

| CRITERION- III | | |
|-----------------------|-------------------|--|
| KEY INDICATOR | 3.5 Collaboration | |
| METRIC NO. | 3.5.1 | |

Number of Collaborative activities for research, Faculty exchange, Student exchange/ internship per year

COPIES OF COLLABORATION/RELATED DOCUMENTS INDICATING THE NATURE OF COLLABORATION AND ACTIVITIES DURING THE ACADEMIC YEAR

2015-2016

Dr. Rafiq Zakaria Campus MAULANA AZAD COLLEGE OF ARTS, SCIENCE & COMMERCE, AURANGABAD – 431 001 Maharashtra (India) NAAC Accredited "A" Grade

Department of Physics & Electronics



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Date: 11 - 07 - 2014

Academic Collaboration and Co-operation To whomsoever it may Concern

This is to certify that Mr. Arif Tamboli from department of Electronic Sciences, Poona College of Arts, Science and Commerce, Camp Pune – 01 is in collaboration and association with our department from August, 2014 till 31st May 2016.

The Collaboration is to utilise the expertise and sharing of knowledge between the entities. Dr. GULAM RABBANI had provided his consent to conduct the following activities with our department under the collaboration:

- 1. Participation in Faculty Exchange Programme
- 2. Participation in Student Training Programme
- 3. Participation in Summer Conferences / Symposia / Workshops etc.
- 4. Research Collaboration
- 5. Invited Talks

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Dr. Gulam Rabbani Associate Professor Head Department of Physics & Electronics

Structural, Magnetic and Resistive Properties of Cu²⁺ Substituted Ni Co Nanocrystalline Spinel Ferrite Material

A.M. Tamboli¹, S.M. Rathod³, M.V. Bhujbal³, Gulam Rabbani^{2*} ¹Department of Electronic Science, Poona College, Camp, Pune-411 001 ²Department of Physics and Electronics, Maulana Azad College, Aurangabad-431 001 ³Department Of Physics, Abasaheb Garware College, Pune- 411 004 Email Address: grabbani@yahoo.com

Abstract— The The nanocrystalline Ni $_{0.2}$ Cu $_{0.2}$ Co $_{0.6}$ Fe₂O₄ and Ni $_{0.2}$ Cu $_{0.6}$ Co $_{0.2}$ Fe₂O₄ has been synthesized by Sol-Gel auto-combustion technique by using high purity metal nitrate and citric acid as a fuel. The prepared samples were annealed at 400°C for 4 hrs. Structural characterization of the annealed samples was done using X-ray diffraction method. The single phase formation of NiCuCoFe₂O₄ was confirmed by X-ray diffraction analysis. The particle size of prepared sample was confirmed by Scherrer's formula. The particle size obtained from Scherrer formula is in 21 to 27 nanometer range. The effect of Particle size observed by substitution of Cu²⁺ in Ni Co. The VSM technique is used to obtain the magnetic properties of prepared sample. The pallets of sample are prepared by using PVA as binder. The resistivity of the prepered sample is measured.

Key Words- Nanocystalline, Sol-gel auto-combustion, X-ray diffraction, VSM, IR

INTRODUCTION

N the field of material science the materials with Magnetic L properties have become a subject of considerable interest in the field of power storage devices. The material with magnetic property prepared in the scale of nano-size by Sol Gel Auto Combustion method opened new application for magnetic materials such as magnetic data storage in power electronics, ferro-fluid technology, magnetically targeted drug carriers in the fields of chemical science, contrast agents in magnetic resonance imaging in the field of medicine. Nanoferrites are very important magnetic materials because of their high resistivity and low energy losses (eddy current) and hence have vast technological application in the fied of electronics and telecommunications due to wide range of frequencies [1]. Recent studies have shown that the physical properties of nanoparticles are enhanced significantly by various processing technique [2]. The crystallite size, distribution of particle sizes and inter particle spacing having the greatest impact on magnetic properties. One can change the properties by preparing the material with different composition of metal nitrates having different crystalline size. Many wet-chemical methods are employed for the preparation of the nano-sized spinel ferrite. One of them is sol-gel auto combustion which has recently become very popular technique. It is a simple process, which offers significant saving in time and energy consumption over the traditional methods and requires a low sintering temperature. This method is used to obtain improved properties, more homogeneity and narrow particle distribution thereby influencing structural, electrical and magnetic properties of µ

spinel ferrite [3]. It is well known that, some magnetic properties such as saturation magnetization and coercivity depend strongly on the particle size and microstructure of the materials. Therefore, it is interesting and important to develop techniques by which the size and shape of the particles can be well controlled. One of the way to prepare the nanocrystalline spinel ferrite material with required properties is Sol-gel auto combustion technique. In the present work we have systematically studied the effect of Cu^{2+} substitution on the structural properties of Ni_{0.2}Co_{0.8-x}Fe₂O₄ samples.

EXPERIMENTAL TECHNIQUE

The high purity AR grade ferric nitrate (Fe(NO₃)₃.9H₂O), Copper nitrate (Cu(NO₃)₂·6H₂O), Nickel nitrate (Ni(NO₃)₂·6H₂O), Cobalt nitrate($Co(NO_3)_2 \cdot 6H_2O$), citric acid ($C_6H_8O_7$), ammonium hydroxide solution (NH4OH) were used to prepare Ni 0.2 Cu x Co _{0.8-x} Fe₂O₄ nanoparticles by sol-gel auto combustion synthesis technique. In this chemical process Citric acid was used as a Fuel [7]. These nitrates and citric acid were weighed accurately to have proper stoichiometric proportion required in the final product. The mixed solutions of all the chemicals were stirred until the homogeneous solution is obtained. During the stirring process ammonium hydroxide solution was added drop by drop to obtain pH of 7. The mixed solution was simultaneously heated at 100 °C for 3 to 4 h to form sol. The transparent sol was heated at 120°C for 2 h for removal of water. The sol turns into a viscous brown gel. The temperature of the gel was further increased up to 150 °C, after some time combustion of the gel takes place and fine powder of Ni 0.2 Cu x Co 0.8-x Fe2O4 ferrite nanoparticle was obtained. The powder was dried and annealed at 400 $^{\circ}$ C for 4h . The pallets of sample are prepared by using PVA as binder and was dried and annealed at 200 $^{\circ}$ C for 2hours.

RESULT AND DISCUSSIONS

Fig. 1 shows the IR spectroscopy, the peak at 560 A gives the confirmation of Ni Cu Co metal formation. Fig. 2 shows the X-ray diffraction pattern of Ni 0.2 Cu 0.2 Co 0.6 Fe₂O₄ and Ni 0.2 Cu 0.6 Co 0.2 Fe₂O₄. These compositions exhibit single phase cubic spinel structure and exclude the presence of any secondary phase. All the reflections are slightly broader and less intense which indicate the nanocrystalline nature of the samples. The analysis of X-ray diffraction pattern revealed that all the samples under investigation possess single phase cubic spinel structure. Using the XRD data, the inter-planar spacing 'd' values for all the reflections were determined using Bragg's law. It is observed that due to the concentration of Cu²⁺ ions in place of Ni Co ions the Bragg's angle shifts towards higher angle and thereby interplanar spacing 'd' values decreases. The lattice constant is found to decrease with increase in Cu²⁺ substitution Ni Co. The variations in lattice constant as a function of copper substitution Ni Co can be understood on the basis of the ionic radius of the substituted cations. The resistivity mesaured for the pallet of Ni $_{0.2}$ Cu $_{0.2}$ Co $_{0.6}$ Fe₂O₄ is about 5.233 MΩ-m and the resistivity for the pallet of Ni 0.2 Cu 0.6 Co 0.2 Fe2O4 is very very high which is increasing due to increase of Cu2+ substitution Ni Co. It is observed that all the peaks in the pattern belong to the spinel structure and it is confirmed that the samples have pure spinel phase[8].



| <u>Composition</u> (X) | <u>Average Grain Size</u> (nm) | <u>Lattices Constant(</u> ^o A) |
|---|-----------------------------------|---|
| Ni 0.2 Cu 0.2 Co 0.6 Fe ₂ O ₄ | 26.6594 | 8.3555 |
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Table 2 Magnetic Properties of I- Ni 0.2 Cu 0.6 Co 0.2 Fe₂O₄

| <u>Composition X</u> | <u>Hc in</u> <u>Oe</u> | <u>Mr</u> emu/gm | <u>Ms emu/gm</u> |
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| <u>Ni 0.2 Cu 0.2 Co 0.6 Fe2O4</u> | <u>173.944</u> | <u>30.2061</u> | <u>50.4215</u> |
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This The nanocrystalline Ni $_{0.2}$ Cu $_{0.2}$ Co $_{0.6}$ Fe₂O₄ and Ni $_{0.2}$ Cu $_{0.6}$ Co $_{0.2}$ Fe₂O₄ have been successfully prepared by solgel auto combustion technique. The magnetic property decreases with increase of Cu⁺² substitution Ni Co and material goes towards soft to hard ferrite. All the prepared samples show the single phase cubic spinel structure of the samples. The particle grain size obtained from X-ray diffraction data decreases with increase in Cu+2 substitution Ni Co.

REFERENCES

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Place: Pune

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Date: August 14, 2015

Academic Collaboration& Co-operation

TO WHOMESOEVER IT MAY CONCERN

This is to certify that Mr. TAMBOLI ARIF from Department of Electronic Science, Poona College

of Arts, Science & Commerce, Camp, Pune-01 is in collaboration & association with our department from

the date of signing this document to next Five Years [05 Years].

This collaboration is to utilize the expertise & sharing of knowledge between the entities. Dr. S.

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Dr. S. M. RATHOD,



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Structural and Dielectric properties of Co⁺² substituted Ni Cu Nanocrystalline Spinel Ferrite Material

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Abstract: In this research paper the dielectric properties such as Ddielectric loss $(\tan \delta)$, AC conductivity, Dielectric constant (real part ϵ ' and imaginary part ϵ '') and dielectric loss tangent $(\tan \delta)$ are reported for the series [Cox Ni(constant) Cu0.8-x Fe2O4] where constant=0.2 with x=0.2, 0.4 and 0.6 of ferrites, prepared by Sol-Gel autocombustion technique by using high purity metal nitrate, double distilled water and citric acid as a catalyst. The variation in the real part of dielectric constant(ϵ '), imaginary part of dielectric constant (ϵ ''), dielectric loss tangent (tan δ)and AC conductivity are studied at room temperature in the frequency range of 100 Hz to 5 MHz. Structural characterization of the annealed samples was done with the help of X-ray diffraction method. The particle size and single phase formation of CoNiCuFe2O4 ferrite was confirmed by X-ray diffraction analysis. The particle size of prepared sample was confirmed by Scherer's formula. The effect on Particle size (t) and lattice constant (Å) is observed due to substitution of Co2+ in Ni Cu. The impedance meter (LCR meter) is used to obtain the Dielectric properties of the prepared ferrite material are discussed.

Keywords - Sol-gel auto-combustion X-ray diffraction, Impedance meter (LCR meter), FT-IR,

I. INTRODUCTION

The ferrite nanoparticle are popular in various fields of electronics and communication Engineering because the ferrite material is having excellent and very different properties especially in electric, di-electric and magnetic properties that are sensibly different from the properties of the other bulk materials. Ferrite nanoparticles are very use full in the area where minimization of eddy current loss, magnetic loss is important and magnetic field dependent properties plays very important role.

The ferrite performs a better response at high frequencies because ferrite nanoparticles are having very high electrical resistivity and due to this Ferrite is used as best core material in the transformers and power supply for frequencies from few kilo Hertz to a few Mega Hertz. Ferrite is having high stability, low cost, light weight and lowest volume therefore it is more popular. These are intensively studied due to their technological applications in microwave industries such as Radar Absorbing Material (RAM), satellite communication, microwave dark room and protection of living animals from the harm of microwave [1–7].

II. EXPERIMENTAL

2.1 Synthesis

The high purity AR grade ferric nitrate [Fe(NO₃)₃.9H₂O)], Copper nitrate [Cu (NO₃)₂ .6H₂O], Nickel nitrate [Ni(NO₃)₂.6H₂O], Cobalt nitrate [Co(NO₃)₂.6H₂O], citric acid (C₆H₈O₇), ammonium hydroxide solution (NH₄OH) and double distilled water were used to prepare the series [Co_x Ni(constant) Cu_{0.8-x} Fe₂O₄] where constant=0.2 with x=0.2, 0.4 and 0.6 of ferrite nanoparticles by sol-gel auto combustion synthesis technique. In this chemical process Citric acid was used as a Fuel. These nitrates and citric acid were weighed accurately to have proper stoichiometric proportion required in the final product and all metal nitrates are dissolved in deionized water to form mixed solution. The mixed solutions of all the chemicals were stirred by using magnetic stirrer until the homogeneous solution is obtained. During the stirring process ammonium hydroxide solution was added drop by drop to obtain pH of 7. The mixed solution was simultaneously heated at 100 °C for 2 hours

to 4 hours such that formation of gel takes place. The transparent solution was heated at 100°C for 2 hours to 4 hours for removal of water and solution turns into a viscous brown gel. The temperature of the gel was further increased up to 150°C, after some time combustion of the gel takes place and fine powder of $[Co_x Ni(constant) Cu_{0.8-x} Fe_2O_4]$ ferrite nanoparticle was obtained. The same procedure is repeated for three times for X=0.2, x=0.4 and x=0.6, such that three ferrite materials are prepared. Three ferrite materials represented by the symbol D, E, and A are $[(Co_{0.2}Ni_{0.2}Cu_{0.6})Fe_2O_4], [(Co_{0.4}Ni_{0.2}Cu_{0.4})Fe_2O_4] and [(Co_{0.6}Ni_{0.2}Cu_{0.2})Fe_2O_4] respectively.$

The powder was dried and annealed at 400 $^{\circ}$ C for 4h in furnace having super kanthal (MoSi₂) heating elements and alumina insulation boards as chamber walls. The pallets of sample are prepared by using binder polyvinyl alcohol (PVA) and it was pressed at 60 kg/cm³ for one min and was dried and annealed at 200 $^{\circ}$ C for 2 hours. The diameter of pallet is 10mm and thickness is 2mm. Three pallets of ferrite materials are prepared for represented by D, E, and A are [(Co_{0.2}Ni_{.0.2}Cu_{.0.6})Fe₂O₄], [(Co_{0.4}Ni_{.0.2}Cu_{.0.4})Fe₂O₄] and [(Co_{0.6}Ni_{.0.2}Cu_{.0.2})Fe₂O₄] respectively.

2.2 Characterization

The phase analysis and gross structural analysis is done by using X-ray diffractometer (Cu K α_1 radiation=1.5418 Å) and confirmation of single phase spinal structure is done. The average particle size of prepared powder has been calculated using Scherrer formula

 $t = 0.9 \lambda /\beta \cos \theta \qquad -----(1)$

Where; λ = Wave length of X-rays.

t = Particle size.

 $\theta = Bragg's angle.$

 β = Full Width Half Maxima of the recorded peak θ and it is corrected for instrumental broadening.

The lattice parameter (a) is calculated from X-ray diffraction data by using formula $1/d^2 = 1/a^{2*}$ (h² +k²+ l²). It is observe that Average Grain Size t (nm) and Lattices Constant a (Å) decreases with increase of Ni²⁺ substitution of in Cu Co as shown in Table 1.

The dielectric constant (ϵ '), dielectric loss tangent (tan δ) and AC conductivity (σ_{ac}) of prepared samples were measured in the frequency range of 100 Hz to 5 MHz by using digital LCR meter of precision impedance analyser at room temperature. The data of digital LCR meter provides the information of frequency (f), Series Capacitance (Cs), Parallel Capacitance (Cp), Quality factor (Q), by using the this date along with thickness of pellet, d=0.002 meter, Diameter of pellet= 10 millimetre and Area of pellet = $\pi r^2 = 3.14*.005*.005$ meter²=0.0000785 meter², the calculations for dielectric constant (ϵ '), imaginary part (ϵ '') of dielectric constant and dielectric loss tangent (tan δ) are completed by using the following equations. The logarithm of frequency (Log₁₀ f) is taken in to consideration while plotting the graph of (Log₁₀ f) verses any other parameter.

Dielectric constant (Real Part) = $\dot{\epsilon} = Cp^*d/\epsilon_0^*A$ ------ (2) Dielectric constant (Imaginary Part) = $\epsilon'' = (\tan \delta)^* \epsilon'$ ------ (3) Dielectric loss tangent= $(\tan \delta) = 1/Q = \epsilon'' / \epsilon'$ ------ (4)

III. RESULTS AND DISCUSSIONS

3.1: Structural analysis.

The XRD pattern of as-synthesized ferrite material of $[(Co_{0.2}Ni_{.0.2} Cu_{.0.6})Fe_2O_4]$ is shown in Fig.1. The highest intensity peaks in all three specimens are observed at (311) and other peaks (220), (400), (422) and (440). The average grain (crystallite) size for all the composites is calculated using Scherer's formula with respect to the high intense peak plane (311) and Lattices Constant a (Å) is calculated by using the formula $1/d^2 = 1/a^2 * (h^2 + k^2 + l^2)$. It is observed that due to the increase concentration of Co²⁺ ions in NiCu the Bragg's angle shifts towards lower angle and thereby interplaner spacing's (d) values increases. The grain (crystallite) size for all the composites is found in the range of 23.71 nanometer to 28.45 nanometer. The XRD pattern contains no secondary peaks and it gives the confirmation about pure spinal structure of sample.

The lattice constant is found to increase with increase in Co^{2+} concentration x. The variations in lattice constant as a function of Cobalt concentration x can be understood on the basis of the ionic radius of the substituted cations. Since the ionic radius of Co^{2+} ions (0.745Å) is greater than that of Cu^{2+} ions (0.73Å), the substitution is expected to increase the lattice constant with increase in cobalt concentration x. When the larger cobalt ions enters at that time lattice unit cell expands while preserving overall symmetry this is true as long as the lattice constant increases with substituent concentration of cobalt.

The values of lattice constant obtained from XRD data by varying cobalt concentration x are given in Table 1. It can be seen from Table 1 that, the lattice constant and particle size (t) increases with increase of cobalt concentration x and obeys Vegard's law [08-14]. Fig.2. Shows that particle size (t) increases with

increase of Co^{2+} concentration in [($\text{Co}_x \text{Ni}_{(constant)} \text{Cu}_{0.8-x}$)Fe₂O₄] and Fig.3. Shows that lattice constant (Å) also increases with increase of Co^{2+} concentration in [($\text{Co}_x \text{Ni}_{(constant)} \text{Cu}_{0.8-x}$)Fe₂O₄].

3.2: Dielectric properties.

The effect of Co^{2+} concentration x on the dielectric properties of $[(Co_{0.2}Ni_{.0.2}Cu_{.0.6})Fe_2O_4]$, $[(Co_{0.4}Ni_{.0.2}Cu_{.0.4})Fe_2O_4]$ and $[(Co_{0.6}Ni_{.0.2}Cu_{.0.2})Fe_2O_4]$ have been studied by using LCR meter (impedance analyzer) in frequency range of 100 Hz–5 MHz.

The Fig. 4 shows that the dielectric loss (tan δ) decreases as the frequency of the applied AC electric field increases because the jumping frequency of charge carriers cannot follow the frequency of the applied field after certain frequency. It is also observed that dielectric loss (tan δ) rapidly decreases at lower frequencies and remains constant at higher frequencies.

The Zig Zag behaviour in the low frequency region of Dielectric loss curve is observed as shown in Fig. 4. This peak in the Dielectric loss curve is observed when the hopping frequency of the electron between Fe^{2+} – Fe^{3+} ions matches with the frequency of the externally applied electric field. It is expected that the peak may be observable in lower frequency range.

The Fig. 5 shows that the variation in the dielectric constant ($\dot{\epsilon}$) with increase in the frequency and it is observed that dielectric constant ($\dot{\epsilon}$) of all spinel ferrite samples rapidly decreases at lower frequencies and remains constant at higher frequencies.

The Fig. 6 shows that the Imaginary Part of Dielectric constant (ε ") also decreases rapidly at lower frequency and remains constant at higher frequencies. Similar results were observed by several other investigators [15-19]. The values of the average dielectric constant and average dielectric loss of the samples are listed in Table 2.

According to Koop's the decrease in dielectric constant for increase in frequency can be expressed by considering the solid as composed of well conducting grains which is separated by the poorly conducting grain boundaries. According to Koop's, at lower frequencies, the resistivity is high and the principal effect is of the grain boundaries (low resistivity regions). Therefore, the energy required for electron hopping between Fe²⁺ and Fe³⁺ at the grain boundaries is higher and the energy losses (tan δ and ϵ'') are larger [20-25].

The rapid decrease of dielectric constant at lower frequencies is explained on the basis of space charge polarization. According to Maxwell and Wagner two-layer model, the space charge polarization is produced in a di-electric material due to the presence of higher conductivity phases (grains) in the insulating matrix (grain boundaries). When an external electric field is applied, the electrons reach the grain boundary through hopping. If the resistance of the grain boundary is high, the electrons pile up at the grain boundaries and produces polarization. This is called space charge polarization. The assembly of space charge carriers in a dielectric material takes a finite time to line up their axes parallel to the alternating electric field. If the frequency of the external electric field reversal increases, a point is reached where the space charge carriers cannot keep up with the external electric field and the alternation of their direction lags behind that of the field [26-29]. In Fig. 7, FT-IR peaks at 3148.22 cm^{-1} , 2983.34 cm⁻¹, 1644.98 cm⁻¹ and 1024.02 cm⁻¹ gives the confirmation of Fe₂O₄.

3.3: AC conductivity (σ) at different concentration of Co^{2+} ions.

It is observed that the AC conductivity remains almost constant in the low frequency region and increases abruptly in the high frequency region Fig. 8. It is well known that the mechanism of the electrical conduction is the same as that of the dielectric polarization.

The increase in the AC conductivity with frequency is also understood by the hopping model. As the frequency of the applied electric field increases, the hopping frequency of electrons between Fe^{3+} – Fe^{2+} ions at adjacent octahedral site also increases, leading to increase in the conductivity.

From Fig. 8. it is observed that for x=0.2 (sample D) graph shown by square dots (Black) is having the minimum AC Conductivity and AC Conductivity increases due increase in substation of Co^{2+} , x=0.4 and x=0.6 which is shown by circular red dots (sample E) and by triangular blue dots (sample A) respectively.

It shows that the AC conductivity increases with increase in x substitution of Co^{2+} . With the increase in the concentration of Co^{2+} ions (x), the hopping action of charge carriers increases due to the increased concentration of Fe³⁺ ions at B-site. Table 3, shows the values of AC Conductivity for Co²⁺ concentration x at 5 MHz [30-34].

IV. FIGURES AND TABLES

International Journal of Innovations in Engineering and Technology (IJIET) http://dx.doi.org/10.21172/ijiet.82.006

Variation of Particle size (t) and Lattices Constant (Å) for due to Substitution of Co^{2+} in $\int (Co Nic_{2-2} - Cu_{2-2})FerOul$

| $[(\operatorname{Co}_x\operatorname{Nt}_{(\operatorname{constant})}\operatorname{Cu}_{0.8-x})\operatorname{Fe}_2\operatorname{O}_4].$ | | | | |
|---|----------------------|-----------------------|--|--|
| Ferrite Sample | Particle Size t (nm) | Lattices Constant (Å) | | |
| (D) x=0.2 | 23.71 | 8.315 | | |
| (E) x=0.4 | 25.75 | 8.377 | | |
| (A) x=0.6 | 28.45 | 8.417 | | |

| Table 2 Variation of Dielectric Constant and Dielectric loss of $[(Co_xNi_{(constant)}Cu_{0.8-x})Fe_2O_4]$. | | | | |
|--|--------------------------|----------------------|--|--|
| Variation in Dielectric Constant and Dielectric loss of D, E and A | | | | |
| Sample Name | Avg. Dielectric Constant | Avg. Dielectric loss | | |
| D [($Co_{0.2}Ni_{.0.2}Cu_{.0.6}$)Fe ₂ O ₄] | 40.372577 | 1.191974 | | |
| $E [(Co_{0.4}Ni_{.0.2}Cu_{.0.4})Fe_2O_4]$ | 88.997411 | 1.342013 | | |
| A $[(Co_{0.6}Ni_{.0.2}Cu_{.0.2})Fe_2O_4]$ | 52.907096 | 0.701638 | | |

| Table 3 | | |
|---|---|--|
| Variation in AC Conducti | vity of $[(Co_xNi_{(constant)}Cu_{0.8-x})Fe_2O_4].$ | |
| $[Co_x (Ni_{(constant)} Cu_{0.8-x})Fe_2O_4]$, Ni =constant=0.2 | | |
| Х | AC Conductivity at 5 MHz | |
| (D) For x=0.2 | 0.00206424 | |
| (E) For x=0.4 | 0.00259871 | |
| (A) For x=0.6 | 0.00265852 | |



Fig.1: XRD pattern of sample D , $[(Co_{0.2}Ni_{.0.2}Cu_{.0.6})Fe_2O_4]$.



Fig. 2: Particle size (t) verses Co^{2+} substitution x in SET-II (D, E, A).



Fig. 3: Lattices Constant verses Co^{2+} substitution x in SET-II (D, E, A).



Fig. 4: Variation in dielectric loss (tan $\delta)$ with increase in frequency of ferrite sample D, E and A.



Fig. 5: Variation in Real Part of Dielectric constant ($\acute{\epsilon}$) with increase in frequency of ferrite sample D, E and A.

International Journal of Innovations in Engineering and Technology (IJIET) http://dx.doi.org/10.21172/ijiet.82.006



Fig. 6: Variation in imaginary part of Dielectric Constant (ε") with increase in frequency of ferrite sample D, E and A.



Fig.7: FTIR graph for SET-II (E), $[(_4Co_{0.4}Ni_{.0.2}Cu_{.0.})\,Fe_2O_4]$



Fig. 8: AC Conductivity of ferrite sample D, E and A.

V. CONCLUSIONS

The nanocrystalline ferrite samples $[(Co_{0.2}Ni_{0.2} Cu_{.0.6})Fe_2O_4]$, $[(Co_{0.4}Ni_{.0.2} Cu_{.0.4})Fe_2O_4]$ and $[(Co_{0.6}Ni_{.0.2} Cu_{.0.2})Fe_2O_4]$ have been successfully prepared by sol-gel auto combustion technique. All the prepared samples show the single phase cubic spinel structure of the samples. The particle grain size obtained from X-ray diffraction data increases with increase in Co⁺² substitutions **Ni** Cu. It clearly shows that the size of the ferrite particles was in the nanometer range. The particle size and nanostructure of the sample was examined by XRD. FTIR also gives the confirmation of spinnel ferrite. Measurement of the dielectric constant and dielectric loss in the 100 Hz–5 MHz frequency range showed higher magnitude, at lower frequencies, decreasing with increase in frequency, essentially becoming constant above 4 MHz. The AC conductivity (σ) increases with increase in x substitution of Co²⁺.

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GRAPHIC DESIGN #WEB DESIGN, DEVELOPMENT & HOSTING # SOFTWARE DEVELOPMENT May Fair Complex, Office No. 9, Opp. Kalpataru Apartment, New Modikhana, Camp, Pune - 411 001 (Maharashtra), India Ph. : 020-65002001, M: +91 9860678682 = e-mail : Info@eclatte.com = www.eclatte.com

Date: 29th December,2015.

Dear Azhar Khan,

We are pleased to offer you an internship position as Trainee Software Engineer in our organization.

Your duties and responsibilities during internship period include:

- As per discussion, you will work under company policy for 6 months. Once you agree you should not resign from the company until 6 months.
- If you resign then you won't be eligible for getting Experience letter and project completion Letter.
- You will continue with the company based on the performance and the requirements. If not then you will get the experience letter and will help you with the placement.
- Emails should be send on company ID's only.
- Leaves: You should inform week before about the leave for a day. For a long leave you should inform us a month before.
- Break: You can have a break of 50 minutes. Manage it on your own.

The period of the internship is 6 months. During this internship you will report directly to Mr. Tausif K.

Welcome to Eclatte IT Solutions!

Best of luck!!!



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Date: 05th January,2016.

Dear Ramiz Shaikh,

We are pleased to offer you an internship position as Trainee Software Engineer in our organization.

Your duties and responsibilities during internship period include:

- As per discussion, you will work under company policy for 6 months. Once you agree you should not resign from the company until 6 months.
- If you resign then you won't be eligible for getting Experience letter and project completion Letter.
- You will continue with the company based on the performance and the requirements. If not then you will get the experience letter and will help you with the placement.
- Emails should be send on company ID's only.
- Leaves: You should inform week before about the leave for a day. For a long leave you should inform us a month before.
- Break: You can have a break of 50 minutes. Manage it on your own.

The period of the internship is 6 months. During this internship you will report directly to Mr. Tausif K.

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Date: 08th January,2016.

Dear Ajay Waghmare,

We are pleased to offer you an internship position as Trainee Software Engineer in our organization.

Your duties and responsibilities during internship period include:

- As per discussion, you will work under company policy for 6 months. Once you agree you should not resign from the company until 6 months.
- If you resign then you won't be eligible for getting Experience letter and project completion Letter.
- You will continue with the company based on the performance and the requirements. If not then you will get the experience letter and will help you with the placement.
- · Emails should be send on company ID's only.
- Leaves: You should inform week before about the leave for a day. For a long leave you should inform us a month before.
- · Break: You can have a break of 50 minutes. Manage it on your own.

The period of the internship is 6 months. During this internship you will report directly to Mr. Tausif K.

Welcome to Eclatte IT Solutions!

Best of luck!!!

Authori Eclatte



ACTIVITY REPORT

(2015 - 2016)

I. Basic Details:

| Name of The Activity: | | | | |
|---|----------------------------|---------------------|--|--|
| Educational Visit to Primary Food Health Laboratory, Pune | | | | |
| Date | Faculty | Department/ | Coordinator Name & Phone | |
| | | Committee | no. | |
| February 12, 2016 | Science | Chemistry | Dr. Mohammed Zamir Ahmed 9028170110 | |
| | | ARTS 9 | | |
| Time | Venue | Activity for class/ | Nature: Academic/co- | |
| | | group& | curricular / extracurricular/ | |
| | | student number | Environmental/ social/ | |
| | | | other | |
| 02.30 pm - 05.00 | P <mark>rimary</mark> Food | TYBSc Students | C | |
| pm | Health Lab, | 09 | 9 | |
| | Pune | | MN | |

II. Brief Information about the Activity (Criterion no - III):

| Topic/ Subject of | Educational Visit to Primary Food Health Laboratory, Pune |
|----------------------|---|
| the activity | |
| Objective for | To have hands on training on instruments and analysis of food samples using |
| conducting | Chromatographic tochniques |
| the activity | chi omatographic techniques. |
| Methodology | Demonstration by expert and discussion on analytical procedures. |
| Outcome | Concepts were developed for the various techniques in analysis. |

III. Proofs attached: letters/ student list of participation/ certificate/ document/photos/ any other

| 1. Notice | 2. Attendance Report | |
|-----------|----------------------|--|
|-----------|----------------------|--|



Anjuman Khairul Islam's POONA COLLEGE OF ARTS, SCIENCE & COMMERCE CAMP, PUNE 411001.





January 13, 2016

The Director Primary Food Health Laboratory, Camp, Pune.

Sir/Madam,

As a part of curriculum laid down by Savitribai Phule Pune University for T.Y.B.Sc. Chemistry students, they have to study various analytical techniques like HPLC, Gas Chromatography & Electrophoresis etc. It will be of great use for our students if you could permit our students to visit your esteemed organization.

l acknowledge your wonderful cooperation with our students in past years and hope for the same in future reflecting the sagacity of your department towards social responsibilities. Date and time can be decided as per your convenience between 27/01/2016 & 02/02/2016. The strength of the class is 20 (Twenty).

Thank you

Sincerely yours.

Dr. M. Rafique Sarkhawas Principal & Head Dept. of Chemistry Poona College, Camp Pune.

Received SPI208 Steve 20/1/2016

(12/2)16

Anjuman Khairul Islam's POONA COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE-1.

Department of Chemistry

(Post-Graduate & Research Center)

Educational Visit to Primary Food Health Laboratory Pune

<u>2015-16</u>

ATTENDANCE REPORT

Class: T. Y. B. Sc. Chemistry

. 2

Date: 12-02-16

Time: 02.30 pm

| Sr. No. | Name of the Student | Signature |
|---------|-------------------------|-----------|
| 1 | Shalkh Rukhsar S. | Rowenikh |
| 2 | Shaikh Juvenya A.W | Estraibl |
| 3 | Rawade Poriyanka Yrwrai | (PA) |
| 4 | Mayo Patel | Maya |
| 5 | Tempeli Akila | Hamber J. |
| 6 | Sayyed Nide Salim | payyed. |
| 7 | Mulla Fairen 7 | (14.12) |
| 8 | Jadhar Balaii | BADHLE. |
| 9 | Mohd. Aatit | - Maly, |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

C Dr. Mohammed Zamir Ahmed (Incharge) 0

The Principal Poona College, Pune

Subject: Permission to conduct S.Y.B.Sc. Educational Tour to Poona Cantonment Water Works on, Wednesday, January 27, 2016.

Respected sir,

This is for your kind information that, the department of chemistry has organized an educational tour to Poona Cantonment Water Works on Wednesday, January 27, 2016 as per the syllabus laid down by the SPPU. The details of the visit are mentioned blow.

| Class | : S.Y.B.Sc. |
|---------------------------|-------------------------------|
| Day & Date of visit | : Wednesday, January 27, 2016 |
| Reporting time | : 08:30 am |
| Reporting location | : Department of Chemistry |
| Arrival | : 11.30 am |
| Teacher In charge | : Prof. Sayed Aziz Mohiuddin |

You are kindly requested to grant us the permission for the same.

Thank you

Sincerely yours,

Prof. Sayed Aziz Mohiuddin

Dept. of Bohange tor Army Permitted Greelog y Stille Le Electro. S Mathemahre 3 Stille " comp. Sei. f " physics.-p. Sop. set.



Anjuman Khairul Islam's POONA COLLEGE OF ARTS, SCIENCE & COMMERCE CAMP, PUNE 411001. Affiliated to Savitribai Phule Pune University : ID No. PU/PN/ASC/023/1970 Tel.: 020 2645 4240,26446319. Fax : 020 2645 3707 www.akipoonacollege.ac.in email : principal@akipoonacollege.ac.in



January 20, 2016

The Director Poona Cantonment Water Works Camp, Pune.

Sir/Madam,

As a part of curriculum laid down by SavitribaiPhule Pune University for S.Y.B.Sc. Chemistry students, they have to visit any institution to study applied sciences. I therefore suggest you to allow us to visit your institution. Date and time can be decided as per your convenience between 27/01/2016 & 02/02/2016. The strength of the class is 65 (Sixty Five).

Thank you

Sincerely yours,

Dr. M. Rafique Sarkhawas Principal & Head Dept. of Chemistry Poona College, Camp Pune.

Visit Dali 27/1/16 cet g. oo an. 615

Anjuman Khairul Islam's POON& COLLEGE OF & COMMERCE, PUNE-1.

Department of Chemistry

(Post-Graduate & Research Center)

Educational Tour to Poona Cantonment Water Works 2015-16

ATTENDANCE REPORT

Class: S. Y. B. Sc. Chemistry

Date: 27-01-16

Time: 09.00 am

| Sr. No. | Name of the student | Şignature |
|---------|------------------------|-------------|
| 1 | Varun . S. Shedre | W2 |
| 2 | Saif Haider | The |
| 3 | Araham Sayned | Aseyyed |
| 4 | Ainuddin m hafizullah | - did |
| 5 | Ruben. V. Manyel | R |
| 6 | Kumphag Dipak V | Dipak |
| 7 | Sharikh TTay | Het. |
| 8 | Manish Singh Bhandari | (may) |
| 9 | Amit Kumar Sah | Amits |
| 10 | Shailen Shahbaz F | Sh 352 |
| 11 | Acrodoshi Antif Rajan | An bet |
| 12 | Shubham Pandey Binod | Shubhus |
| 13 | Shoeb Ahamad | 86026 |
| 14 | Shaikh Arbage Kiyoz | (Jacitch) |
| 15 | Ibrahim Varin Ghaikh. | 5. Moralins |
| 16 | Arah Moshan Tayyab Ali | mortail |
| 17 | Schall Charlebary | Cart- |
| 18 | Magsood Raig | Con |
| 19 | Shoaib. Zaheen | - Strict |
| 20 | HageekJavid J. Shaikh | Heren . |
| 21 | Shaikh Muthtar Ashraf | |
| 22 | Sajjan Sohel Shabbir | lingthe |
| 23 | mup tageem Ahmed | Antel |
| 24 | Shaikh Sajeed Shabbis | Sharpely_ |
| 25 | Phyngmi Shimray (5015) | physin. |
| 26 | Safendra Kumar | 1 Aline |
| 27 | K.M. VAISHAKH | Curallonds |
| 28 | >hqikn Zubqik | Q. |
| 29 | | ~ |
| 30 | | |

Prof. Sayed Aziz Mohluddin (Incharge)

Page 1 of 2



ACTIVITY REPORT

(2015 - 2016)

I. Basic Details:

Name of The Activity: Educational Visit to Vasantdada Sugar Institute (VSI), Manjri, Hadapsar Pune

| | 1 | r | |
|------------------|-------------------------------|---------------------|-------------------------------------|
| Date | Faculty | Department/ | Coordinator Name & Phone |
| | | Committee | no. |
| 29/12/2015 | Science | Zoology | Dr. Mujeeb Shaikh |
| | | | (9890007996) |
| Time | Venue | Activity for class/ | Nature: Academic/co- |
| | OF | group & | curricular / extracurricular/ |
| | | student number | Environmental/ social/ |
| | .G ^v | | other |
| 10:00 am to 4:00 | Vasantdada | S.Y.B.Sc. (Zoology) | co- curricular |
| pm | Sugar Institute | Students | |
| | (<mark>VSI), M</mark> anjri, | 48 | |
| | H <mark>adaps</mark> ar Pune | | |
| | | | |

II. Brief Information about the Activity (Criterion no -

| Topic/ | Educat <mark>ional V</mark> isit to Vasantdada Sugar Institute (VSI), Manjri, Hadapsar Pune |
|----------------------|---|
| Subject of | |
| the activity | |
| Objective for | To experience Vermicomposting Techniques |
| conducting | |
| the activity | |
| Methodology | Live Demonstration |
| | KNOW |
| Outcome | Students learned techniques how to establish vermicomposting unit and how |
| | to maintain earthworms. Besides they also came to know the role of |
| | earthworm in agro-ecosystem and steps and techniques in vermicomposting. |

):

III. Proofs attached: letters/ student list of participation/ certificate/ document/photos/ any other

| 1. Permission letter | 2. Students Attendance | 3. Photos | |
|----------------------|------------------------|-----------|--|
| | | | |

AKI's **POONA COLLEGE** of Arts, Science & Commerce Camp, Pune 411001 (Maharashtra)

<u>Educational Visit to Vasantdada Sugar Institute (VSI), Manjri,</u> <u>Hadapsar Pune</u>

Activity Report

Date: 29/12/2015

Department of Zoology conducted an educational visit to Agricultural Microbiology Section of Vasantdada Sugar Institute (VSI), Manjri, Hadapsar Pune on 29th December 2015 for S.Y.B.Sc. (Zoology) students. Total 48 Students of S.Y.B.Sc (Zoology) accompanied with Dr. Mujeeb Shaikh and Dr. Kalim Shaikh visited to V.S.I. Students visited to microbiology section of V.S.I. The Expert of the institute explained about the life cycle, habit habitat of the earthworms and he showed the vermicomposting unit to rear earthworms Further the expert elaborated the techniques how to establish vermicomposting unit and how to maintain earthworms. Besides these he also told the role of earthworm in agro-ecosystem. Through this visit student came to know the steps and techniques in vermicomposting.



Anjuman Khairul Islams POONA COLLEGE OF ARTS, SCIENCE & COMMERCE

CAMP, PUNE 411001

Affiliated to Savitribai Phule Pune University : ID No. PU/PN/ASC/023/1970 Tel.: 020 2645 4240,26446319. Fax : 020 2645 3707 ww.akipoonacollege.ac.in email : principal@akipoonacollege.ac.in /gmnazeruddin@yahoo.co.in



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Date: 21/12/2015

To The Director V.S.I Maniri Hadapsar, Pune.

Sir,

Our S.Y. B.Sc Zoology students have to visit Vermicultur unit in Institute to study Vermicomposting. The visit is compulsory part of their syllabus. (No. of the students are 60)

Kindly allow us to visit the Institute. We request you to give us suitable date and time as per your convenience.

About 30 students with one staff members will visit the institute on the date allotted as per your permission.

Thanking you,

Department of Zoology

Yours Faithfully

Dr. Rafique Sarkhawas Soona Colles Principalence &

Visite is sanctioned on dated findi 123/12/13 Sr. Technical ADST. Mob - 9404307156

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AKI's POONA COLLEGE OF ARTS, SCIENCE & COMMERCE, CAMP, PUNE – 1

DEPARTMENT OF ZOOLOGY

Educational Visit To V. S. I. Manjri, Hadapsar, Pune Date: 29/12/2015

| SR. NO. | ROLL NO. | NAME OF STUDENTS | SIGN |
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| 16. | 5181 | Khan Anam Fatima Skakil | Ahany |
| 17. | 5180 | Khan Saniya Javed | General. |
| 18. | 5182 | Khan Shabista Yunus | Shabuta |
| 19. | 5192 | Khan Afifa Ferrez | Aféro |
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ACTIVITY REPORT

(2015 - 2016)

I. Basic Details:

Name of The Activity: Educational Visit to Central Bee Research and Training Institute (CBRTI), Shivajinagar, Pune

| Date | Faculty | Department/ | Coordinator Name & Phone |
|------------|----------------------|---------------------|-------------------------------|
| | 5 | Committee | no. |
| 30/12/2015 | Science | Zoology | Dr. Mujeeb Shaikh |
| | | | (9890007996) |
| Time | Venue | Activity for class/ | Nature: Academic/co- |
| | | group & | curricular / extracurricular/ |
| | OF | student number | Environmental/ social/ |
| | | .EN | other |
| 10:00 am - | Central Bee | Students of SYBSc | co- curricular |
| 5:00pm | Research and | (Zoology) | CO CO |
| | Training | 46 | |
| | Institute | | |
| | (CBRTI), | | |
| | Shiva jinagar | | |

II. Brief Information about the Activity (Criterion no -

| Topic/ | Educational Visit to Central Bee Research and Training Institute (CBRTI), |
|----------------------|---|
| Subject of | Shivajinagar, Pune |
| the activity | |
| Objective for | To experience Beekeeping Techniques |
| conducting | |
| the activity | |
| Methodology | Live Demonstration |
| | LEDGE IS POWE |
| Outcome | Students understand the handling of the live bee in bee boxes, equipment to |
| | process the honey and bee wax, economic importance of beekeeping and how |
| | one can start beekeeping as business |

):

III. Proofs attached: letters/ student list of participation/ certificate/ document/photos/ any other

| 1. Permission Letter | 2. Students Attendance | 3. Photos |
|----------------------|------------------------|-----------|
| 4. | 5. | 6. |

AKI's **POONA COLLEGE** of Arts, Science & Commerce Camp, Pune 411001 (Maharashtra)

Educational Visit to Central Bee Research and Training Institute (CBRTI), Shivajinagar, Pune

Activity Report

Date: 30/12/2015

Department of Zoology conducted an educational visit to Central Bee Research and Training Institute (CBRTI), Shivajinagar, Pune on 30th December 2015 for S.Y.B.Sc. (Zoology) students). Total 46 Students of S.Y.B.Sc (Zoology) accompanied with Dr. Mujeeb Shaikh and Dr. Kalim Shaikh visited to CBRTI. At the CBRTI the trainer of the Institute, Mr. Pokle demonstrated the equipment beekeeping and he also explained the techniques to handle the live bee in bee boxes. Further Mr. Pokle showed the equipment to process the honey and bee wax. Students also experience more about beekeeping by seeing some video in theatre inside CBRTI. Mr. Pokle told about the economic importance of beekeeping and how one can start beekeeping as business, He also told about the assistance that is being provided by CBRTI to start beekeeping at your own. Hence, through this visit students experience the beekeeping practices other that syllabus.





Alexand Krama same 15 FON & COLLEGE OF ARTS, SCIENCE & COMMERCE

CAMP PUNE 411001

Affiliated to Savitribal Phule Pune University : ID No PU/PN/ASC/023/1970 Tel.: 020 2645 4240,26446319 Fax 020 2645 3707 www.akipoonacottege.ac.in_email:principat@akipoonacottege.ac.in/gmnazeruddin@yahoo.co.in

Date: 21/12/2015

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To The Director Apiculature Institute, Shivaji Nagar, Pune - 5

Sir.

Our S.Y. B.Sc Zoology students have to visit Apiculature Institute to study Artificial Bee Reeping. The visit is compulsory part of their syllabus. (No. of the students are 60)

Kindly allow us to visit the Institute. We request you to give us suitable date and time as per your convenience.

About 30 students with one staff members will visit the institute on the date allotted as per your permission.

Thanking you,

Head

Department of Zoology

312 A 30/12/15 Detail 30/12/15

Central Bee Research KHADI & VILLAGE INDUCTIVIES COMMISSION Instituto

1153, Ganeshkhind Road, Fune 411016.

Yours Faithfully

Dr. Rafique Sarkhawas Principal

Deputer Musich Kle

POONA COLLEGE OF ARTS, SCIENCE & COMMERCE, CAMP, PUNE - 1

Department of Zoology

Educational Visit To Central Bee Research & Training Institute (CBRTI) Shivajinagar, Pune

Date: 30/12/2015

| SR. NO. | ROLL NO. | NAME OF STUDENTS | SIGN |
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M.C.E. Society's ABEDA INAMDAR SENIOR COLLEGE

of Arts, Science & Commerce, Pune

Affiliated to Savitribai Phule Pune University (Accred

(Accredated with 'A' grade by NAAC) P. A. Inamdar

Dr. E. M. Khan (M.Sc.,M.Phil., Ph.D.) Principal

Ref. AISC /

President, M.C.E. Society

Date : 01 01 2016

A

To,

Mr. Imran Qureshi

Assistant Professor

A.K.i'S Poona College of arts, science and Commerce

Pune.

Subject: Invitation letter for conducting visiting lectures in M.C.A. (Science) and M.C.A. (Commerce)

Respected Sir,

We kindly invite you for conducting visiting lectures for "Theoretical computer science" and numerical on "distributed systems" of M.C.A (Science) and M.C.A. (commerce) in our reputed concern.

Request you to give your confirmation at the earliest.

Thanking you.



Yours Sincerely, Dr Dept. of Cor Abeda Krantidar Si Vris, Sci & Comm. Cano, Pune

2390-B, K .B. Hidayatullah Road, Azam Campus, Camp, Pune - 411 001 E-mail : info@abedainamdarcollege.org/aiscg@vsnl.net.in

Tel : 020-26446970, (R) 26448629, Fax : 26457577 website : http://www.abedainamdarcollege.org.in



ABEDA INAMDAR SENIOR COLLEGE of Arts, Science & Commerce, Pune

Affiliated to Savitribai Phule Pune University (/

(Accredated with 'A' grade by NAAC) P. A. Inamdar

Dr. E. M. Khan (M.Sc.,M.Phil., Ph.D.) Principal

M.C.E. Society's

Ref. AISC /

Date : 15 01 2016

To whomsoever it may concern

This is to certify that Mr. Imran Qureshi working as an Assistant Professor in A.K.I's Poona college of Arts, science and commerce has successfully conducted visiting lectures for **"Theoretical computer science"** and numerical on **"distributed systems"** of M.C.A (Science) and M.C.A. (Commerce) in our reputed concern.

Thanking you.



Yours Sincerely, r. E.M.Khan CHARIO ept. of C(Rrincipal) pleases Abeda tratidar Sr. College of Sci & Colum, Camp, Prine



M.C.E. Society's **ABEDA INAMDAR SENIOR COLLEGE** of Arts, Science & Commerce, Pune

Affiliated to Savitribai Phule Pune University

(Accredated with 'A' grade by NAAC)

Dr. E. M. Khan (M.Sc., M.Phil., Ph.D.) Principal

Ref. AISC /

Date : 20/08/2016

President, M.C.E. Society

P. A. Inamdar

To, Imran Qureshi, Poona College, Camp, Pune.

Subject:- Invitatión for guest lecturer

Respected Sir,

We are pleased to invite you to the Seminar of Operating System for S.Y.B.C.A students scheduled on 27th August 2016 in our college. The seminar will be held at PV-11 in order to inform you for the same.

Your expertise and experience in this field of work will be an additional advantage to our students.

We look forward to a positive response.

Thanking You.

in a



Your's faithfully, Mr.Salahuddin Sajjan Co-ordinator BCA AVCA CoArdinator) Abeda manidar Sr. Collaga of Ans, Sci & Comm. Camp, Purie-1



Ref. AISC / BCA / 2018 / 01

Date: 07 Sept 2018

To, <u>Imran Qureshi</u> of Computer

Respected Sir/Madam,

We are thankful to you for accepting our invitation and gracing the occasion with your presence in the event <u>Seminar on Operating</u> dated on <u>08 Sept 2018</u> organized by Department of Computer Application.

Hoping to receive similar kind of cooperation in future too.

Thanking you,

Yours Sincerely,

Mr. Salauddin Sajjan

(Head of Dept B.C.A) MEAO Dept. of Computer Application Abeda Inamdar Sr. College of Abeda Inamdar Sr. College of Control & Comm. Camp. Pune-



2390-B, K .B. Hidayatullah Road, Azam Campus, Camp, Pune - 411 001 E-mail : prin-aisc@azamcampus.org Tel : 020-26446970, (R) 29700235, Fax : 26457577 website : http://www.abedainamdarcollege.org.in Bansilal Ramnath Agarwal Charitable Trust's

VISHWAKARMA COLLEGE OF ARTS, COMMERCE & SCIENCE

(Affiliated to University of Pune & Recognized by Government of Maharashtra)

IDNo:- PU/PN/ACS/275/2007

VCACS

College Code :- 824

Date- 15/12/2018

Invitation Letter

To,

Mr. Imran Qureshi Poona College of ACS,Pune Pune ,Maharashtra.

Respected Sir

It gives me immense pleasure to inform you that Department of Science, Vishwakarma College of Arts, Commerce and Science, Kondhwa Campus, Pune organizing a Two-days National Workshop, which is sponsored by Savitribai Phule University of Pune on

20th & 21st December 2018 entitled,

"National Workshop on Hands on Machine Learning and IoT"

I take pride to invite you as a "<u>Kev note Speaker</u>" on the Topic Machine Learning – Python Programming on Friday, 21^{*} December 2018 at 10:30 a.m.



Fr.Arun R. Patil (PRINCIPAL)

Sr. No. 3/6, Laxminagar, Kondhwa (Bk), Pune- 411 048.

Ph.: +91 020 - 60204040 / 32335778 Fax:- +91 020 - 26932700 / E-mail :- principal@vcacs.ac.in Website :- www.vcacs.ac.in

Bansilal Ramnath Agarwal Charitable Trust's

VISHWAKARMA COLLEGE OF ARTS, COMMERCE & SCIENCE

(Affiliated to University of Pune & Recognized by Government of Maharashtra)

IDNo:- PU/PN/ACS/275/2007

College Code :- 824

Date:19/10/2019

Το,

VCACS

Mr. Imran Qureshi

Poona College of ACS, Pune

Pune.

Sub: Invitation for Guest Lecture on Hands on Database Technology and Neo4J for M. Sc students.

Respected Sir,

It is regarding with mention subject that we would like to invite you to deliver a lecture on **Hands on Database technology and Neo4J** to our M. Sc students to increase their knowledge. We, therefore request you to kindly share your knowledge and experience with our students.

Venue: BRACT's

Vishwakrama College of Arts, Commerce and Science, Pune

Date: 05/10/2019 and 22/10/2019

Time: 2.00 p.m. to 4.00 p.m.

Hope you would accept the invitation and give confirmation of the same. Thanking you in anticipation.

(Dr.A.R. Patil)

Sr. No. 3/6, Laxminagar, Kondhwa (Bk), Pune- 411 048.