic force Microscopy, UV visible spectroscopy. Consequently, the measurement of photovoltaic characteristics has been discussed and lastly, the EIS study of fabricated DSSCs have been done in order to analyse the DSSCs using Al doped TiO_2 nanoparticles photo anode sensitized by eosin Y dye which reveals that the DSSC with 0.07M Al doped TiO_2 nanoparticles photo anode has the charge transfer resistance of 138 ohm at the TiO_2/dye/electrolyte interface

Al doped TiO_2, DSSCs, Eosin Y dye, EIS, photo anode

1. INTRODUCTION

Being mimicry of photosynthesis, dye sensitized solar cell has ever accepted as the best solar cell from last few decades [1]. DSSC is an electrochemical device, converting light energy into electrical energy, consist of three active layers namely, dye sensitized nano-crystalline semiconductor layer (known as photo anode), counter electrode and an organic electrolyte containing redox couple sandwiched between prior two layers. Both the semiconductor layer and counter electrode has synthesized usually on the Fluorine doped transparent conducting oxide layer on glass [2]. The highest efficiency ever achieved has been found to be 13% using porphyrin dye [3]. Charge generation and transfer process depends on the nature and compatibility of each layer with another and more particularly on the photo anode [4]. TiO_2 nanoparticles has been proved to be most viable member to synthesize the photo anode owing to its properties like wide band gap, large exciton binding energy, low cost, non-toxic and environmental benign. The absorption in TiO_2 layer can be increased by either doping or adsorbing the dye molecules on its surface [5]. Nanostructure of TiO_2 photo anode provides the sufficiently large surface area for dye adsorption [4]. Further, doping the TiO_2 will form the new valance state, decreases the Band gap, enhances the surface area and creates the charge carrier trapping sites which helps to increase the photo current [6]. Various metals and non-metals and other elements have been tried for doping the TiO_2 in the thrust of enhancing the photo-catalytic activity of TiO_2 photo anode [7]. Aluminium, the transitional metal having good optical quality, low resistivity, high conductance and high crystal qualities, when doped in TiO_2 shifts onset of absorption from UV region to visible region [8-9]. According to the previous optimization it has been observed that the aluminium doping concentration of 0.07M exhibits superior results [10]. Hence, in the current study 0.07M aluminium doped TiO_2 nanoparticles have been synthesized and used to create the photo anode of DSSC.

The basic purpose behind the development of DSSC has been found to investigate a low cost, environmental friendly solar cell through the use of eco-friendly materials and methods [11]. Hence, while designing the DSSC, high efficiency along with the least environmental hazard must be the agenda. Sensitizer used to harvest the photo energy is the crucial parameter on this basis, deciding the response of DSSC. Inorganic metal complex dyes and organic dyes have been intensively investigated by researchers since from last two decades. Inorganic metal complex dyes has been studied, involves lengthy, tedious and expensive manufacturing steps [12-13]. Moreover, inorganic dyes contain heavy metals which are rarely found and hence become costly. Also, their toxic nature becomes hazardous for environment. On the contrary, organic dyes which are abundantly available in nature and found to be ideal for eco-friendly DSSCs being non-toxic, having affordable cost, renewable, biodegradable and easily available, not producing any hazardous by products. Particularly, Eosin Y dye has been shown to be one of the best synthetic dyes having high molar extinction coefficient (60803M^{-1} cm^{-1}), upon excitation becomes more reducing and oxidizing and found to be applied in cell staining, as pH indicator and as a dye pigment in cosmetics also [14]. Eosin Y is having single carboxyl group which is suitable to anchor with TiO_2 molecules in photo anode [15].

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Dept. of chemistry 2018-19 (7)

RESEARCH JOURNEY International Multidisciplinary E-Research Journal
Impact Factor - (SJIF) – 6.261, (CIF) - 3.452, (GIF) –0.676 Issue 168(A)
March 2019 | UGC Approved No.40705

Stability study of complexation of transition metals with schiff base 2-hydroxy-5-bromoacetophenone-N-(4-methoxyphenyl) imine: Thermo dynamic aspect

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Abstract:
Stability constant ofschiff base2-hydroxy-5-bromoacetophenone-N-(4-methoxyphenyl) iminewith diivalenttransition metalCu^{2+},Ni^{2+},Cd^{2+},Co^{2+},Mn^{2+} and Zn^{2+} using apHmetric titration technique in 50%(v/v) ethanol-water mixture atthree different temperatures 25°C, 35°C & 45°C at an ionic strength of 0.1M $NaClO_4$ were studied. The method of Calvin-Bjerrum as adopted by Irving-Rossotti has been employed to determine metal-ligand stability constant logKvalues. The trend in the formation constants is as: $Cu^{2+}> Cd^{2+}>Ni^{2+}>Zn^{2+}>Co^{2+}>Mn^{2+}$The thermodynamic parameters such as, Gibb's free energy change (ΔG), entropy change (ΔS) and enthalpy change (ΔH) 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 metalions, schiff base, pH metry,thermodynamic parameteretc.

1. Introduction: Metal complexes of schiff bases have played a central role in the development of coordination chemistry. pHmetric titration is accepted as a powerful and simple electro analytical technique for determination of stability constants. It is also well known that some schiff basesexhibit increased activity when administered as metal complexes. Most of the d-block elements form complexes.Thereare different kinds of ligands used for complexation. For the present investigation, schiff base2-hydroxy-5-bromo acetophenone-N-(4-methoxyphenyl) imine,having molecular formulaC15H14O2NBr, was selected.

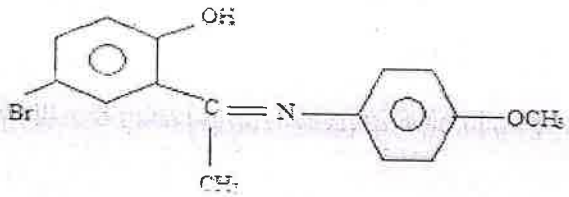

Figure: 2-hydroxy-5-bromo acetophenone-N-(4-methoxyphenyl) imine

In continuation of earlier work with complexation of schiff base [1-9] 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 ΔG, enthalpy change ΔH and entropy change ΔS of complexes of2-hydroxy-5-bromo acetophenone-N-(4-methoxyphenyl) iminewith transition metal ions Cu^{2+},Ni^{2+},Cd^{2+},Co^{2+},Mn^{2+} and Zn^{2+} pH metrically in 50% (v/v)ethanol-water mixture.

2.Experimental

2.1Materials and Solution

All transition metal salts,$HClO_4$,NaOH, $NaClO_4$,were of AR grade.The solutions were used in the pH metric titration were prepared in double distilled CO_2free water. TheNaOH solution was standardized against oxalic acid solution and standard alkali solution was again used for standardization of $HClO_4$. The transition metalsalt solutions were standardized using EDTA.All the measurements were made atthree different temperatures25°C, 35°Cand 45°C in 50% (v/v) ethanol-water mixture at constant ionic strength of 0.1M $NaClO_4$.The water thermostat model SL-131was used to maintain the temperature constant.The solutions were equilibrated in the thermostat for 10-15 minutes before titration. The pH measurement was made using a digital pH meter model Elico L1-120 in conjunction with a glass and reference calomel electrode (reading accuracy ±0.01 pH units). The instrument was calibrated at pH 4.00, 7.00 and 9.18 using the standard buffer solutions.

2.2pH metric procedures

For evaluating the protonation constant of the ligand and the formation constant of the complexes in 50% (v/v) ethanol-water mixture with different metal ions the following sets of solutions were prepared (total volume 50 ml) and titrated pH metrically against standard NaOH solution at three different temperature 25°C, 35°C and 45°C.

i. Free acid $HClO_4$
ii. Free acid $HClO_4$ + Ligand (schiff base)
iii. Free acid $HClO_4$ + Ligand (schiff base) + Metal solution

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Dr. V.B. Kulkarni 2018-19
Maths (Dept. of Maths)

(8)

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SOLUTION OF FORCED AND FREE CONVECTION FLOW OF DISSIPATIVE FLUID PAST AN INFINITE VERTICAL PLATE

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ABSTRACT
An approximate solution of forced and free convection flow of dissipative fluid past an infinite vertical Plate, is derived by explicit finite difference technique by taking into account viscous dissipative heat. It is observed that the velocity decreases near the plate and the increases far away from the plate. Greater Viscous dissipative heat causes a rise in the velocity but the velocity decreases with increasing the Prandtl number for large t. An increase in G or t also increases in the skin friction but the rate of heat transfer decreases.

***Keywords**: Viscous dissipative heat, Prandtl number , Grashof number , Skin friction.*

INTRODUCTION
Siegel (1958)] schetz and Eichhorn (1962) Menold and Yang (1962) Chung and Anderson (1961),Goldstein and Briggs (1964) and Sugawara and Michiyoshi (1951) Soundalgekar ,Lahurikar and Pohnerkar (1997) studied the unsteady free convection flow under various conditions past an infinite vertical plate. Goldstein and Eckert (1960), confirmed experimentally some of these theoretical predictions. In all these studies, the infinite plate was assumed to be stationary and the fluid was suppose to move due to temperature difference only. If the fluid is stationary and the infinite plate surrounded by stationary fluid is given an impulsive motion along with its temperature raised to such that, where is the temperature of the surrounding fluid how the shape of fluid flowing takes its shape? This was studied by Soundalgekar (1977) in case of an isothermal plate. The effect of free convection currents on the flow and the skin friction were studied in this paper.

Combined free and forced convection flow past a semi-infinite vertical plate was first studied by Acrivos (1958),Kliegel (1959)who solved the equations by using the Karman- Pohlhausen method.. However another physical situation which is often experienced in the industrial application is the unsteady free and forced convective flow past an infinite vertical isothermal plate of an incompressible fluid. This situation studied by Jahagirdar and Lahurikar (1989) without considering the dissipative heat.

In some of these papers the effect of viscous dissipative heat was assumed to be neglected. Gebhart (1962) has studied and get the result that when the temperature difference is small or in high Prandtl number fluids or when the gravitational field is of high intensity, viscous dissipative heat should be taken into account in steady free convection flow past a semi-infinite vertical plate. Following this assumption Soundalgekar, Bhat and Mohiuddin (1979) studied the effect of free convection currents on the flow past impulsively started infinite plate, in this case the problem is governed by a coupled non-linear system of partial differential equations This problem was solved by finite difference technique.

It has been proposed to study forced and free convection flow of dissipative fluid past an infinite vertical Plate. As the problem is governed by coupled nonlinear system of partial difference equations exact solutions are not possible, so we employ explicit finite difference method.

MATHEMATICAL ANALYSIS :
Here we consider the unsteady free and forced convection flow of a viscous incompressible fluid past an infinite vertical isothermal plate in the upward direction in presence of dissipative heat. The -axis is taken along the plate in the vertically upward direction and the - axis taken normal to the plate. Initially at both the plate and the fluid are stationary and at the same temperature At tim.e the plate temperature is raised to and the fluid starts moving upward with velocity U_0 Then the difference between the plate temperature and the ambient temperature causes the free convection currents to flow near the plate modifying the fluid flow. The physical variables are functions of and only. Then under usual Bonssinesq's approximation,by the following system of coupled partial differential equation in non dimensional form

ISSN 2394 - 7780

$$\tau = \left(\frac{\tau'}{\rho U_0^{\,2}}\right) = \left(\frac{-du}{dy}\right)_{y=0}$$

$$q = \left(\frac{vq'}{kU_0\Delta T}\right) = -\left(\frac{d\theta}{dy}\right)_{y=0} \qquad (8)$$

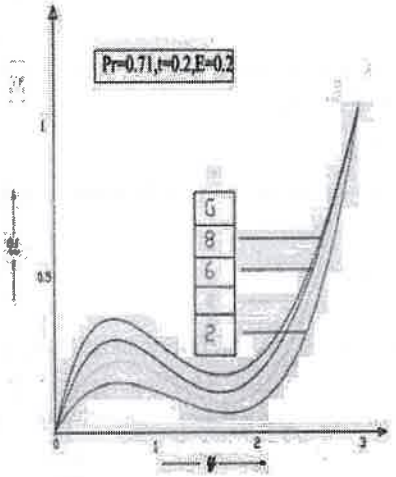

Fig.1. Velocity profile

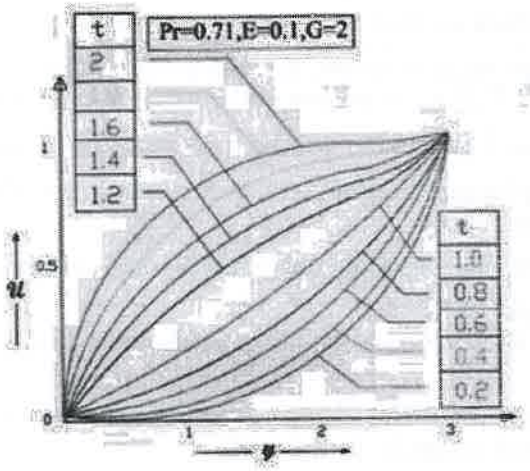

Fig. 2. Velocity profile

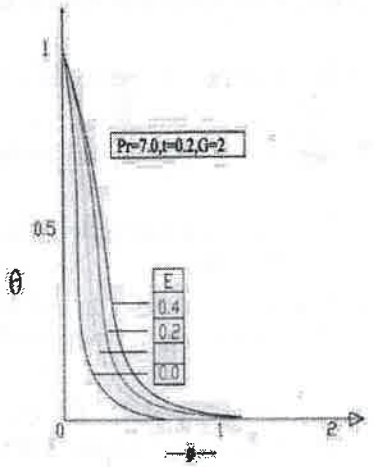

Fig-3: Temperature profile

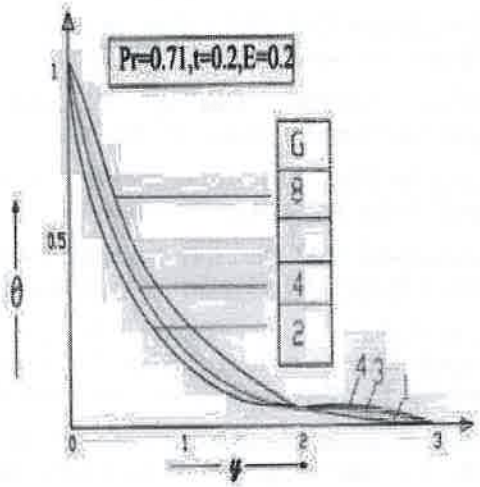

Fig-4: Temperature profile

t	E	G	Pr= 0.71		Pr= 7	
			-τ	-q	-τ	-q
0.2	0.0	2	0.548661	1.057851	0.275831	3.343185
	0.1	2	0.548696	1.056722	0.275836	3.342900
	0.4		0.548801	1.053334	0.275851	3.342067
0.2	0.2	4	1.097791	1.049022	0.551706	3.340955
		6	1.647578	1.038052	0.827688	3.338174
0.4	0.1	2	0.782358	0.744987	0.397351	2.355254
0.6			0.986162	0.601883	0.513918	1.919075

TABLE (I)

केल्याने होत आहे रे । आधि केलेचि पाहिजे ।।

Bhartiya Shikshan Prasarak Sanstha, Ambajogai

Swa. Sawarkar Mahavidyalaya, Beed

Arts, Science & Commerce

NAAC Accreditation Grade 'B'

Sawarkar Nagar, Near Netradham Hospital, Jalna Road, Beed 431 122, Maharashtra (INDIA)
☎ 02442-226218, e-Mail : veersawarkarbeed@gmail.com, Website - www.sawarkar.co.in

Certificate of Collaborative Research Activity

As per the agreement between *Swa. Sawarkar Mahavidyalaya, Beed* and *R.B. Attal College, Georai,* there has been collaborative research activity between Faculty of the Department of Mathematics,Swa. Sawarkar Mahavidyalaya, Beed and Faculty of the Department of Mathematics,R.B. Attal College, Georai. The details of the collaborative research activities are as follows:

Faculty engaged in Collaborative Research:

Sr. No.	Name	Department	College
1	Dr. Vinod Kulkarni	Mathematics	Swa. Sawarkar Mahavidyalaya, Beed
2	Dr. Vijay Sangale	Mathematics	R.B. Attal College, Georai

Details of publication underCollaborative Research Activity:

Sr. No.	Title of the Research Paper	Journal/ Book	Month of Publication	
1	Fuzzification Of Linear Spaces	International Journal Of Advance And Innovative Research	January-March, 2019	2018-19
2	Solution Of Forced And Free Convection Flow Of Dissipative Fluid Past anInfinite Vertical Plate	International Journal Of Advance And Innovative Research	April-June 2019	2018-19
3	Solution Of Dissipative Fluid Flow Of An Impulsively StartedInfinite Vertical Plate.	Our Heritage	February 2020	2019-20
4	Rotating Fluid of Magneto Hydrodynamics Flow Past An Impulsively Started infinite Vertical Plate	Research Journey International e- Journal	December 2020	2020-21

Hence certified that there has been successful collaboration in terms of research and resulted in the publication of research paper during the academic year 2018-2023.

Principal
R.B. Attal College, Georai

Principal
R.B. Attal College
Georai.Dist.Beed.

Principal
Swa. Sawarkar Mahavidyalaya, Beed

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

NAAC Re-Accredited
'B' Grade (CGPA 2.78)
ISO 9001 : 2015

Prof. Rajani Shikhare
(M.A. Ph.D.)
Principal

Marathwada Shikshan Prasarak Mandal's

R. B. ATTAL ARTS, SCIENCE & COMMERCE COLLEGE

ESTD. 1971

Georai - 431127, Dist. Beed, Maharashtra, INDIA

- Affiliated to : Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
- Study Centre : Yashwantrao Chavan Maharashtra Open University, Nashik (M.S.) 22[illegible]A
- Centre No. : Senior - 50 / Junior - 264 (Index No. 57.04.001)

Ref. No.: RBAC /

Date : /20

Certificate of Collaborative Research Activity

As per the agreement between *R.B. Attal College, Georai* and *Swa. Sawarkar Mahavidyalaya, Beed,* there has been collaborative research activity between Faculty of the Department of Mathematics, R.B. Attal College, Georai and Faculty of the Department of Mathematics, Swa. Sawarkar Mahavidyalaya, Beed. The details of the collaborative research activities are as follows:

Faculty engaged in Collaborative Research:

Sr. No.	Name	Department	College
1	Dr. Vijay Sangale	Mathematics	R.B. Attal College, Georai
2	Dr. Vinod Kulkarni	Mathematics	Swa. Sawarkar Mahavidyalaya, Beed

Details of publication under Collaborative Research Activity:

Sr. No.	Title of the Research Paper	Journal/ Book	Month of Publication
1	Fuzzification Of Linear Spaces	International Journal Of Advance And Innovative Research	January-March, 2019
2	Solution Of Forced And Free Convection Flow Of Dissipative Fluid Past An Infinite Vertical Plate	International Journal Of Advance And Innovative Research	April-June 2019
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4	Rotating Fluid of Magneto Hydrodynamics Flow Past An Impulsively Started infinite Vertical Plate	Research Journey International e- Journal	December 2020

Hence certified that there has been successful collaboration in terms of research and resulted in the publication of a research paper during the academic year 2018-2023.

Principal
Swa. Sawarkar Mahavidyalaya, Beed

Principal
R. B. Attal College, Georai

Principal
Swa. Sawarkar Mahavidyalaya
Beed.

P.O.Box No. 3, GEORAI - 431127, Dist. Beed, Maharashtra (INDIA) Phone : (02447) - 262047.
E-mail : rbattal_college@yahoo.com Visit us : www.rbattalcollege.in

Dept. of Mathematics 2018-2019

9

SWA. SAWARKAR MAHAVIDYALAYA , BEED.

COLLABIRATION WITH

MARATHWADA MATHENATICAL SOCIATY, AURANGABAD

17th REGIONAL LEVEL SEMINAR COMPTITION

ON

MATHEMATICS AND APPLICATIONS

(05 FEB, 2019)

PROGRAM DETAILS: AT A GLANCE

TIME	ACTIVITY
09.00am to 10.00am	Registration.
10.00am to 10.30am	Inauguration function.
10.30am to 01.30pm	Seminar presentations.
01.30pm to 02.00pm	Refreshment.
02.00pm to 04.30pm	Seminar presentations.
04.30pm to 05.00pm	Valedictory function. (Prize distribution)

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Date: 15 /01 /2019.

To,

The Principal,

Swa.Sawarkar Mahavidyalaya,

Beed .Dist –Beed.

Sub : **Application for the permission to organize regional level seminar competition for the UG/PG student.**

R/Sir,

As per the above subject, Department of mathematics want to organize a regional level seminar computation for UG/PG student with the collaboration of Marathwada Mathematical Society Aurangabad on the topic " Mathematics and Applications".

If you permit, then department is ready to organize such seminar computation on 5th Feb 2019. Approximate expenditure is 6000 /- Rs.

So , permit & sanction the required amount to organize such seminar computation.

Thanking you !

Your's faithfully,

Dr. Vinod B. Kulkarni.

Asst. Prof. & Head ,Dead Dept. of Maths

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

MARATHWADA MATHEMATICAL SOCIETY

(Reg. No. Maha/218/2000, Dt.27.03.2000 and F73116/2002)
3, "Acharya" Shree Colony, Kokanwadi, Padampura Raod,
Aurangabad - 431 005. (MS) Ph. No. (0240) 2350660, 9372137534.

Date: 21.09.2018.
11-10

To,
The Principal/Director/HOD Math
S. Sawarkar Mahavidyalaya
BEED

Subject : 17th Seminar Competition,

Respected Sir,

On behalf of the Marathwada Mathematical Society (MMS), the ***Seventeenth Preliminary Seminar Competitions*** will be held in **December 2018** at Colleges

(1) S. B. Science College, Aurangabad, (2) Savarkar Mahavidyalaya, Beed,

(3) Sharada Mahavidyalaya, Parbhani and (4) Maharashtra Udaygiri Mahavidyalaya, Udgir, Dist. Latur., you are kindly requested to place this information brochure enclosed herewith on the notice board of your college for wide publicity and welfare of the students. You are also requested to send at least **two** students from your college to any one of **four** centres mentioned above. Note that no T.A. and D.A. will be given to the desired participants. The exact date of the Seminar Competition will be communicated to you later. Final Seminar Competition will be held at **Shrikrishna Mahavidyalaya, Gunjoti, Tq. Umarga, Dist. Osmanabad** after four preliminary competitions.

Thanking you,

FOC
Dr. Vinod Bhalerao

Yours Sincerely,

Sd/-

Dr. D.B. Dhaigude,
(Executive President, MMS)

(B.B. Kulkarni)
Jt. Secre. MMS.

Principal
Swa.Sawarkar Mahavidyalaya
Beed.



B.S.P. Sanstha, Ambajogai

Swa. Sawarkar Arts, Science and Commerce College, Beed

and

Marathwada Mathematical Society, Aurangabad

Jointly Organized

Seminar Competition on Mathematics and Applications

Certificate

This is to certify that

Mr. /Miss.----------

Of ----------

has participated and won First / Second / Third / Consolation prize in Seminar Competition on Mathematics and Applications at Swa, Sawarkar Arts, Science and Commerce College, Beed On 5th Feb.2019.

Dr. Vinod Kulkarni
Convener

Dr. Bhausaheb Sontakke
Co-ordinator, SSMMS

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

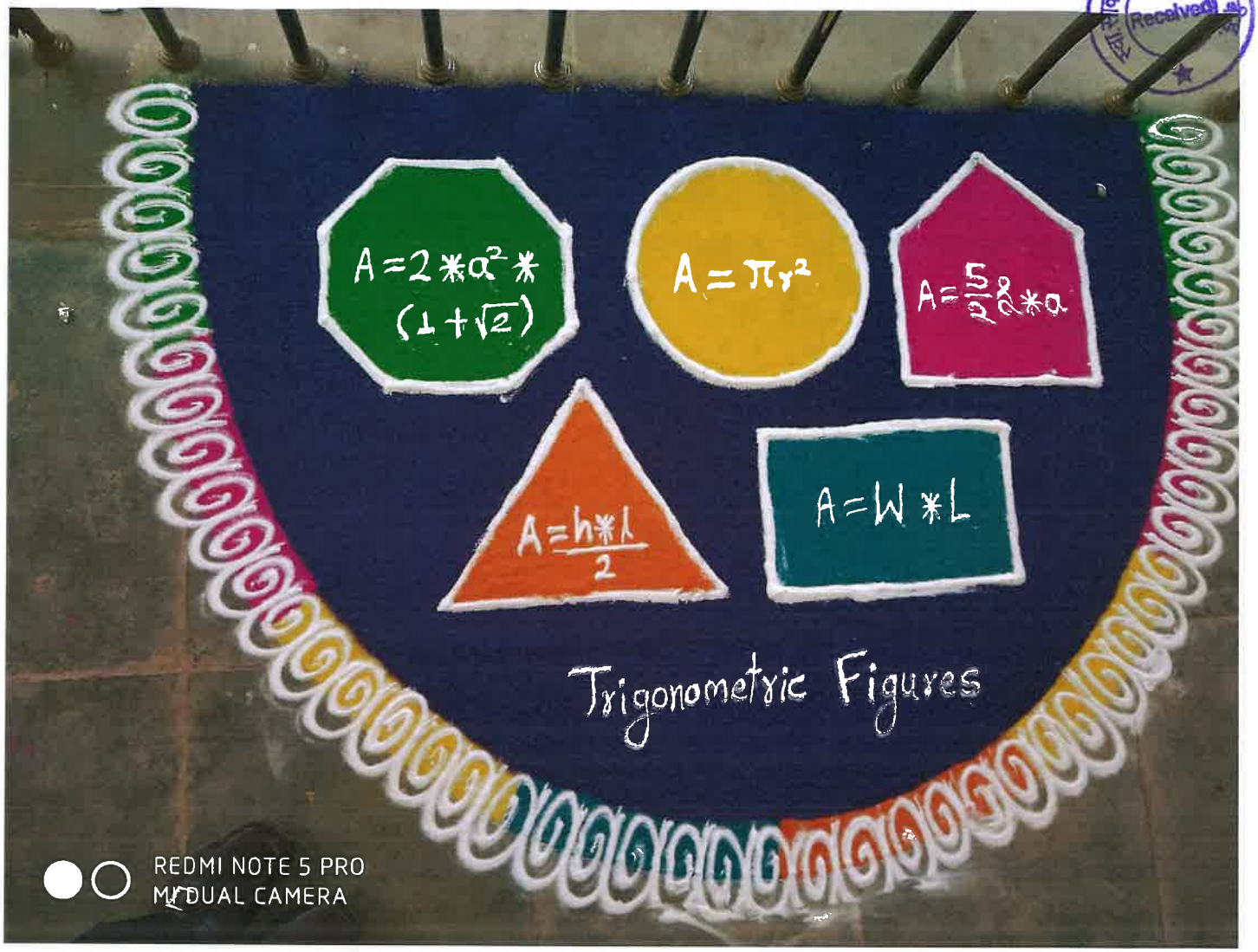
Dr. Sanjay Shirodkar
Principal

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Principal
Swa.Savarkar Mahavidyalaya
Beed.

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Principal
Swa.Sawarkar Mahavidyalaya
Beed.



Principal
Swa.Sawarkar Mahavidyalaya
Beed.

(10)

Established 1995

केल्याने होत आहे रे | आधी केलेचि पाहिजे ||

Bhartiya Shikshan Prasarak Sanstha, Ambajogai

Swa. Sawarkar Mahavidyalaya, Beed

Arts, Science & Commerce

NAAC Accreditation Grade 'B'

Dr.S.G.Shirodkar
Principal

Sawarkar Nagar, Near Netradham Hospital, Jalna Road, Beed- 431122, Maharashtra (INDIA)
Phone : 02442-226218 E-mail:- veersawarkarbeed@gmail.com Web site-www.sawarkar.co.in

Out No.: SSMB/2018-2019/Library/ 617B दिनांक: 15/10/2018

प्रति,
मा. श्री. मुख्याध्यापक
प्रज्ञाचक्षु निवासी अंध विद्यालय,
बीड

आपल्यातील अंतर ग्रंथालय देवघेव योजने तिल (Inter Library Services) सहसंबंधाला अनुसरून आपण आमच्या कडील अंध विद्यार्थ्याला काही ब्रेल पुस्तकांची आवश्यकता होती. ती आपण दिलीत त्या बद्दल आम्ही आपले आभारी आहोत.

सर्व पुस्तके सुस्थितीत परत करत आहोत. भविष्यात ही आवश्यकता पडल्यास आपण एकमेकांच्या मदतीला येवू.

धन्यवाद!

प्राचार्य

Principal
Swa.Sawarkar Mahavidyalaya
Beed

परत करत असलेले पुस्तके

1. B 115 – स्फूर्तीचे धबधबे – उज्वला पवार AK
2. B 72 – कुमार मुलांसाठी प्रश्न उत्तर AK
3. 162 – जनातलं मनातलं – हेमंत टाकले AK

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Established 1995

केल्याने होत आहे रे | आधी केलेचि पाहिजे ||

Bhartiya Shikshan Prasarak Sanstha, Ambajogai

Swa. Sawarkar Mahavidyalaya, Beed

Arts, Science & Commerce

NAAC Accreditation Grade 'B'

Dr.S.G.Shirodkar
Principal

Sawarkar Nagar, Near Netradham Hospital, Jalna Road, Beed- 431122, Maharashtra (INDIA)
Phone : 02442-226218 E-mail:- veersawarkarbeed@gmail.com Web site-www.sawarkar.co.in

Out No.: SSMB/2018-2019/Library/483.11 दिनांक: 16/07/2018

प्रति,
मा. श्री. मुख्याध्यापक
प्रज्ञाचक्षु निवासी अंध विद्यालय,
बीड

विषय: अंतर ग्रंथालय देवघेव योजनेतून (Inter Library Services) सहसंबंध निर्माण करणे बाबत.

महोदय,

आपल्या दोन्ही संस्कार केंद्रा मधून शिकणाऱ्या विद्यार्थ्यांना ज्ञानग्रहण करण्यासाठी विविध सेवा एकमेकांना पुरविण्याच्या दृष्टीकोनातून आम्ही आपणास विनंती करतो कि ग्रंथालयातील विद्यार्थ्यांना वाचनासाठी काही साहित्य लागल्यास आम्ही आपण्यास सेवा देण्यात आनंद मानू. तसेच. आमच्या कडील प्रज्ञाचक्षु विज्ञार्थ्यास ही आपल्याकडून ब्रेल साहित्याची देवाण घेवाण व्हावी ही विनंती.

अंतर ग्रंथालय देवघेव योजने तिल (Inter Library Services) सहसंबंध भविष्यात ही सुरु ठेवू.

धन्यवाद.

प्राचार्य

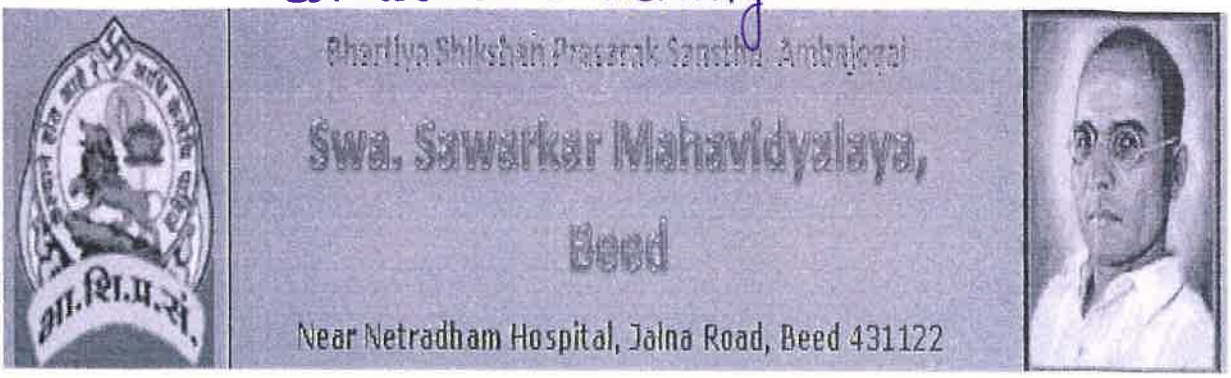
Principal
Swa.Sawarkar Mahavidyalaya
Beed

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

2018-19

11

Dept of chemistry
Collaborative Activity



Affiliated to
DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

CHEMISTRY DEPARTMENT

GUEST LECTURE/SPECIAL LECTURE

REPORT

Detail Report

Title of Programme:		Guest Lecture		
Name of Organizing Department/Unit:		Department of Chemistry, Swa. Sawarkar Mahavidyalaya, Beed in Collaboration with Department of Chemistry, Milliya College, Beed		
Name of the Coordinator(s)/Convener(s)/ Organizer(s) of the Programme:		**Organizing Secretary:** Joshi H. U. **Co-coordinator:** Jadhav R. L. **Convener:** Naiknaware V. V.		
Date(s) of the Programme:		18.9.2018		
Venue:		Swa. Sawarkar Mahavidyalaya, Beed		
Target Group:		Student		
Numberof Participants:		**Male**	**Female**	**Total**
	Teaching	06	01	07
	Non-teaching	---	--	--
	Students	19	16	35
Name(s) and details of Resource Person(s),		Dr. Abdul Rahem, Assistant Professor, Department of Chemistry, Milliya College, Beed		
Topic		Organic Reaction Mechanism		
Total Expenditure for the Programme:		Nil		
Source of Funding:		Nil		

Brief Summary of Events/Sessions: Dr. Rahem enlightened about the fundamentals of reaction mechanism in organic chemistry.

Conclusion, with Feedback on the Programme: This lecture benefited students to know about mechanism behind organic reactions.

Head
Department Of Chemistry
Swa.Sawarkar Mahavidyalay,Beed.

Principal
Swa.Sawarkar Mahavidyalaya,
Beed.

Swa. Sawarkar Mahavidyalaya, Beed. B.S.P.S. Ambajogai

Notice

Students of B.Sc. FY are hereby informed that Department of Chemistry is going to organize a guest lecture on 18 September 2018 during 9.48-10.36am in Hall No. B109. **Dr. Abdul Rahem,** Assistant Professor, Department of Chemistry, Milliya College, Beed will enlighten on "Organic Reaction Mechanism".

HEAD
Department Of Chemistry
Swa. Sawarkar Mahavidyalaya, Beed

Date: 12/9/2018

Principal
Swa. Sawarkar Mahavidyalaya
Beed.

Swa.Sawarkar Mahavidyalaya Beed. B.S.P.S. Ambajogai

SSMB/2018-2019/ **Date : 18/09/2018**

To,

Dr. Abdul Rahem,

Assistant Professor,

Department of Chemistry,

Milliya College, Beed

Subject: Letter of Thanks

Respected Sir,

We are grateful for delivering a lecture on "Organic Reaction Mechanism" on 18 September 2018 for B.Sc. First Year students. The lecture was helpful for students. As per students' feedback, it was informative with total clarity.

Thanking You.

Principal
Swa.Sawarkar Mahavidyalaya
Beed

Swa. Sawarkar Mahavidyalaya, Beed

SSMB/2018-2019/
12.09.2018

Date :

To,

Dr. Abdul Rahem,

Assistant Professor,

Department of Chemistry,

Milliya College, Beed

Subject : Invitation as a Guest Lecture

Respected Sir,

Department of Chemistry is going to organize a guest lecture on "Organic Reaction Mechanism" on 18 September 2018 during 9.48-10.36am for B.Sc. First Year students. You are requested to enlighten students on the said topic.

Kindly convey your consent and oblige.

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Principal
Swa.Sawarkar Mahavidyalaya
Beed

Swa. Sawarkar Mahavidyalaya, Beed
Department of Chemistry
Guest Lecture
18 September 2018

Class: B.Sc. First Year Time: 9.48 – 10.36

List of Attendance

Sr. No.	Name of Student	Mobile No.	Signature
1	Kasbe Shivani Sanjay	8698787751	Shivani
2	Aishwarya Ramrao Pimple	9860737328	Aishwarya
3	Acne Sayali Raju	9975212995	Sayali
4	Raut sayali K.	8888682772	Sayali.
5	Rajapurkar Pooja P	7588336840	Pooja
6	Komal Dahibhate	9764752481	Kdahibhate.
7	Gole Sonali D.	7709061381	Sonali
8	Kadam Dnyaneshwari	7447825045	Kadam
9	Bedre Gitanjalee Rameshwar	9455634107	GBedre
10	Priyanka Bhandwale	9146582396	Priyanka
11	Shenkar Apurva	7498191976	Apurva
12	Varpe Vaishanavi	9673063015	Vaishnavi
13	Ghumare sujatasandip	8554022148	Sujata

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

Swa. Sawarkar Mahavidyalaya, Beed
B.S.P.S. Ambajogai

Swa. Sawarkar Mahavidyalaya, Beed
Department of Chemistry
Feedback Form Students

Name of the Event : Guest Lecture
Name of the Topic : Organic reaction mechanism.

Name of Teacher : Dr. Abdul Rahem.

Date : 18/ 9 /2018 **Time :** 9:48-

Name of the student: Neha Anant Patange. **Class: B.Sc. First Year**

	Excellent	Good	Average	Not Satisfactory
Preparation of topic		✓		
Expression		✓		
Conceptual Understanding			✓	
Method of Teaching			✓	
Usefulness		✓		

Apatange.

Swa. Sawarkar Mahavidyalaya, Beed
Department of Chemistry
Feedback Form Students

Name of the Event : Guest Lecture
Name of the Topic : Organic reation mechanism

Name of Teacher : D.r Abdul Rehem

Date : 18 / 9 /2018 **Time:** 9:48

Name of the student: Gadhar Roham Balasahed **Class: B.Sc. First Year**

	Excellent	Good	Average	Not Satisfactory
Preparation of topic		✓		
Expression		✓	✓	
Conceptual Understanding			✓	
Method of Teaching			✓	
Usefulness		✓		

Principal
Swa.Sawarkar Mahavidyalaya
Beed.

HEAD
Department Of Chemistry
Swa. Sawarkar Mahavidyalaya Beed

Dr. VBK 2018-19

International Journal of Advance and Innovative Research
Volume 6, Issue 1 (XVI): January - March, 2019
ISSN 2394 - 7780

FUZZIFICATION OF LINEAR SPACES

Vinod Kulkarni[1] and Vijay Sangle[2]
[1]Department of Mathematics, Swa. Sawarkar Mahavidyalaya, Beed
[2]Department of Mathematics, R. B. Attal College, Georai, Dist. Beed

ABSTRACT
Analyze the concept of fuzzy linear spaces (FLS) and we have proposed the redefined notion of fuzzy linear spaces and have established that the proposed definition is more general and appealing than that of Nanda and Biswas. The notion of product (*) of two fuzzy linear spaces has been proposed and it has been observed that the product is again a fuzzy linear space under the new definition. In other words, we can say that these structures are preserved under the product (*). We observe that it is more general than its classical counter part.

1. INTRODUCTION

The concept of fuzzy linear spaces was introduced by ***Sudarsan Nanda*** in 1986 and was again redefined by **Biswas** in 1989. It is expected that several results from linear algebra and functional analysis can be extended to the concept of fuzzy setting. ***Nanda*** propounded the notion of fuzzy linear spaces in a linear space as follows:

2. FUZZY LINEAR SPACE

Let F be a fuzzy field in a field (X, + , .) with membership function $F(\lambda)$. Let Y be a linear space over F and V be a fuzzy subset of Y with membership function V(x). Then, V is called as a fuzzy linear space in Y if the following postulates are satisfied:

(i) $V(x + y) \geq \min\{V(x), V(y)\}, \forall\ x, y \in Y$

(ii) $V(\lambda x) \geq \min\{F(\lambda), V(x)\}, \forall\ \lambda \in F$ and $\forall\ x \in Y$

(iii) $V(0) = 1$

In case F is an ordinary field then, $F(\lambda) = 1$ and hence

$V(\lambda x) \geq \min\{1, V(x)\}, \forall \lambda \in F$ and $x \in Y$

$= V(x)$

Hence, for F to be an ordinary field, the (ii) postulate may be considered as

$V(\lambda x) \geq V(x), \forall\ \lambda \in F$ and $x \in Y$

Now we will analyze the definition of fuzzy linear space introduced by ***Nanda***.

Let us consider the case when F and V both are classical set. Then , we have $F(\lambda) = 1$, $V(x) = 1$ and $V(y) = 1$ for all $x, y \in F$

and $\lambda \in F$.

Hence, from condition (i), we have

$V(x + y) = 1 \Rightarrow x + y \in V$

Thus, we get that $x, y \in V \Rightarrow x + y \in V$.

Further, from condition (ii), we get

$V(\lambda x) \geq \min\{1,1\} = 1$

i.e. $V(\lambda x) = 1 \Rightarrow \lambda x \in V$. That is, $x \in V, \lambda \in F \Rightarrow \lambda x \in V$.

It follows that V is closed under addition and scalar multiplication.

Thus, on the basis of above discussion we arrive at the conclusion that the definition of fuzzy linear space has been considered in such a way that when F and V both are considered as an ordinary subset, V turns out to be a subspace of Y.

Alternatively, For all $x, y \in Y$. and $\lambda, \mu \in F$, we have

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R. B. ATTAL ARTS, SCIENCE & COMMERCE COLLEGE

Georai - 431127, Dist. Beed, Maharashtra, INDIA

- Affiliated to : Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
- Study Centre : Yashwantrao Chavan Maharashtra Open University, Nashik (M.S.) 2222A
- Centre No. : Senior - 50 / Junior - 264 (Index No. 57.04.001)

Ref. No.: RBAC /

Date : 15/06/2018

Received

AGREEMENT OF ACADEMIC COLLABORATION

Between

R.B. Attal College, Georai and *Swa. Sawarkar Mahavidyalaya, Beed.*

Whereas the above-named institutions recognize that academic collaboration would be of mutual benefit and would provide strengths in research and education and their mutual interest in engaging themselves in academic cooperation with *R.B. Attal College, Georai* and *Swa. Sawarkar Mahavidyalaya, Beed*, it is agreed that:

Aims and Objectives of the Collaboration:

1. To promote interest in research activities of the respective institutions
2. To undertake collaborative research activities leading to research analysis
3. To have exchange and dissemination of research ideas.
4. To carry out research jointly on particular research areas

The following terms and conditions are being laid with mutual understanding for the period of 5 years (2018-2023):

- There shall be an equal contribution by both faculties involved in the research activities
- Research facilities available at the respective institutions will be utilized for the research work.
- The research outcomes will be published with the consent of people involved in the research activities.

Date:

Principal
Swa. Sawarkar Mahavidyalaya, Beed

Principal
Swa. Sawarkar Mahavidyalaya
Beed.

Principal
R. B. Attal College, Georai

PRINCIPAL
R.B.Attal College
Georai Dist.Beed

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Date : / /20

Certificate of Collaborative Research Activity

As per the agreement between *R.B. Attal College, Georai* and *Swa. Sawarkar Mahavidyalaya, Beed,* there has been collaborative research activity between Faculty of the Department of Mathematics, R.B. Attal College, Georai and Faculty of the Department of Mathematics, Swa. Sawarkar Mahavidyalaya, Beed. The details of the collaborative research activities are as follows:

Faculty engaged in Collaborative Research:

Sr. No.	Name	Department	College
1	Dr. Vijay Sangale	Mathematics	R.B. Attal College, Georai
2	Dr. Vinod Kulkarni	Mathematics	Swa. Sawarkar Mahavidyalaya, Beed

Details of publication under Collaborative Research Activity:

Sr. No.	Title of the Research Paper	Journal/ Book	Month of Publication
1	Fuzzification Of Linear Spaces	International Journal Of Advance And Innovative Research	January-March, 2019
2	Solution Of Forced And Free Convection Flow Of Dissipative Fluid Past An Infinite Vertical Plate	International Journal Of Advance And Innovative Research	April-June 2019
3	Solution Of Dissipative Fluid Flow Of An Impulsively Started Infinite Vertical Plate.	Our Heritage	February 2020
4	Rotating Fluid of Magneto Hydrodynamics Flow Past An Impulsively Started infinite Vertical Plate	Research Journey International e- Journal	December 2020

Hence certified that there has been successful collaboration in terms of research and resulted in the publication of a research paper during the academic year 2018-2023.

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Swa. Sawarkar Mahavidyalaya, Beed

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