Completion Report of Minor Research Project

MRP Sanction letter No: MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 15-Feb-2014

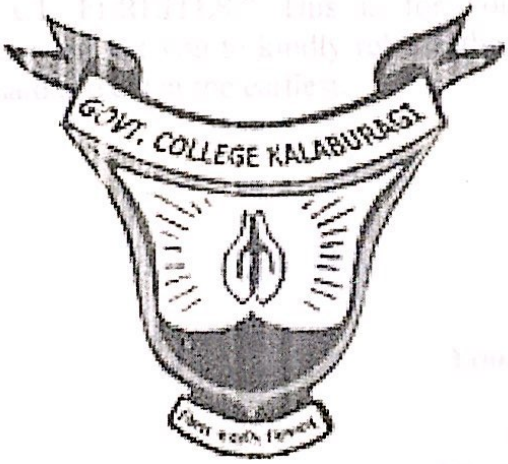
Project Title

SYNTHESIS AND CHARECTERIZATION OF FERRITES

Submitted by

Dr. Aparna Shetty

Principal Investigator



GOVERNMENT COLLEGE, KALABURAGI-585105,
KARNATAKA, INDIA

From: **Date: 22-11-2019**

Dr. APARNA SHETTY
Principal Investigator,
Assistant Professor in Physics
Government College,
Kalaburagi,
Karnataka.

To
The Deputy Secretary,
SWRO-UGC,
Bangalore.

Subject: Submission of Final Report of UGC Minor Research Project in physics
File No: MRP(S)-0426/13-14/KAGU009/UGC-SWRO, Dated 28-03-2014

Sir,

I am here by submitting the final report of my UGC minor research project in Physics, along with utilization certificate (File No: MRP(S)-0426/13-14/KAGU009/UGC-SWRO, Dated 28-03-2014) entitled "SYNTHESIS AND CHARECTERIZTION OF FERRITES." This is for your kind information and necessary action. Hence, I request you to kindly release the remaining financial grant sanctioned towards the said project at the earliest.

Thanking You,

Yours Sincerely

Dr. Aparna Shetty
Principal Investigator &
Assistant Professor in Physics.
Govt. College, Kalaburagi

Completion Report of Minor Research Project

MRP Sanction letter No: MRP(S)/13-14/KAGU009/UGC-SWRO dated 15-Feb-2014

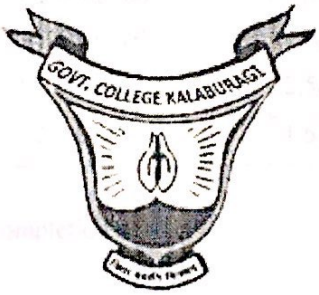
Project Title

SYNTHESIS AND CHARECTERIZATION OF FERRITES

Submitted by

Dr. Aparna Shetty

Principal Investigator



GOVERNMENT COLLEGE, KALABURAGI-585105,
KARNATAKA, INDIA

Date: 22-11-2019

Signature of the
Principal Investigator

Principal
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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
ಗುಲಬರ್ಗಾ-585 105

To,
The Account Officer,
SWRO University Grants Commission,
P.K. Block, Palace road, Gandhi Nagar,
Bengaluru-560009.

Date:22-11-2019

(Through the Principal Govt. College, Kalaburagi-585105)

Sub: Submission of Accounts of Expenditure for the Minor Research Project MRP
Sanction letter No. **MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 28 March 2014**

With Reference to the above cited subject, I am herewith submitting the detail of expenditure incurred for completing the Minor Research Project (MRP) sanctioned by UGC. The details are as follows

Sl.No.	Items	UGC Sanctioned amount Rupees	Grant received Rupees	Expenditure incurred Rupees
1	**Non-Recurring:**			
	Books and Journals	10,000=00	10000=00	10,000=00
	Equipment	1,25,000=00	1,25,000=00	1,24,875=00
2	**Recurring:**			
	Contingency including special needs	25,000=00	12,500=00	24,825=00
	Chemicals and Glasswares	25,000=00	12,500=00	25,500=00
	Field and travel	10,000=00	5,000=00	10,000=00
	Any other	5,000=00	2,500=00	4800=00
	Total	2,00,000=00	1,67,500=00	2,00,000=00

The UGC Sanctioned amount Rs 2,00,000=00

Total expenditure incurred for completion of MRP Rs 2,00,000=00

Grant received from UGC Rs 1,67,500=00

The balance Grant to be released **Rs 32,500=00**

Hence I request you to release the balance of Rs 32,500=00 at an earliest possible.

Aparna

Yours faithfully

(Dr. Aparna Shetty)

Govt. of Karnataka
Department of Collegiate Education
GOVERNMENT COLLEGE
KALABURAGI-585105
Ph: 08472 - 245064. Website: http://gc.kar.nic.in/kalaburagi/
Email : principal.gc.kalaaburagi@gmail.com
(Affiliated to Gulbarga University, Gulbarga.)

Date: 22-11-2019

CERTIFICATE

It is certified that, a copy of Final report of Minor research Project (MRP) entitled "SYNTHESIS AND CHARECTERIZATION OF FERRITES " **submitted by Dr. Aparna Shetty , Assistant Professor , Dept. of Physics, has been kept in the college Library.**

An executive summary of the Minor research Project (MRP) entitled above has been uploaded in the college website: http://gc.kar.nic.in/kalaburagi/

Principal
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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
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Annexure – VI

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002
ANNUAL/FINAL REPORT OF THE WORK DONE ON THE MINOR RESEARCH PROJECT
(Report to be submitted within 6 weeks after completion of each year)

1	Project Report No. 1st/2nd/3rd/Final	**Final**
2	UGC Reference No.	**No. MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 28 March 2014**
3	Period of report	**Two years From 28-03-2014 to 28-03-2016**
4	Title of the research project	**Synthesis nd charectrization of ferrites**
5	a. Name of the Principal investigator	**Dr. Aparna Shetty**
	b. Dept. and university/college where wok has progressed	**Dept. of Physics, Govt. College, Kalaburagi-585105.**
6	Effective date of starting the project	**28 March 2014**
7	Grant Approved and expenditure incurred during the period of the report:	
	Total amount approved Rs	**Rs. 2,00,000=00**
	Total Grant received Rs.	**Rs. 1.67,500=00**
	FINAL EXPENDITURE	**Rs.2,00,000=00**
8	Report of the work done: (Please attach a separate sheet)	**Enclosed**
i.	Brief objectives of the project	**1. To synthesize and characterize different ferrites** **2. To study the properties of these materials**
ii.	Work done so far and results achieved and publications, if any resulting from the work(Give details of the papers and names of the journals in which it has been published or accepted for publication)	**Yes, Details given in Annexure VIII-2**
iii.	Has the progress been according to original plan of work and towards achieving the objective , if not state reasons	**Yes**
iv.	Please indicate the difficulties, if any experienced in implementing the project	**No**
v.	If Project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual Basis) may please be sent to the commission on a separate sheet	**Completed**
vi.	If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work	**Enclosed**

	done may also be sent to the Commission.	
vii.	Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as a) Manpower trained (b)Ph.D Awarded(c) Publication of results(d) other impact if any	No

(PRINCIPAL INVESTIGATOR)

(PRINCIPAL)
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RAJKIRAN PATIL AND CO
CHARTERED ACCOUNTANTS

17, Darshan Edifice, Beside Jagat Post Office
Super Market, Main Road, KALABURAGI - 585 101
☎ : 08472 - 233545 - Cell : 9886843545
E-mail:carajkiranpatil@gmail.com

Annexure - V

Utilization certificate

Certified that the grant of Rs. 2,000,00=00 (Rupees TWO LAKHS only) received from the University Grants Commission under the scheme of support for Minor Research Project entitled **"SYNTHESIS AND CHARECERIZATION OF FERRITES"** vide UGC letter No. MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 28/03/2014 has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission.

If as a result of check or audit objection, some irregularity is noticed at a later stage, action will be taken to refund or regularize the objected amount. It is further certified that inventories of permanent or semi permanent assets created/acquired wholly or mainly out of the grants given by the University Grants Commission as indicated above are being maintained in the prescribed form and are being kept up to date and these assets have not been disposed of encumbered or utilized for any other purpose.

SIGNATURE OF THE
PRINCIPAL INVESTIGATOR
Dr. Aparna Shetty
M.Sc.,M.Phil.,Ph.D.
Assistant Professor of Physics
Government College, KALABURAGI.

PRINCIPAL
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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
ಗುಲಬರ್ಗಾ-585 105
(Seal)

STATUTORY AUDITOR

(Seal)3
UDIN-19228803AAAABN3522

RAJKIRANPATIL AND CO. CHARTERED ACCOUNTANTS
KALABURAGI
M.No.228803
Frn.No.013632 S

GOVERNMENT DEGREE COLLEGE (MRP)(S)

SEDAM ROAD KALABURGI-585105

RECCEIPTS AND PAYMENTS ACCOUNT

RECEIPTS	AMOUNT	PAYMENTS	AMOUNT
To Opening Balance		**Non Recuuring**	
Csah on Hand	--	Books &Journals	10,000.00
Cash on bank	--	Equipments	1,24,875.00
Grant Recceived from		**Recurring**	
MRP(S)-0426/13-14/KAGU009/UGC/SWRO Dated 28/03/2014	1,67,500.00	Contingency	24,825.00
		Chemicals & glassware	25,500.00
		Field work &Travel	10,000.00
Hand loan	32,500.00	Any other exp	4800.00
		Closing Balance	--
		Cash on hand	--
		Cash of Bank	---
Total	**2,00,000.00**	**Total**	**2,00,000.00**

RAJKIRAN PATIL AND CO. CHARTERED ACCOUNTANTS KALABURAGI M.No.226803 Frn.No.013632 S

Dr. Aparna Shetty
M.Sc.,M.Phil.,Ph.D.
Assistant Professor of Physics
Government College, KALABURAGI.

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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
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Annexure - III

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002
STATEMENT OF EXPENDITURE IN RESPECT OF MINOR RESEARCH PROJECT

1. Name of Principal Investigator — Dr. Aparna Shetty
2. Dept. of Principal Investigator University/College — Dept. of Physics, Govt. College, Kalaburagir-585105
3. UGC approval Letter No. and Date — **MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 28 March 2014**
4. Title of the Research Project — **Synthesis and Characterization of Ferrites**
5. Effective date of starting the project — 28 March 2014
6. a. Period of Expenditure — From 28 March 2014 to 20 Nov 2019
   b. Details of Expenditure

Sl.No.	Items	UGC Sanctioned amount Rupees	Grant received Rupees	Expenditure incurred Rupees
1	**Non-Recurring:**			
	Books and Journals	10,000=00	10000=00	10,000=00
	Equipment	1,25,000=00	1,25,000=00	1,24,875=00
2	**Recurring:**			
	Contingency including special needs	25,000=00	12,500=00	25,500=00
	Chemicals and Glass wares	25,000=00	12,500=00	24,825=00
	Field and travel	10,000=00	5,000=00	10,000=00
	Any other	5,000=00	2,500=00	4800=00
	Total	2,00,000=00	1,67,500=00	2,00,000=00

c. Staff Date of Appointment: Not Applicable.

It is certified that the grant of Rs. 1,67,500/- (Rupees One lakh twenty seventhousand five hundred only) received from the sanctioned amount Rs 2,00,000/ - (Two lakh only)from the University Grants Commission under the scheme of support for Minor Research Project entitled **Synthesis and Characterization of Ferrites** vide UGC letter No. **MRP(S)/13-14/KAGU009/UGC-SWRO dated 15-Feb-2014** have been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission.

Aparna

PRINCIPAL INVESTIGATOR

PRINCIPAL
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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
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Annexure - IV

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG NEW
DELHI – 110 002

STATEMENT OF EXPENDITURE INCURRED ON FIELD WORK

Name of the Principal Investigator: Dr. Aparna Shetty

Name of the Place visited	Duration of the Visit		Mode of Journey	Expenditure Incurred (Rs.)
	From	To		
IISC Bangalore	Kalburagi 06-08-2015	Bangalore 08-08-2015	Train	2500-00
Mysore University	Kalaburagi 23-05-2016	Mysore 26-05-2016	Train & Taxi	4800-00
Osmania University	Kalauragi 21-11-2016	Hyderabad 22-11-201	Taxi	2700-00
Total				**10,000-00**

Certified that the above expenditure is in accordance with the UGC norms for Major Research Projects.

Aparna

PRINCIPAL INVESTIGATOR

PRINCIPAL
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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
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(Seal)

Annexure – VII

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002
PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE FINAL REPORT OF THE WORK DONE ON THE PROJECT

1	NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR	Dr.Aparna Shetty, Assistant professor of Physics, Govt college Kalaburagi
2	NAME AND ADDRESS OF THE INSTITUTION	Department Of Physics, Govt.college, Kalaburagi-585105 Karnataka
3	UGC APPROVAL NO. AND DATE	**No. MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 28 March 2014**
4	DATE OF IMPLEMENTATION	28 March 2014
5	TENURE OF THE PROJECT	Two years From 28-03-2014 to 28-03-2016
6	TOTAL GRANT ALLOCATED	Rs. 2,00,000=00
7	TOTAL GRANT RECEIVED	Rs. 1.67,500=00
8	FINAL EXPENDITURE	Rs.2,00,000=00
9	TITLE OF THE PROJECT	**Synthesis and Characterization of Ferrites**
10	OBJECTIVES OF THE PROJECT	Enclosed Annexure –VIII-1
11	WHETHER OBJECTIVES WERE ACHIEVED (GIVE DETAILS)	Yes (Details given in Annexure VIII-2)
12	ACHIEVEMENTS FROM THE PROJECT	Required equipments were brought and the lab was established for synthesis. The samples were synthesized and XRD, SEM, EDAX, FTIR characterizations were carried out.
13	SUMMARY OF THE FINDINGS (IN 500 WORDS)	Enclosed Annexure-VIII-3
14	CONTRIBUTION TO THE SOCIETY (GIVE DETAILS)	
15	WHETHER ANY PH.D.ENROLLED/PRODUCED OUT OF THE PROJECT	No
16	NO. OF PUBLICATIONS OUT OF THE PROJECT	01

Aparna
(PRINCIPAL INVESTIGATOR)

(PRINCIPAL)
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ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ
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OBJECTIVES OF THE WORK.

We are surrounded by magnetic materials playing a crucial role in many devices of every day life and dc motors which perform any operstions: power distribution systems, ased on power transmitters which deliver energy for home and industrial use; video and audio applications which provide information and entertainment in massive scale, telephone and telecommunication system which link continents at nearly the speed of light, data storage system which pervade irtually every human activity. History of the magnetic materials is as old as that of man. Magnetic ceramics or ferrites are a very well estabilished group of manetic materials . Ferrite materials are potential candidates for modern technological applications because of their tunable electrical and magnetic properties. Hence with these ideas an attempt is made through this project to synthesise and characterize the some ferrites.

The main objectives of the work.

1. Synthesis of some ferrites like Barium and Strontium
2. Characterization of the samples
3. Study of Dielectric properties

METHODOLOGY

The work is executed the following steps.

1. Collection of literature
2. Establishment of laboratory facilities.
3. Synthesis of the ferrites
4. Characterization of samples

INTRODUCTION

Ferrites form a very good class of electrical material because of their high resistivity and low behaviour and hence have vast technological applications over awide range of frequencies. Ferrites are preferred in the feild of electronics and telecommunication industry because of their novel electrical properties which makes them useful in radio frequency circuits., high quality filters, rod antennas, transformer cores, read /write heads for hgh digital tapes and other devices. They consists of spontaneously magnetized domains and show the saturation and hysteresis. Ferrites having low resistivity and low eddy current losses have been found to be the most versatile to be used for technological applications as in case of stress and recording media.

Magnetic materials can be divided into two group soft and hard magnetic materials. The soft magnetic materials are those materials which are magnetized and demagnetized easily while the hard magnetic materials are those which are difficult to magnetize and demagnetize.The hard magnetic materials have high coercivity. because the high coercivity resists the magnetization action. The basic difference of two types of permanent magnets was described on the basis of hysteresis loop. The soft magnetic materials exhibit a narrow hysteresis loop, whereas; the hard magnetic materials show a broad hysteresis loop. In the narrow hysteresis loop magnetization follows the variation of the applied field without significant loss. The broad hysteresis loop shows the magnetic energy that can be stored in the materials [1].

Soft magnetic materials

Soft magnetic materials can be easily magnetized and demagnetized. They retain their magnetization only in presence of a magnetic field. They show a narrow hysteresis loop, so that the magnetization follows the variation of applied field nearly without hysteresis loss. They are used to enhance the flux, produced by an electric current in them. The quality factor of a soft magnetic material is to measure of its permeability with respect to the applied magnetic field. The other main parameter is the corecivity. saturation magnetization and the electrical conductivity. An ideal soft magnetic material would have low coericivty (Hc), a very large saturation magnetization (Ms), zero remanence (Br), zero hysteresis loss and very large permeability.

Hard magnetic materials

Hard Magnetic materials also called as permanent magnets are used to produce strong field without applying a current to coil. Permanent magnets required high coercivity, so they should exhibit a strong net magnetization and is stable in the presence of external fields, which requires

high coercivity. In hard magnetic materials uniaxial magnetic anisotropy is necessary and the following magnetic properties are required. The term ferrite is commonly used generically to describe a class of magnetic oxide compounds, which contains iron oxide as a principal component. Magnetite, Fe3O4 also called loadstone, is a genuine ferrite and also was the first magnetic materials known to the ancient people. Ferrites can be classified according to crystal structure, i.e. cubic vs. hexagonal ferrite, or magnetic behavior, i.e. soft vs. hard ferrite. Soft ferrites are easy to magnetize and demagnetize. Hard ferrites are hard to magnetize and demagnetize. Hard magnetic materials are commonly used for permanent magnetic applications. Hard ferrites have a hexagonal structure and can be classified as M-, W-, X-, Y-, Z- type ferrites. W-, X-, Y-, Z- type are not important economically because of their relatively difficult processing.

Barium ferrite, abbreviated BaFe. BaM, is the chemical compound with the formula $BaFe_{12}O_{19}$. This and related ferrite materials are components in magnetic stripe cards and loudspeaker magnets. BaFe is described as $Ba^{2+}(Fe^{3+})_{12}(O^{2-})_{19}$. The Fe^{3+} centers are ferromagnetically coupled. This area of technology is usually considered to be an application of the related fields of materials science and solid state chemistry. Barium ferrite is a highly magnetic material, has a high packing density, and is a metal oxide. Studies of this material date at least as far back as 1931 and it has found applications in magnetic card strips, speakers, and magnetic tapes. One area in particular it has found success in is long-term data storage; the material is magnetic, resistant to temperature change, corrosion and oxidization.

Strontium ferrite, $SrFe_{12}O_{19}$ ($SrO{\cdot}6Fe_2O_3$), used in small electric motors, micro-wave devices, recording media, magneto-optic media, telecommunication and electronic industry.[4] Strontium hexaferrite ($SrFe_{12}O_{19}$) is well known for its high coercivity due to its magnetocrystalline anisotropy. It has been widely used in industrial applications as permanent magnets and, because they can be powdered and formed easily, they are finding their applications into micro and nano-types systems such as biomarkers, bio diagnostics and biosensors.Strontium ferrite has been a subject of continuous interest and intensive study for several decades due to the fact that this compound has been the the most widely used permanent magnets, which account for about 90wt% of the annual production of permanent magnets since shortly after its discovery in the 1950s. Strontium hexaferrite, SrFe12O19, is a ferromagnet and is also known as ceramic permanent magnet. When compared with alnico-magnets, strontium ferrite has high coercivity, moderate remenance, corrosion resistance and excellent chemical stability. Iron(III) oxide (Fe2O3) is the principal components in SrFe12O19 which

gives rise to its magnetic properties. Within the five different crystallographic sites of strontium ferrite, the iron ions are coupled antiferromagnetically. Due to its high magnetocrystalline anisotropy field in its structure, SrFe12O19 exhibits high saturation magnetization and high coercivity. The high magnetic permeability in strontium ferrite enables it to store strong magnetic fields, which is stronger than iron. Strontium ferrite is often produced as nanoscale size powder, which can be sintered into solid cores.

Strontium ferrite has been used for several important industrial applications, such as permanent magnets, microwave devices and high density perpendicular recording media, with proper doping in order to improve properties of strontium ferrite. SrFe12O19 has also been investigated as a medium for magnetic recording and magneto-optical recording and for long (millimetre)-wave devices. Efforts have made to the development of novel synthetic methods which facilitate the production of fine hexagonal ferrite particles and to possible ways of reducing their high intrinsic magneto-crystalline anisotropy.

REVIEW OF LITERATURE

Since the discovery of the M-type hexagonal ferrites in 1950s, it has being of great interest due to its application as permanent magnetic materials and perpendicular recording media. The main reason for its great success is its low cost at moderate magnetic properties. Various work has been carried to develop hexaferrite by various methods and their properties has been investigated. On other hand extensive work has been done to understand the effect of various dopant for Ba and Fe. It is found the doping of metal ion, rare earth ion substantially effects their properties. Work carried out in past few year on different processing methods and different dopants are given below:

In 2000 Gonzalez-Carreno T, Morales MP, Serna CJ studied the nanoparticles of BaFe12O19 (10 nm in diameter) by combination of two methods, the citrate precursor and the aerosol pyrolysis technique [24]. The hexaferrite phase was found at lower temperatures at 1000 0C. The particle size was increased up to 100 nm in diameter by heat treatment at 1000 0C in an oven. The obtained particles are spherical aggregates of 400 nm, which can be easily disaggregated by grinding in a mortar. Saturation magnetization and coercivity values obtained for the largest particles were similar to those found for commercial Figments, 50emu/g and 5600 Oe, respectively.

In 2000 Ng WK, Ding J, Chow YY, Wang S, Shi Y prepared fine particles of barium ferrite with high coercivity (450kA/m) by chemical co-precipitation method. Magnetic properties of the

bonded barium ferrite magnet were measured at different temperatures. Mechanical milling was utilized to prepare ultrafine dispersed barium ferrite particles. A weak anisotropy in the coercivity and remanence was found in the directions parallel and perpendicular to the compaction direction.

In 2001 Janasi SR *et. al.* produced barium ferrites by the ceramic method. Ferrite powders were obtained by co precipitation [26]. This method can produce high purity materials, i.e. particles composed of only Ba0.6Fe2O3. The effects of the pH during co precipitation and calcinations temperature in the magnetic properties were investigated. The molar ratio (Fe/Ba) used in this work was 10. The products were characterized by scanning electron microscopy and magnetic properties were evaluated by vibrating sample magnetometer. Particle size increases with decreasing pH and with increasing calcination temperature. Very fine particles were obtained. Intrinsic coercivities up to 4.80 kOe were achieved.

In 2010 Mohsen Q was study to synthesize stoichiometric and single phase barium hexaferrite by a technique of oxalate precursor. Effect of different annealing temperature on the particle size, microstructure and magnetic properties of the resulting barium hexaferrite powders has been studied. The annealing temperature was in the range 800 to 1200 0 C. The resultant powders were investigated by differential thermal analyzer (DTA), X-ray diffractometer (XRD), scanning electron microscopy (SEM) and vibrating sample magnetometer (VSM). Single phase of BaFe12O19 was obtained at annealing temperature 1200 0C. The SEM results showed that the grains were regular hexagonal platelets. Maximum saturation magnetization (66.36 emu/g) was observed at annealing temperature 1100 0C. However, it was found that the coercivity of the synthesized BaFe12O19 samples was lower than the theoretical values.

In 2005 A. Gonzalez-Angeles *et al.* successfully prepared the Sn2+Ru4+-substituted barium hexaferrite by mechanical alloying. It is found that Sn2+ –Ru4+ substitution is effective in maintains relatively high saturation magnetization (64.2 Am2/kg), with easy control of the coercivity [28]. Increasing the substitution amount causes decrease in coercivity along with reduction of magnetocrystalline anisotropy. Mossbauer spectroscopy shows that the Sn2+ ions found on the octahedral sites (4f2 & 2a) sites, while the Ru4+ ions occupy the 4f1 & 2b sits.

Again in 2005 A. Gonzalez-Angeles *et al.* studies the effect of (Ni, Zn) Ru mixtures on magnetic properties of barium hexaferrites prepaired by high-energy ball milling. It was found that the saturation magnetization (*Ms*) stays high (66.5Am2/kg) and the intrinsic coercivity decreases rapidly, due to the high contribution to the anisotropy the cations are occupy to the

4f2 and 2b sites. The *Ms* valus of divalent cation reached high due to the magnetic nature of ZnRu mixture than of NiRu. It can be said that the Zn2+ is more effective to increase *Ms* than Ni2+. Mossbauer spectroscopy studies showed that both ions mainly occupy the 4f2 and 2a+4f1 sites. The tetravalent Ru4+ ion has a special effect on magnetic properties of hexagonal ferrites (enhances *Ms* and decreases rapidly *Hci* at low substitutions).

Ying Chen *et al* .studied the one-dimensional nonmaterial's synthesized using High-Energy Ball Milling and annealing process in 2006[30]. In this study, two different types of HEBM mills have been used: a vertical rotating ball mill and a planetary ball mill. The experimental results shows that HEBM has played an important role in the formation of the nanotubes and nanowires. HEBM creates a nanosized, disordered and more active structure in the precursor materials. The new metastable structure has different properties than un-milled materials including large surface area, reduced vaporization temperatures and a lower activation energy. These new properties enable the growth of 1D structure possible during the low-temperature annealing process.

A. Ghasemi *et al.* again in 2006 analysis the electromagnetic properties and microwave absorbing characteristics of doped barium hexaferrite [31]. It was found that the ferrite grain size was almost depend on the chemical composition. The samples having higher magnetic susceptibility, higher permeability, larger coercive force and larger hysteresis loop shows the larger microwave-absorbing ability. Microwave absorbers for the applications over 15GHz, and with satisfactory reflection losses, could be obtained at a thickness of 1.8mm by controlling the substituted value of Mn, Cu and Ti elements in barium ferrite.

In 2007 G. Litsardakis *et al.* studied the structural and magnetic properties of barium hexaferrites with Gd–Co substitution by the conventional ceramic route [32]. Simultaneously substitution of b Gd for Ba and Co for Fe causes secondary phase formation which reduces magnetization value. A considerable increase in coercivity was found.

In 2007 P.Sharma *et al*, prepared two series of barium hexaferrites one by mechanical alloying and other by conventional route. A reduction in phase formation temperature is found as compared to conventionally prepared powder. The higher amount of hexaferrites phase formed in the mechanically processed samples accounted for the higher *MS* and *MR*. The *HC* enhancement in the mechanically alloyed samples is attributed to its smaller particle size as compared to the conventionally prepared samples.

In 2007 M. Radwan *et al.* prepared barium hexaferrite nanoparticles by chemical coprecipitation. The effect of Fe/Ba molar ratio was studied. Samples were calcined at different temperature. The addition of surfactants enhances the formation of single phase barium hexaferrite at low calcination temperature and helpful in controlling microstructure

In 2007 L. Lechevallier *et al.* studied the influence of the presence of Co on the rare-earth solubility in M-type hexaferrite. The magnetic properties of strontium hexaferrites can be improved by the combined substitutionn of Pr and Nd. The results of XRD and Mossbauer spectrometry shows that the solubility of Pr and Nd atoms in M-type hexaferrites is higher in Co containing powders than in Co-free powders. Moreover, for the same composition, the solubility of Pr in the M-type phase is higher than that of Nd.

P Sharma *et al.* in 2008 studied the Structural, Mössbauer and magnetic studies on Mn-substituted barium hexaferrites prepared by high energy ball milling and thermal annealing. The magnetization decreases with increasing the substitution amount due to the dilution of the magnetic structure. The increase in coercivity is due to the decrease in lattice parameter, c, which may enhance the super exchange interaction between neighboring ions.

In the same year 2009 Muhammad Javed Iqbal analyzed the effect of doping of Zr–Zn binary mixtures on structural, electrical and magnetic properties of Sr- hexaferrite nanoparticles of strontium hexaferrite doped with Zr–Zn are synthesized by a chemical co-precipitation method. The crystallite sizes of 30–47 nm are small enough to obtain a suitable signal to noise ratio for application in the magnetic recording media. The temperature dependent DC resistivity of Zr–Zn doped samples shows metal-to-semiconductor transition in the temperature (*T*MS) range of 388–408 K. The Curie temperature, DC resistivity and activation energy for hopping decrease but the dielectric constant, dielectric loss and drift mobility increase by enhancing Zr– Zn content. With the substitution of Zr–Zn content of $x \leq 0.4$ the saturation magnetization, magnetic moment and remanence increase from 71 to 92 kAm−1, 11.2–13.6_B and 55–59 kAm−1, respectively, while coercivity decreases from137 to 34 kAm−1. With the improvement in the values of the above-mentioned parameters, the synthesized materials may be suitable for potential application in recording media.

The tailored magnetic properties of Sm(Zn) substituted nanocrystalline barium hexaferrites was studied by the Sha Jian *et al.* [38]. It was found that the doping greatly affects the phase composition and the magnetic properties. The substitution of Sm lead to the increase

of *Ms* firstly, and then decreased, but *Hc* increased with doping. The magnatic properties indicate that the doped-Zn2+ substituted Fe3+ at 4*f*2 site.

In the recent years most work are done on the nanoparticles. Iftikhar Hussain Gul *et al.* studied the structural, magnetic and dielectric properties of Zr–Cd substituted strontium hexaferrite nanoparticles. The saturation magnetization was found to increase at low doping content of while the coercivity decrease for all the doped samples. The smaller crystallite size and increase in saturation magnetization while decrease in coercivity reveals that the synthesized materials are suitable for their applications in the recording media. The dielectric constant decreases with increasing frequency for all the samples. The decrease in dielectric constant has been explained on the basis of space charge polarization resulting from electron displacement and is a major contributor to the dielectric constant in ferrites.

S.A. Seyyed Ebrahimi studied the preparation of strontium hexaferrite nano- crystalline powder by carbon monoxide heat treatment and re-calcination from conventionally synthesized powder in 2009. First strontium hexaferrite was obtained by the conventional route with calcination of strontium carbonate and hematite at 1100 OC for 1h. Then strontium hexaferrite was isothermally subjected to carbon monoxide dynamic atmosphere at various temperatures and flows for different times Strontium hexaferrite decomposed into hematite and strontium oxide during the carbon monoxide heat treatment and the resultant iron oxide was then reduced by carbon monoxide mainly to metallic iron. This process made the microstructure much finer.

Muhammad Javed Iqbal, In the present work, Sr0.5Ba0.5Fe12O19 hexaferrite has been doped with a binary mixture of lanthanum and nickel using chemical co- precipitation method of synthesis. The crystallite size of the synthesized samples is estimated in the range of 36–58nm and their structural analyses have confirmed a single magnetoplumbite phaseThe results shows the ferrimagnetic to paramagnetic transition at Curie temperature (TC) which deceases with the dopant content due to weakening of the super-exchange interactions. DC-electrical resistivity decreases with increasing temperature showing the semiconductor like nature. High electrical resistivity combined with low dielectric constant and low dielectric loss.

Recently in the 2010 I. Bsoul *et al.* successfully investigate the Magnetic and structural properties of barium hexaferrite with its stoichiometric chemical formula BaFe12O19. In the present work concerned with the magnetic properties of BaM doped with gallium[42]. In this study they suggest that the preferential site occupation of Ga below this particular concentration is different than at higher concentration. The effect of Ga substitution for Fe results in an increase

in the coercivity, which is attributed to the decrease of the magnetic exchange coupling. The reduction in exchange coupling is confirmed by the broadening of SFD and the decrease in remanence ratio and Curie temperature with increasing Ga concentration.

Yue Liu *et al.* investigated Co-Zn-Sn doped barium hexaferrites in the present year 2010 [43]. An increase in saturation magnetization (71.9emu/gm) has been achieved.

WandeeOnreabroyet. all investigated the structural and magnetic properties of Sr0.8La0.2Fe12O19 which were fabricated by conventional ceramic process. It was observed by studying the XRD patterns that the undoped sample had a hematite phase which was much lower in case of the doped specimen. By SEM analysis it was also observed that by the doping of La+3 caused a lesser increase in average grain size as compared to the undoped specimen. The study also showed that the doped sample had higher values of saturation magnetization than before.

Ali Ghasemiet. al. [prepared Sn and Zn substituted Strontium hexa-ferrite by a sol-gel process onthermallyoxidizedsiliconwafer (Si/SiO2). The SEM analysis of samples showed that on increasing Sn-Zn content the grain size decreased. It was also observed that by increasing the substitution content in the ferrite thin films, the coercivity value and saturation magnetization values increased but magnetic interaction reduced.

QingqingFanget. al. [22] prepared strontium hexa-ferrite nanoparticles through a chemical sol-gel process. The strontium hexa-ferrite was substituted by Zn+2, Ti+4, Ir+4 and it was observed that (Zn, Ti)x shows higher values of both coercivefield strength and saturation magnetization than the (Zn, Ir)x substituted phase for $0 < x \leq 0.6$.

XiansongLiuet. al. synthesized strontium hexa-ferrite by ceramic process where Sr+2was substituted by La+3 and Fe+3 was substituted by Co+2 according to the formula Sr1-xLaxFe12-xCoxO19. It was observed that when an appropriate amount of substitution of La+3and Co+2 was done then an increase in saturation magnetisation and intrinsic coercivity resulted.

Ali Ghasemi prepared SrFe12-x(Zr0.5Mg0.5)xO19 by sol-gel method where x = 0 to 2.5. The magnetic properties of this sample was studied with the help of a vibrating sample magnetometer (VSM) and it was observed that with an increase in Zr-Mg substitution content the coercivity decreases but saturation magnetisation value increases.

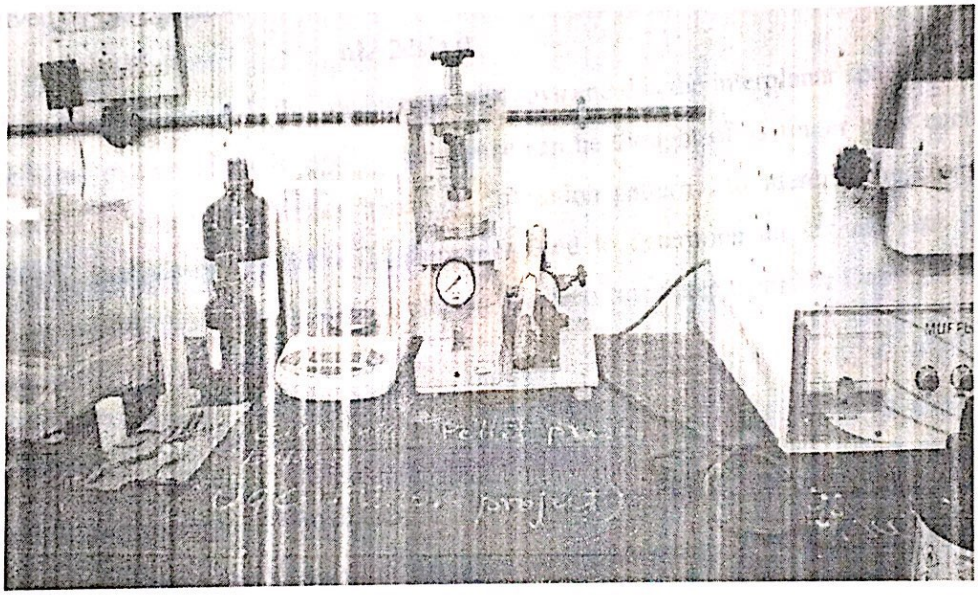
Kubo et. al. invented a composite type magnetic particles (A) each of which contains hexagonal ferrite and spinel structure ferrite and single phase type magnetic particles of hexagonal ferrite (B). This type of magnetic particle has a stronger resistance to noise than that made by using single phase type magnetic particles of hexagonal ferrite thereby providing excellent electromagnetic

characteristics. This also provides a higher signal to noise ratio for short wavelength range. The formula for the compound is AOn(Fe12-x-yM(1)xM(2)yO18-z) where A = Ba / Sr / Ca / Pb , M(1) = Co / Zn / Ni / Cu / Mn / Fe, M(2) = Ti / Sn / Ge / Zr / Sb / Nb / V / Ta / W / Mo. X can vary from 0.5 to 0.3 , Y from 0 to 2.0 and Z can be 0.05 or larger. When A : B = 5: 95 to 30 : 70 it can be used as a magnetic recording medium for 1μm wavelength or lower and when A : B = 70 : 30 to 95 : 5 it can be used for 1μm wavelength or higher.

EXPERIMENTAL METHODS

Sample preperation

In the present study the two kind of samples were prepared. Firstly the barium ferrite was prepared then the strontium ferrite was prepared. Further these ferrites were used as dopant in the PANI.



Preparation of barium and strontium ferrites

The raw material used in the study were $BaCO_3$ (purity 99.0% Loba Chemicals) and Fe_2O_3 (Purity 99.0% Sigma-Aldrich grade). The equimolar composition of $BaCO_3$ and Fe_2O_3 was weighed according to above formula and thoroughly premixed by using pestle and mortar for 30 minute. Further the mix were wet milled for three hours in a planetary ball mill. Zirconia jar and ball were used for the milling., The ball to charge ratio was 2:1 and rpm of the milling was fixed to 60. After milling, the excess acetone was drained and powder was dried in air over night. Further the powder were kept in alumina boat and calcined in air between the

temperature range 800 to 1100 0C in tubular furnace. The heating cooling rate was fixed at 5 0C/minute and the holding time was 2 hours.

In the similar steps strontium ferrite samples were sythesised using raw materials as strontium corbonate and Fe2O3.

Charecrization:

1. X-ray Diffraction

Powder X-ray diffraction is one of the most important characterization tools used in the solid state chemistry and materials science. XRD is easy tool to determine the size and shape of the unit cell for qualitative analysis, quantitative analysis and diffraction pattern gives information on translational symmetry – size and the shape of the unit cell from peak position Brag shoed hat the x-ray s reflected from a lattice plane and the effect associated with it could be derived by the equation

$$n\lambda=2d\sin\theta.$$

Where n is the order, λ is the wavelength of X-rays and d is the interplanar spacing. The x-ray pattern of the crystalline substance can be thought of as finger print each crystalline materials having within limits. a unique diffraction pattern . to Identify the compounds in a powder, analysis of the diffractin pattern is used to determine the crystal size. The average crystallite size (D) from ray line broadening has been calculated using the Debye Scherrer Equation.

$$D= K\lambda/\beta\cos\theta$$

Where λ is wavelength of x-ray beam, β is full width at half maximum of XRD peaks in radians, θ is the Bragg angle and K is a shape factor, a constant depends on the grain shape. The value of K can vary from 0.7 to 0.9depending on the crystalline shape.

2. **Microstructural Analysis**

The microstructures of the sintered pellets were studied with the help of Scanning Electron Microscopy (SEM). The SEM has an electron gun which under vacuum conditions emits a beam of electrons which is allowed to pass through a series of electromagnetic lenses before falling on the surface of the sample. The voltage range of the electron beam is in the range of 1-30 kV. When the electron beam interacts with the surface of the sample a part of it is reflected as back scattered electron (BSE) and also as low energy secondary electron (SE), cathode luminescence, X-ray

excitation beam and some part of the electron beam is transmitted. The secondary electron beam forms an image which is studied in the extrinsic mode of SEM. These secondary electrons are then displayed on a television screen. The image thus formed would be bright if there is high secondary electron emission and this type of high emission is due to surface structure of the sample. The final picture which is obtained has brightness associated with surface characteristics and the image is normally illuminated. The samples were mounted on a metal stub with carbon paint.

3. FTIR

FTIR analysis helps clients understand materials and products. Analytical testing sample screens, profiles and data interpretation are available on a global basis from our experts who deploy FTIR to identify chemical compounds in consumer products, paints, polymers, coatings, pharmaceuticals, foods and other products. Laboratories with FTIR expertise are located throughout the Intertek global laboratory network. FTIR offers quantitative and qualitative analysis for organic and inorganic samples. Fourier Transform Infrared Spectroscopy (FTIR) identifies chemical bonds in a molecule by producing an infrared absorption spectrum. The spectra produce a profile of the sample, a distinctive molecular fingerprint that can be used to screen and scan samples for many different components. FTIR is an effective analytical instrument for detecting functional groups and characterizing covalent bonding information.

4. Dielectric characterization

For the dielectric characterization the sintered pellet samples were first cleaned with acetone and then a layer of silver paste was applied on the top and bottom surface of each pellet. Then these pellets were cured in a furnace at 650 C for 30 mins. After curing the dielectric test of these samples was carried out. The device used for this characterization was LCR meter HIOKI. The measurements for this test were taken in the range of 100Hz to 1MHz. The graphs of tan δ vs frequency and permittivity vs frequency was plotted and analysed. where tan δ = dissipation or loss factor and relative permittivity is:

ε''= relative permittivity of air (8.854 x 10-12 F m-1)

C = capacitance

d = thickness of pellet

A = area of the top surface of pellet

RESULTS AND DISSCUSSION

Barium Ferrites

The required samples were synthesized by solid state eaction method as explained in the earlier section.

The X-ray diffraction analysis of Barium ferrite confirms the formation of the single phase . Using the Debye Scherrer formula. the crystallite size was calculated. The average crystallite size was found to be 22-25nm. Four peaks at 2theta values of 35.523, 43.29, 57.23 and 62.846 degrees, corresponds to (110) (111) (210) and (211) planes. The average grain size was 20m was oserved from SEM micrograph. the FTIR spectra of combusted and calcined BaFe12O19 samples in a wave number ranging from 4000 to 400 cm-1 . The spectra shows dominant absorption bands at 1629 cm-1 . 1426 cm-1 , 628 cm-1 , 555 cm-1 and 442 cm-1 . The bands below 650 cm-1 are due to the iron-oxygen bonds which are characteristics of hematite (γ-Fe2O3) [1]. The adsorption bands at 3433 cm-1 exhibit the stretching vibration of hydroxyl group (O-H) which indicate the presence of free or absorbed water in the samples. There are two weak and broad absorptions around 1400 and 1600 cm-1 corresponding to the presence of small amount of residual carbon in the samples.

Strontium Ferrites

The required samples were synthesized by solid state eaction method as explained in the earlier section.

The X-ray diffraction analysis of strontium ferrite confirms the formation of the single phase . Using the Debye Scherrer formula. the crystallite size was calculated. The average crystallite size was found to be 22-30nm. The prominent peak was observed at 34.28 degree.The SrFe12O19 phase formed with miller indices as [110], [114], [116],. The average grain size was 20m was oserved from SEM micrograph. We observed two major peak in the result of FT-IR spectroscopy at 420 cm-1 and 580 cm-1 which means that the formation of hexaferrite has been taken. These peak corresponding to the stretching vibration of metal-oxygen bond. The peak 420-480 cm-1 and 550-590 cm-1 arises due to crystallographic octahedral and tetrahedral site of iron ion. We doesn't find any peak at 3200-3700 cm-1 which reveals absence of carboxylic group. The peak near 1714 corresponding to presence of stretching of C=O bond.

ಪ್ರಾಂಶುಪಾಲರು
ಸರಕಾರಿ ಮಹಾವಿದ್ಯಾಲಯ

विश्वविद्यालय अनुदान आयोग
दक्षिण पश्चिम प्रादेशिक कार्यालय
UNIVERSITY GRANTS COMMISSION
SOUTH WESTERN REGIONAL OFFICE
P.K. Block, Palace Road, Gandhinagar
Bangalore-560 009.
Phone : (080) 2228 0380 Fax : (080) 2228 0381

ज्ञान-विज्ञान विमुक्तये

PROVISIONAL APPROVAL LETTER

MRP(S)/13-14/KAGU009/UGC-SWRO

15-Feb-14

DR APARNA SHETTY
ASSISTANT PROFESSOR
Dept. of PHYSICS
GOVERNMENT COLLEGE
SEDAM ROAD
GULBARGA - 585 105

Sub: Financial Assistance to DR APARNA SHETTY, GOVERNMENT COLLEGE, SEDAM ROAD, GULBARGA for undertaking Minor Research Project in Sciences for the project entitled SYNTHESIS AND CHARACTERIZATION OF FERRITES

Sir/Madam,

This is in reference to the proposal submitted by DR. APARNA SHETTY, ASSISTANT PROFESSOR, to UGC for financial assistance under the above scheme. The proposal was placed before an Expert Committee duly constituted for the purpose.

Items	Amount Recommended
Non-Recurring:	
Books and Journals	10000/-
Equipment	125000/-
Recurring :	
Contingency	25000/-
Chemicals	25000/-
Fieldwork and Travel	10000/
Any other	5000/-
TOTAL :	200000/-

On receipt of the Approval letter, the Principal Investigator should inform the undersigned of his/her consent to implement the project and send the Acceptance Certificate(Annexure-I) before 10.3.14, otherwise it will be presumed that the Principal Investigator (PI) is not willing to implement the project and the approval will be withdrawn.

The grant is subject to the terms and conditions as per XIth plan guidelines on Minor Research Project and availability of funds. and Final approval by the UGC

Yours faithfully

(Neethu S Thulaseedharan)
Education Officer

Encl: As above

Copy to

1. The Principal
GOVERNMENT COLLEGE
SEDAM ROAD
GULBARGA - 585 105

2. Office copy

ANNEXURE-I

UNIVERSITY GRANTS COMMISSION
SOUTH WESTERN REGIONAL OFFICE
BANGALORE-560009

ACCEPTANCE CERTIFICATE FOR MINOR RESEARCH PROJECT

NAME---------DR. APARNA SHETTY----------

FILE NO---MRP(S)/13-14/KAGU009/UGC-SWRO DATED---15 Feb 14----------

TITLE OF THE PROJECT---SYNTHESES AND CHARACTERIZATION OF FERRITE

---

1. This is to certify that the awardee is permanent/regular working teacher in the college.
2. The research project is not being supported by any other funding agency.
3. The terms and conditions related to the grant are acceptable to the Principal investigator and college.
4. At present, I have no research project/FIP fellowship approved by UGC and the accounts for the previous project, if any have been settled.
5. The project awarded is not connected with any other research work/project of the principal investigator.
6. The College is fit to receive financial assistance from UGC and is included in the section 2(F) and 12(B) of UGC Act, 1956.
7. This is to certify that the college is aided by state government (i.e. Receiving salary grant from state government).
8. His/her date of birth is---01-04-1980----
9. The project shall be implemented immediately on the receipt of the grant.

Signature of Principal
With seal

PRINCIPAL
Govt. College
Kusnoor Road, GULBARGA-585 105.

Date

Signature of Principal Investigator
of the project

Dr. APARNA SHETTY
ASST. PROF. OF PHYSICS
GOVT. COLLEGE, GULBARGA

Diary No. 5812

MRP(S)-0426/13-14/KAGU009/UGC-SWRO

The Accounts Officer
South Western Regional Office
University Grants Commission
P.K. Block, Palace Road
Gandhinagar, Bangalore

ज्ञान-विज्ञान विमुक्तये

विश्वविद्यालय अनुदान आयोग
नैरुत्य प्रादेशिक कार्यालय
UNIVERSITY GRANTS COMMISSION
SOUTH WESTERN REGIONAL OFFICE
P.K. Block, Palace Road, Gandhinagar
Bangalore-560 009.
Phone : (080) 2228 0380 Fax : (080) 2228 0381

28-Mar-14

Sub: Release of Grants-in-aid to GOVERNMENT COLLEGE, SEDAM ROAD, GULBARGA for the year 2013-2014 under MRP(S) (Plan) entitled SYNTHESIS AND CHARACTERIZATION OF FERRITES

Sir/Madam,

I am directed to convey the sanction of the University Grants Commission for payment of grant of Rs.167500/- as first installment for the year 2013-2014 to GOVERNMENT COLLEGE, SEDAM ROAD, GULBARGA under Minor Research Project (Plan) to Principal Investigator APARNA SHETTY expenditure to be incurred during 2013-2014.

Items	Amount Allocated Rs.	HEAD OF ACCOUNT	Grant now being Sactioned	Grant already Sactioned	Total Grant	Balance
Non-Recurring:						
Books and Journals	10000/-	5(viii)	10000/-	0	10000/-	0
Equipment	125000/		125000/-	0	125000/-	0
Recurring :						
Contingency including special needs	25000/-		12500/-	0	12500/-	12500/-
Chemicals and Glassware	25000/-		12500/-	0	12500/-	12500/-
Fieldwork and Travel	10000/-		5000/-	0	5000/-	5000/-
Any other	5000/-		2500/-	0	2500/-	2500/-
Total :	200000/-		167500	0	167500	32500/-

2. The sanctioned amount is debitable to 5(viii) and is valid for payment during the finacial year 2013-2014 only.

3. The amount of the Grant shall be drawn by the Accounts Officer/Drawing and Disbursing Officer, South Western Regional Office, UGC, Bangalore on the Grants-In-aid bill and shall be disbursed to and credited to the Principal of the College through Electronic mode as per the following details:

   a. Details (Name & Address) of Account Holder: GOVERNMENT COLLEGE, SEDAM ROAD, GULBARGA
   b. Account No: 0513101060035
   c. Name & adress of Bank branch: CANARA BANK, .
   d. MICR Code. 585015002
   e. IFSC Code: CNRB0000513
   f. Type of Account. SB

4. The grant is subject to the adjustment on the basis of utilisation certificate in the prescribed proforma submitted by the College.

5. The college shall maintain proper accounts of the expenditure out of the grants which shall be utilised only on approved items of expenditure.

6. The College may follow the General Financial Rules, 2005 and take urgent necessary action to amend their manuals of financial procedures to bring them in conformity with GFRs, 2005 and those don't have their own approved manuals on financial procedures may adopt the provisions of GFRs, 2005 and instructions/guideline there under from time to time.

7. The Utilization Certificate to the effect that the grant has been utilized for the purpose for which it has been sanctioned shall be furnished to UGC as early as possible after the close of current financial year.

Contd.2

8. The assets acquired wholly or substantially out of University Grants Commission's Grant shall not be disposed or encumbered or utilised for the purposes other than those for which the grant was given without proper sanction of the UGC and should at any time the College ceased to function, such assets shall revert to the University Grants Commission.
9. A Register of Assets acquired wholly or substantially out of the grants shall be maintained by the College in the prescribed proforma.
10. The grantee institution shall ensure the Utilization of grants-in-aid for which it is being sanctioned/paid. In case of non-utilization/part utilization thereof, the simple interest @ 10% per annum as amended from time to time on unutilised amount from the date of drawal to the date of refund as per provisions contained in General Financial Rules of Govt. of India will be charged.
11. The College shall follow strictly the Government of India/UGC's guidelines regarding implementation of the reservation of policy [both vertical (for SC, ST and OBC) and horizontal (for person with disability etc.)] in teaching and non-teaching posts.
12. The College shall fully implement the Official Language Policy of Union Govt. and comply with the Official Language Act, 1963, and Official Languages (Use for Official Purposes of the Union) Rules, 1978 etc.
13. The sanction is issued in exercise of the delegation of powers vide UGC office order No.130/2013[F.No.10-11/12(Admn. IA B)] dated 28/5/2013.
14. The College shall strictly follow the UGC Regulations on curbing the menace of Ragging in Higher Education Institutions, 2009.
15. The College shall take immediate action for its accreditation by National Assessment and Accreditation Council (NAAC).
16. The accounts of the College will be open for audit by the Comptroller and Auditor General of India in accordance with provisions of General Financial Rules, 2005.
17. The annual accounts i.e. balance sheet, income and expenditure statement and statement of receipts and payments are to be prepared strictly in accordance with the Uniform Format of Accounting prescribed by the Government.
18. The funds to the extent are available under the Scheme.
19. This issues with the concurrence of IFD and approval of Secretary vide Diary No. 7900 dated 06-Mar-2014 respectively.
20. An amount of Rs nil out of the grant of Rs.nil sanctioned vide letter No.MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated nil has been utilized by the College for the purpose for which it was sanctioned and noted in Grants-in-aid Register at Page No. ____
21. The grant is sanctioned on the basis of the information/documents provided by the college. In case of any discrepancy in the above information and the college is found ineligible for the above grant at the time of expert committee meeting the college is liable to refund the sanctioned grant along with interest.
22. The college shall ensure involvement of Technical advice on and supervision of specifications and construction standards.

Yours faithfully

(Dr.N. Gopukumar)
Deputy Secretary

NEETHU S. THULASEEDHARAN
Education Officer
University Grants Commission
South Western Regional Office
Palace Road, Gandhi Nagar,
BANGALORE - 560 009.

Copy to

1. The Principal
GOVERNMENT COLLEGE
SEDAM ROAD
GULBARGA - 585 105
(He/She is requested to abide by these instructions/guidelines of sanction order.)

2. DR APARNA SHETTY
ASSISTANT PROFESSOR
GOVERNMENT COLLEGE
SEDAM ROAD
GULBARGA - 585 105

3. Officer of Director General of Audit, Central Revenues, AGCR Building, I.P. Estate, New Delhi
4. The Commissioner
Department of Collegiate Education
Government of Karnataka, Bangalore -
5. The Dean/Director, College Development Council
GULBARGA UNIVERSITY
GNANA GANGA
GULBARGA - 585 106
6. Office copy

ज्ञान-विज्ञान विमुक्तये

विश्वविद्यालय अनुदान आयोग
नैरुत्य प्रादेशिक कार्यालय
UNIVERSITY GRANTS COMMISSION
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Bangalore-560 009.
Phone : (080) 2228 0380 Fax : (080) 2228 0381

MRP(S)-0426/13-14/KAGU009/UGC-SWRO

08-Apr-14

The Principal
GOVERNMENT COLLEGE
SEDAM ROAD
GULBARGA - 585 105

Sub: Transfer of funds to Colleges through RTGS/NEFT

Sir/Madam,

This has reference to this office Sanction letter No. MRP(S)-0426/13-14/KAGU009/UGC-SWRO dated 28-Mar-2014 sanctioning therewith an amount of Rs 167500/- under the scheme of Minor Research Project

The above sanctioned amount has been transfered to your college Account No.0513101060635 with IFSC code: CNRB0000513 through RTGS/ NEFT.

The CANARA BANK, CUNNINGHAM ROAD, BANGALORE (CNRB0000431) has confirmed the above transfer of funds to your college through RTGS/NEFT vide confirmation number P14040781658309 on dated 08-Apr-2014

You are requested to confirm the receipt of the above amount in your account by sending back the enclosed stamped receipt(colour paper). Further grants to the college will depend on receipt of this acknowledgement within ten days.

Yours faithfully,

Deputy Secretary

Encl. 1. Sanction order
2. Acknowledgement