



Office of Alumni Affairs & International Relations(OAA&IR)
Indian Institute of Technology
Kharagpur – 721 302

REF: 2131/2024/OIR

Dated: 22.01.2024
15.01.2024

To:
The Head of the Department
Metallurgical and Materials Engineering
IIT Kharagpur
721302.

Subject: Submission of Application of Mr. Bifa Shimelis Haile
Program Applied: Short term visit _for Internship.
Tentative Intended duration of stay: Feb, 2024 – Aug, 2024.

Dear Prof. Shiv Brat Singh,
Greetings from the Office of Alumni Affairs & International Relations (OAA&IR)!

We are pleased to forward an application for a short term visit of Mr. Bifa Shimelis Haile – Master in Science from Hawassa University, Ethiopia. Mr. Haile is interested in conducting his internship at the department of Metallurgical and Materials Engineering. As per the student application form (enclosed no. Flag-b) it is understood that the funding to this short term visit will be supported by Prof. Chandra Sekhar Tiwary, MME from his project fund.

All supporting documents of the application are attached. The Departmental Recommendation Form (DRF) [enclosed no. Flag-a] for the foreign applicant is also enclosed.

You are requested to kindly:

- Review and evaluate the application form and mark accordingly in the attached DRF.
- Approve the Faculty mentor (identified as Prof. Chandra Sekhar Tiwary).
- Provide your additional comments (if any).
- 'Sign' with date; put your name seal in the space provided.

You are requested to return this filled and signed application form to OIR for our further processing. You may contact our Office (Extn: 81077/81064) or email at ir-office@adm.iitkgp.ac.in in case of any issues or further query regarding this application form.

We additionally request you to process the application at your end at the earliest convenience so that the student may apply for their visa following the completion of standard procedure at the OIR.

Thank you.

Sincerely,

Associate Dean AA&IR

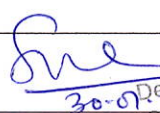
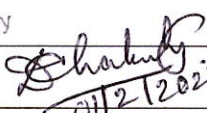

सह-संकायप्यक्ष, पूर्वछात्र मामले एवं अंतर्राष्ट्रीय संबंध
Associate Dean, Alumni Affairs and International Relations
भारतीय प्रौद्योगिकी संस्थान खड़गपुर
Indian Institute of Technology Kharagpur

- Encl: (a) Dept. Recommendation Form (DRF) for Short Term visit to be completed by the Department.
(b) Application form along with the supporting documents.
(c) Copy of email correspondence.



Office of International Relations
Indian Institute of Technology
Kharagpur-721302

Recommendation Form for short-term visit to IIT Kharagpur by foreign applicants for coursework or research not leading to a degree

Applicant details (to be filled in by OIR)			
Name :	Mr. BIFA SHIMELIS HAILE		
Citizenship:	ETHIOPIA	Date of birth:	25-08-1994
Home Institute :	HAWASSA UNIVERSITY, ETHIOPIA		
Program enrolled in :	MSc.		
Details of application at IIT Kharagpur (to be filled in by OIR)			
Department/School/Centre:	MME		
Intended courses/research to be undertaken at IITKGP:	HYDROGEN EVOLUTION REACTIONS & Oxygen Evolution Reactions		
Intended start date/month at IITKGP :	FEB, 2024	Intended end date/month at IITKGP :	AUGUST, 2024
Source of funding:	Self / Scholarship	PROJECT FUND OF PROF. C.S. TIWARY, Details: MME	
Recommendation (to be filled in by D/C/S)			
Evaluation of applicant's academic credentials	Completed on:	Marks Awarded:	
	23 / 01 / 2024	80 / 100	
Personal interview conducted (Skype/In person)	Conducted on:	Marks Awarded:	
	23 / 01 / 2024	90 / 100	
Assigned Mentor's Name (if recommended):	Prof. Chandra Sekhar Tiwary		
Comments/Remarks/Pre-requisites (if any):			
Signature of Head with seal and date:	 Head Department of Metallurgical and Materials Engineering Indian Institute of Technology Kharagpur-721302, India		
Forwarded by Associate Dean AA & IR:	 01/2/2024		
Comments by Dy. Reg Academics/ Joint Reg Academics	N.A		
Approval by the Academic Dean (Dean FoEA/FoS/BTBS)			
Comments by the Academic Dean	APPROVED WITH FUNDING FROM PI'S PROJECT		
Signature of the Academic Dean with seal and date	 08/2/2024		

Please note: Kindly return this signed form to OIR for further processing. If recommended, GoI rules will be followed for issuing visa invitation letter to applicant.

संकायाध्यक्ष, अभि. एवं वास्तुकला आचार्यसंकुल
भारतीय प्रौद्योगिकी संस्थान खड़गपुर
Dean, Faculty of Engg. & Architecture
Indian Institute of Technology Kharagpur

Form updated: May 2023

**Short-term visit to Indian Institute of Technology Kharagpur for
Coursework or Research not leading to a Degree**

APPLICATION FORM

Instructions for filling this form:

- ✓ Please treat all fields as mandatory. Incomplete application will not be considered. In case any field is not applicable then please put 'NA'. It should take nearly about 45mins to complete the application.
- ✓ Please provide your personal details as per your passport.
- ✓ Please attach scan copies of your passport, current official transcripts, past educational degrees. Please note that your application will be processed only after we receive these scanned copies.
- ✓ After your application is approved you will be asked to complete your online application with further details.

DEADLINES FOR APPLICATION:

Applications	Coursework not leading to a degree		Research / Internship not leading to a degree
	Targeted enrolment in Autumn Semester (July admission)	Targeted enrolment in Spring Semester (January admission)	
Early decision applications	February 28 th	August 15 th	No deadline (rolling admission)
Late decision applications	May 15 th	September 30 th	

PERSONAL DETAILS:

Please provide your name, date of birth and gender as per your travel documents to be attached herewith.

Name as in Passport	BIFA SHIMELIS HAILE
Date of Birth	25 AUG 94
Place of Birth	GIMBICHU
Gender	MALE
Nationality	ETHIOPIAN
Main Language/s spoken at home	AFAN OROMO
Other Languages Known	AMHARIC

Disability details:

Please indicate any disabilities you may have even if you do not require assistance. Further information about available support can be provided on request. Do you have a disability, impairment or long term medical condition?

NORMAL

Have you contacted any Faculty member or any office of the Institute about your present intended visit to IITKGP?(Tick your answer)

YES



NO



If 'Yes' please provide the following details:

Name of the Faculty/ Person Contacted	Name of the respective Department/School/Center/Lab/Office of Int.Relations where contacted	Details of Communications (You may provide email references, if any)
Prof. Chandra Sekhar Tiwary	Metallurgical and Materials Engineering	Chandra.tiwary@metal.iitkgp.ac.in

Intended courses /areas of Research in IITKGP during this stay:

Area of Research : Hydrogen evolution reactions and Oxygen evolution reactions

Intended duration of stay at IITKGP:

FROM: (MM/YY)... FEBRUARY / 2024

TO : (MM/YY)... AUGUST / 2024

Have you received/ will you apply for any scholarship award for visiting IIT Kharagpur?(Tick your answer)

☐ YES

☒ NO

If 'YES' Please specify:

If 'YES' is this an IITKGP scholarship? Please give details.

If you do not have a scholarship or if the scholarship is partial, do you have any other funding source?(Tick your answer)

☒ YES

☐ NO

If 'YES' Please specify:

According to our conversations, Prof. Chandra Sekhar Tiwary would want to pay for my accommodations and living expenses while am hosted by him (NOTE: Eligibility and admission will be decided independent of financial status.) for 6 months.

ACADEMIC QUALIFICATIONS/ EDUCATIONAL DETAILS: (Latest on top including the ongoing programme)

SL NO	NAME OF THE DEGREE/ EXAM	UNIVERSITY/BOARD/COUNCIL	YEAR OF COMPLETION/EXPECTED	GPA (or EQUIVALENT)	MAXIMUM GPA SCALE (or EQUIVALENT)	MAJOR/ SPECIALISATION/ SUBJECTS	TRANSCRIPTS/ GRADE CARD
1.	Master of Science	Hawassa University	2018	3.73	4	Material Science	Attach
2.	Bachelor of Science	Ambo University	2016	3.89	4	Physics	Attach
3.							Attach
4.							Attach
5.							Attach

PUBLICATIONS/RESEARCH PAPERS/BOOKS: (You may add more rows if required)

SL NO	TITLE OF PAPER/BOOK	PUBLICATION TYPE	PUBLICATION YEAR	ADD/REMOVE
1	Preparation of hydrated lime quality for water treatment	Research journal	2021	
2	Factor that influence academic performance of female student	Research journal	2022	

WORK EXPERIENCE DETAILS: (You may add more rows if required)

SL NO	Company Name	Nature of Job	From	To	Supporting Docs
1.	Kebri Dega University	Lecturer	July 8, 2018	July 7, 2022	Attach
2.					Attach
3.					Attach



Mootummaa Naannoo Oromiyaatti
Biirroo Barnootaa
Regional State of Oromia
Education Bureau



WARAQAA RAGAA QORUMSA NAANNOO KUTAA 8 FFAA

Maqaa BILFAA SHIMALLIS

HAYILEE

Umrii 16 Saala dh

Lakk. Galmee. 158174

Bara 2001

Maqaa Mana Barnootaa Coffee Sadi. Haa

Godina/Bul. Maga. sk/Bahaa

Qabxii Giddu Galeessaa 64.23

Parsantaayilii 85.51 argatee/ttee gara kutaa

gfaattii

Maqaa fi Mallattoo Raawwataa Hojii Madaallii fi Kenna

Ragaa Barnootaa

GRADE 8 REGIONAL EXAMINATION CERTIFICATE

Name _____

Age _____ Sex _____

Reg. No. _____

Year _____

School Name _____

Zonal/Town Adm. Edu. Office _____

Scored 64.23 Average and 85.51%

ile and _____ to grade 9

Zonal/Town Assessment Performer's Name and signature

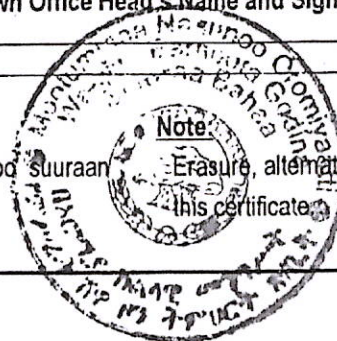
Girmaa Dhaabaa Ayyaane
70% AN A.P.
Ekspanii Qorumsaa
12.15 haa hooiroo

Maqaa fi Mallattoo Hooganaa Waajjirichaa
(Zonal/town Office Head's Name and Signature)

Takkaalliny Dandanaa Dharraa
70% AN A.P.
Ekspanii Qorumsaa
12.15 haa hooiroo

Hubachiisa:

Waraqaan ragaa kun yoo haqame akkasumas yoo suuraan
Irraa ka'e faayidaa hin qabu.



Note

Erasure, alterations or absence of the photograph in validates
this certificate

CHEFE DONSA SECONDARY SCHOOL

MANA BARUMSAA CAFFEE DONSAA SAD.2^{FFAA}

School Leaving and grade transcript form

Tel. 0224510040 p.o.box 05



Name BEFA SELIMALES HAYLE Age 18 Sex M

Date of Admission 11-1-2002 date of leaving 6-10-2003 File No. 258

Year Semester subject	Grade 9 J year 2002			Grade 10 E Year 2003		
	I.	II.	AV.	I.	II.	AV.
Afan Oromo	71	78	74.5	94	91	92.5
Amharic	74	79	76.5	75	68	71.5
English	83	88	85.5	90	75	82.5
Mathematics	49.5	71	60.25	77	80	78.5
Physics	79	69	74	85	71	78
Chemistry	77.5	71	74.25	82	73	77.5
Biology	82	84	83	89	78	83.5
Geography	73	86	79.5	86	82	84
History	60.5	82	71.25	71	65	68
Civic and ethical Education	80	82	81	81	75	78
Information Technology (IT)						
H.P. Education	74	85	79.5	74	87	80.5
Total	803.5	875	839.25	904	845	874.5
Average	73.05	79.55	76.3	82.18	76.81	79.5
Rank	3	2	2	4	2	2
No. of Students				52	48	48
conduct	A	A		A	A	

N.B Any alternative or erasing in this transcript invalidates the Document forth with.

Present Grade 10 (TEAD) promoted to _____ Detained in Grade _____

Completed Grade 10

Remarks if any _____

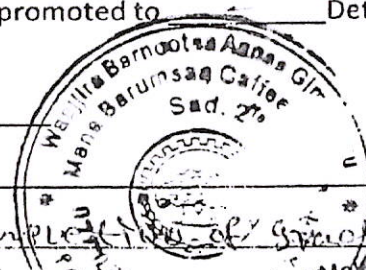
Reasons of with drawl _____

Record officer's Name _____

Signature _____

Date _____

Record Officer _____



Signature _____

Date _____



Biüroo Barnoota Oromiyaatti mana Barnoota Sagantaa
Qophaa'inaa Bishooftuu

በኢትዮጵያ ትምህርት ቤት የቢሽዮፍት ከፍተኛ
ትምህርት መስፍን ት/ቤት

Oromiya Education Bureau Bishoftu Higher Education
Preparator School

☎ 0114-33 44 35 Fax 0114 37 15 05 ☒ 35

Bishoftu Ethiopia

STUDENT'S TRANSCRIPT



Name BIFA SHIMELIS HAILE Age 20 Sex M

Date of entrance 2004 Date of Leaving 2005

Grade left PH Stream Science

Promoted to grade Detained in Grade

Year	E. C.			E. C.			2004 E. C.			2005 E. C.		
Grade	9 (Nine)			10 (Ten)			11 (Eleven)			12 (Twelve)		
Semester	I	II	AV	I	II	AV	I	II	AV	I	II	AV
A. Oromo							74	79	77	82	87	65
Amharic												
English							60	70	65	70	68	69
Maths							70	58	64	73	68	71
Physics							62	70	65	64	41	53
Chemistry							63	87	75	66	86	76
Biology							78	75	77	76	85	81
Geography												
History												
Information Tech.							73	73	73	85	70	78
General Business												
Tech. Drawing							77	79	78	82	77	80
Civic Education							81	82	82	79	80	80
Economics												
H. Ph. Education							53	70	62	80	91	86
Conduct												
Average							69.3	74.3	71.8	75.7	75.3	75.9
Rank							21	19	21	22	21	18
No of Students in Class							80	80	80	70	70	70

Remarks

Record Officer [Signature] School Seal

Date 15/11/2005

Director [Signature] Bekele Hurrise

Daankiteera

Note:-Any alteration, deletion or absence of the School Seal on this transcript will make it invalid
Principal



808011



1638663583



THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
MINISTRY OF EDUCATION
NATIONAL EDUCATIONAL ASSESSMENT AND EXAMINATIONS
AGENCY (NEAEA)

The Ethiopian University Entrance Examination Certificate

This is to certify that BIFA SHIMELIS HAILE

has taken 7 (SEVEN) subject(s) in the 2013(2005 E.C.)

Examination session and has earned the following score(s) in 7 (SEVEN) subject(s)

English	44
Maths (Natural)	55
Aptitude	53
Physics	58
Chemistry	43
Biology	62
Civics	61

TOTAL 376

Araya G Egziabher Mehari
DIRECTOR GENERAL



Zerhun Duressa
DEPUTY DIRECTOR GENERAL

JULY 2013(HAMLE 2005 E.C.)

This certificate is invalid unless
it bears the NEAEA seal on the
Photograph of the candidate.
B.S.S.P.E

N^o 930448



AMBO UNIVERSITY OFFICE OF THE REGISTRAR

P.O.Box - 240 Tel:+251-112-362215 Fax:+251-112-365639



Certificate of Graduation

አማራጭ ሁለት

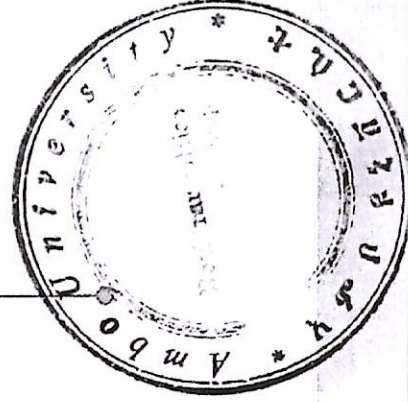
በፋ ሽምጭስ ሐይሌ በፈዛክስ የትምህርት መስክ ሰኔ 23 ቀን 2008 ዓ.ም. በደረሰ ባችለር ዲግሪ በፈዛክስ በመመረቃቸው ይህ የምስክር ወረቀት ተሠጥቷቸዋል። ወጣታቸውም በአጠቃላይ 3.89 መሆኑን እየገለጸገ፣ዋናው ዲግሪና ትራንስክሪፕት በወጪ መጋራት ወል መሠረት ግዴታቸውን ሰጠው የሚሰጥባቸው ይሆናል።

ከሰላምታ ጋር

To Whom It May Concern

This certificate is issued to **Bifa Shipelis Hailu** upon graduation in the field of Physics on June 30, 2016 G.C. and obtained Bachelor of Science Degree in Physics. He has scored an overall CGPA of 3.89. The original Diploma and Transcript will be issued upon the discharge of cost sharing duty.

Sincerely



Registrar

Solomon Masho Aiorinsa (PhD)

Registrar

July 04, 2016 G.C.

Date Issued

Preparation of hydrated lime quality for water treatment: to reduce silica concentration from hydrated lime up to standard specification

Bifa Shimelis^a, Abel Saka^b, Leta Tesfaye Jule^{b,c}, Bulcha Bekele^b, Mesfin Redi^d, Nagaprasad. N^e, E.S. Esakkiraj^f, B. Stalin^g, Krishnaraj Ramaswamy^{c,f,*}

^aPhysics Department, College of Natural and Computational Science, Kebri Dehar University, Ethiopia, email: bifashime@gmail.com (B. Shimelis)

^bPhysics Department, College of Natural and Computational Science, Dambi Dollo University, Ethiopia, emails: latiyejesus@gmail.com (A. Saka), laterajule@gmail.com (L. Tesfaye Jule), Bulchabekele1@gmail.com (B. Bekele)

^cCentre for Excellence-Indigenous Knowledge, Innovative Technology Transfer and Entrepreneurship, Dambi Dollo University, Ethiopia, emails: r.kraj009@gmail.com (K. Ramaswamy), laterajule@gmail.com (L. Tesfaye Jule)

^dChemistry Department, College Natural and Computational Science, Addis Ababa University, Ethiopia, email: mesfinredi@gmail.com (M. Redi)

^eDepartment of Mechanical Engineering, ULTRA College of Engineering and Technology, Madurai – 625 104, Tamil Nadu, India, email: nagaprasad.au@gmail.com (Nagaprasad. N)

^fMechanical Engineering Department, College of Engineering Science, Dambi Dollo University, Ethiopia, emails: r.kraj009@gmail.com (K. Ramaswamy), skyrider_raj@yahoo.in (E.S. Esakkiraj)

^gDepartment of Mechanical Engineering, Anna University, Regional Campus Madurai, Madurai – 625 019, Tamil Nadu, India, email: stalin1312@gmail.com (B. Stalin)

Received 28 June 2021; Accepted 18 December 2021

ABSTRACT

This research paper examines the effort of preparation of hydrated lime for water treatment matching the required quality. In order to avoid scale formation, hydrated lime quality needs the removal of silica from the lime water. Laboratory tests were conducted on lime samples and then checked for conformity with the AAWSA and AWWA standards. In this research, lime water was prepared from a 1.49% silica concentration of limestone, so much preferable. One of the most practical strategies for reducing silica content in hydrated lime was ion exchange. 2 M NaOH and 0.1 M HCl were dosed in limewater with different dosing amounts. The optical absorption value of silica in final solutions of limewater was recorded by UV-Visible spectrophotometer, and the results found 0.042, 0.132, 0.121, 0.05, 0.688 and 0.21. All these absorbance values are equivalents to less than 0.5% silica concentration lime water, which is adequate for water treatment, hence matching the standards. Among dosages amounts, the optimum dose of sodium hydroxide was 10 mL of 2 M NaOH.

Keywords: Hydrated lime; Silica; Silica reduction; Ion exchange; Scaling

* Corresponding author.

Presented at the Virtual International Conference on New Strategies in Water Treatment and Desalination (WTD-2021), 21–23 March 2021, by SRM Institute of Science and Technology, Kattankulathur, India

1944-3994/1944-3986 © 2022 Desalination Publications. All rights reserved.

The following basic apparatus and instruments are used for the determination of silica in hydrated lime for water treatment. Muffle furnace, beakers, Whatman filter paper, platinum dishes, conical flask, bottle, Buret Clamp, pipettes, and UV spectrophotometer. The chemical reagents used in this analysis were sodium hydroxide NaOH, hydrochloric acid for the treatment of hydrated lime.

2.2. Lime analysis by titration method

The purity of both quicklime and hydrated lime can be determined using a titration technique for the detection of calcium oxide content [17]. 1.5 g of calcined lime was pulverized by mortar and pestle. Then it dissolved in 200 mL of distilled water. It was swirled up to all samples dissolved. This was filtered by the Whatman filter. Now, the filtered sample was treated with 2 M NaOH and 0.1 M HCl.

2.3. Batch method

For batch method, the prepared limewater was mixed with 2 M NaOH and 0.1 M HCl for 24 h. In order to discover the best dosage that lower silica concentration in lime water, 10 mL of limewater combined with the varied volume of sodium hydroxide and maintained fixed volume of hydrochloric acid. Similarly, maintain a constant volume of sodium hydroxide and change the volume of hydrochloric acid. The final solution was tested for silica concentration using a UV spectrophotometer at the completion of each created mixture.

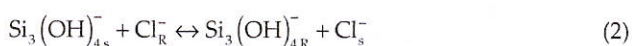
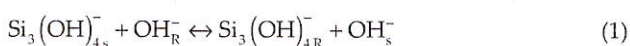
3. Result and discussions

3.1. Lime analysis results of titration

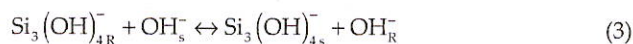
The purity of the lime can be determined by the calcium oxide concentration. The calcium oxide percentage of Type I quicklime should be at least 90%, according to SABS 459-1955, whereas the calcium oxide content of Grade I hydrated lime should be at least 68%, according to the same standard [18]. As described in Table 1, lime prepared after calcined yellowish white color limestone from Mugher cement factory source results 70% of CaO, which meets the standard specification of AAWSA standard specification that of hydrated lime for water treatment effectively.

3.1.1. Ion exchange mechanism

Since silica in lime water exists after the hydrolyzed solid, silica is found as monosilicic form. Silica removal is a sort of ion exchange that is often achieved with strong base resin of the hydroxide kind. Due to the fact that silica is a weak acid, the exchange reaction for silica removal is shown below (Nguyen et al. [15]). From Eq. (2), mono silicic acid is reactive as follows:



Anion-exchange resins are frequently regenerated with caustic soda, NaOH, according to the reaction:



The ion exchanger (resin) is denoted by the subscript "R" whereas the mobile phase (solution) is denoted by the subscript "S". The percentages in the resin and the solution are represented in m mol/g of resin and mmol/mL of solution, respectively.

3.2. Performance of ion exchanger on silica reduction from hydrated lime

Batch tests have been conducted to investigate the effect of strong base ion exchange in the silica concentration in hydrated lime. Ion exchange with a strong foundation its interchange of anionic and cationic species is facilitated by the resin in the solution [17]. Therefore, the performance of the Strong base anion exchange on reduction of silica was studied for varied volume sodium hydroxide solution as well as kept constant volume sodium hydroxide solution with a varied volume of hydrochloric acid solution to determine the optimum dosing. The optical absorption value of silica in the final solution of prepared hydrated lime was recorded by a single-cell holder UV-Visible spectrophotometer within the wavelength at 815 nm with room temperature using the Molydosilicate method. The concentrations of silica in the hydrated lime prepared sample were calculated from absorption data by using the Lambert-Beer equation, Eq. (12).

The relationship can be expressed as $A = \epsilon l C$ where A is absorbance, ϵ is the molar extinction coefficient (which depends on the nature of the chemical and the wavelength of the light used), l is the length of the path light must travel in the solution in centimetres, and C is the concentration of a given solution.

$$A = \epsilon l C \quad (4)$$

$$C = \frac{A}{\epsilon l} \quad (5)$$

where C is the concentration (mol/L), A is absorbance value, l is the path length of cuvette which is 1 cm and ϵ , is molar absorptivity of silica at 815 nm, it is $46,201 \text{ mol}^{-1} \text{ L cm}^{-1}$. The concentration of silica unit obtained in mol/L was converted to percent (%) by using Eq. (6):

$$C(\%) = \frac{(C(\text{mol/L})) (60 \text{ g/mol}) \times 1,000}{10,000} \quad (6)$$

Table 2 determines optimum dosing sodium hydroxide and hydrochloric acid at different volumes into lime water. These optimums were expected based on silica concentration found in lime water of AAWSA and AWWA standards for water treatment. Caustic soda (100 mg/L) reduces silica than 18 mg/L [18]. As shown in Table 2,

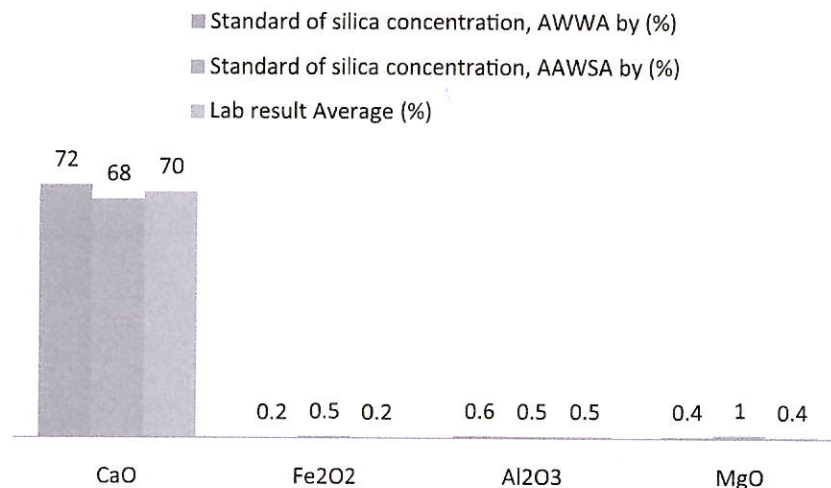


Fig. 1. Hydrated lime laboratory analysis results comparative to standards.

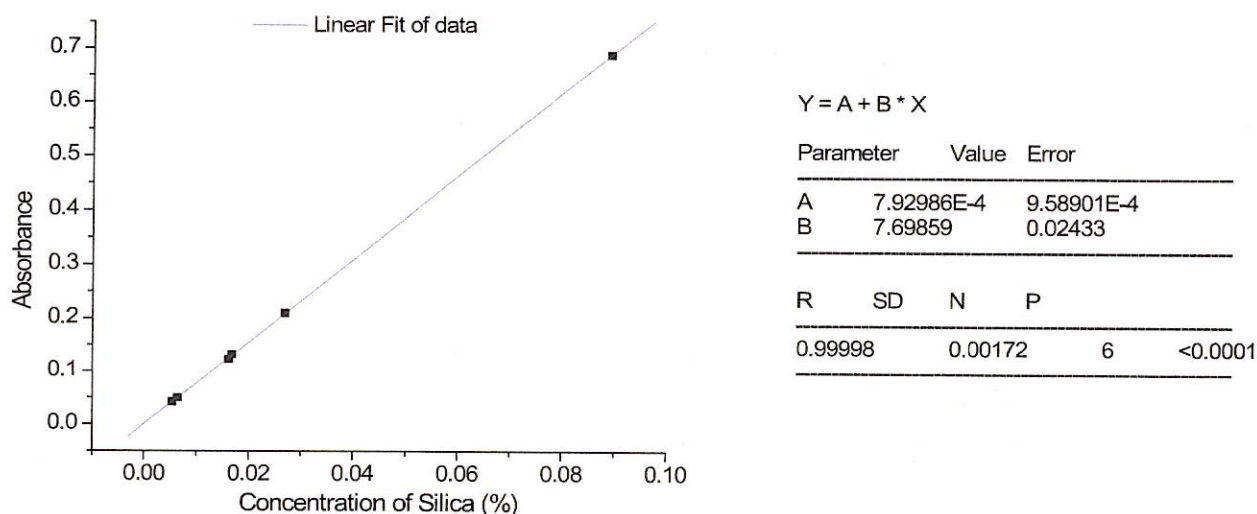


Fig. 2. Experimental data fitted for different dosages of ion-exchange into hydrated lime.

become \$230. Similarly, in 2021 unit price becomes \$264.5. FOB cost of price (USD) = Unit price × total weight (ton).

Fig. 3 reveals the trend that as long as time (y) increases, the total cost was also directly increased because the unit price cost was incremented by 15% per year. In addition to this, as Table 3 shows, there was a cost for transportation for importing hydrated lime so much expensive than a local product of hydrated lime. From these data, it is possible to decide or estimate the cost for importing hydrated lime after the coming five years will be required a very large dollar to import rather than the quality problem of locally manufactured products [19]. Therefore producing hydrated lime in Ethiopia widely is very crucial for saving high currency.

Lime is also used in large numbers in water treatment, and the need for lime for road construction is expected to rise. Domestic production of lime is currently insufficient to meet demand (maximum 4,500 tons per year), and getting

supplies has proven challenging due to cement manufacture taking precedence.

Above data obtained from the AAWSA that of local hydrated lime product was produced at Derba Cement Factory. The results from Table 4 and the calculation shows that utilizing locally produced hydrated lime have an annual saving of 2,328,780 Birr cost advantages for only AAWSA than utilizing imported hydrated lime. This result may also indicate that the total cost of saving after the coming five years, a minimum of 11,643,900 Birr, will be saved for only AAWSA. In addition to these results shows hydrated lime consumption again as a whole in Ethiopia for water treatment becomes cost effective whenever a used local product of hydrated lime. There is no hydrated lime production for water treatment in Mughar Cement Factory. But as this research result shows, there was convenient limestone that can be used to prepare hydrated lime for water treatment.

Table 5

Comparing limestone water and conventional methods of water treatment

No.	Conventional (chemical) methods	Advantages	Disadvantages	References
1	Coagulation and flocculation	Chemicals with a positive charge are added to the water. The positive charge of these chemicals neutralizes the negative charge of dirt and other dissolved particles in the water. When this occurs, the particles bind with the chemicals and form larger particles, called floc.	Requires adjunction of non-reusable chemicals (coagulants, flocculants, aid chemicals); Physicochemical monitoring of the effluent (pH); Increased sludge volume generation (management, treatment, cost); Low removal of arsenic.	[20]
2	Flotation froth flotation	Integrated physicochemical process; Different types of collectors (nonionic or ionic); Efficient for removal of small particles and can remove low-density particles, which would require long settling periods; Useful for primary clarification; Metal selective; Low retention time; Used as an efficient tertiary treatment in the pulp and paper industry; <i>Mechanisms:</i> true flotation, entrainment and aggregation.	High initial capital cost; Energy costs; Maintenance and operation costs no negligible; Chemicals required (to control the relative hydrophobicities between the particles and to maintain proper froth characteristics); Selectivity is pH-dependent.	[21]
3	Chemical oxidation Simple oxidation Ozone; Hypochlorite treatment; Hydrogen peroxide	Chemical oxidation; Simple oxidation; Ozone; Hypochlorite treatment; Hydrogen peroxide.	Chemicals required; Production, transport and management of the oxidants (other than ozone); Pretreatment indispensable; Efficiency strongly influenced by the type of oxidant; Short half-life (ozone); A few dyes are more resistant to treatment and necessitate high ozone doses; Formation of (unknown) intermediates; No diminution of chemical oxygen demand values or limited effect (ozone); No effect on salinity (ozone); Release of volatile compounds and aromatic amines (hypochlorite treatment); Generates sludge.	[22]
4	Chemical precipitation	Technologically simple (simple equipment); Integrated physicochemical process; Both economically advantageous and efficient; Adapted to high pollutant loads; Very efficient for metals and fluoride elimination; Not metal selective;	Chemical consumption (lime, oxidants, H_2S , etc.); Physicochemical monitoring of the effluent (pH); Ineffective in the removal of the metal ions at low concentration; Requires an oxidation step if the metals are complexed; High sludge production, handling and disposal problems (management, treatment, cost).	[23]
5	Limestone	Significant reduction in the chemical oxygen demand. Limited solubility – cannot over-treat – Can install years of treatment capacity. • Can store on-site without loss; • Not hazardous; • Less than 20% of the cost of lime and caustic alternatives.	When exposed to acidic water containing Al and Fe^{3+} , solids quickly form. • Solids foul limestone aggregate, greatly decreasing its effectiveness	

ሀዋሳ
ዩኒቨርሲቲ

Tel: 046-220-96-76/77
-220-02-29
-202-03-41



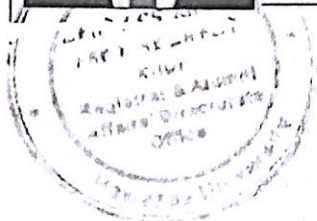
**HAWASSA
UNIVERSITY**

Fax: 046-2-21 47 81
Website: www.hu.edu.et
P.O.Box 05, Hawassa, Ethiopia

Date: June 28, 2018



TO WHOM IT MAY CONCERN



This is to certify that
BIFA SHIMELIS HAILE
Graduated From Hawassa University
With

Master of Science Degree in Material Science

CGPA: 3.73

June 28, 2018

Issuance of original diploma and transcript awaits settlements of cost-sharing expenses or provision of the required services.

Registrar

Zerihun Kifle Birhanu (PhD)
Registrar & Alumni Affairs
Directorate Director



ሀዋሳ ዩኒቨርሲቲ

ፊዚክስ ት/ክፍል

☎ (+) 251 (0) 462209436

✉ 5, Hawassa, Ethiopia



Hawassa University

Physics Department

Fax (+) 251 (0) 462209678

E-mail

ቁጥር

Ref No

ቀን

Date

2/11/2010

TO WHOM IT MAY CONCERN

LETTER OF RECOMMENDATION

It is my pleasure to write this recommendation letter for **Mr. Bifa Shimelis** I have known his while he was MSc Material science student in the department of physics at Hawassa University since 2015 – 2018. I had an opportunity to closely examine his academic, research and social competence. Taught his different graduate courses and he had a good understanding in the subjects and performed very well. **Mr. Bifa Shimelis** has also conducted his MSc Thesis research work under my supervision on Hydrate lime quality for water treatment :Effort in preparation of hydrated lime that matching the required quality . He did his task properly with deep passion and performed his research independently and scored a result of “**very good**”. **Mr. Bifa Shimelis** honest, strong and capable of carrying out any responsibility given to his.

Therefore, I have found **Mr. Bifa Shimelis** is hard working and emotionally stable person and strongly recommend his for further training or any carrier which requires his knowledge's. Finally, I wish his all the best in his future career.

With regard!

Fikadu Gashaw (PhD)

Hawassa University, Hawassa

E-mail: fekeye@gamil.com



ቁጥር/ሰ/343/14ec

Ref. No.

ቁጥር/11/14ec

To Whom It May Concern
Subject: Issuance of Certificate of Work Experience

Mr. Bifa Shimelis Haile in his application dated July 26, 2022 has requested our office to be availed work experience as per his performances in our university.

Hence, Bifa Shimelis is serving in Kebri Dehar University, College of Natural and Computational Science, Department of Physics as a lecturer and researcher from July 8, 2018 until July 7, 2019 G.C earning a monthly salary of 10,470 (Ten thousand four hundred seventy) birr. From July 8, 2019 until now while earning a monthly salary of 11305 (Eleven thousand three hundred five) birr.

During his tenure of employment, he has been hard worker, sociable, punctual and devoted to his profession. He also communicative, interactive and has very good approach to his colleagues and supervisors. He demonstrated the competence and diligence that the university demanded of him. He has also been paying the necessary government taxes, and discharging his responsibility properly since he has been working in Kebri Dehar University

Thus, we recommend him for a job related to his profession and gave him this work experience with grateful. We wish him all the best in his future endeavors.

Best Regards,

CC:

➤ Human Resource Administration and Development Directorate



EU 3A7C4 00000 905 105 10 This passport is valid for all countries



EP79090286ETH9408252M28022750<<<<<<<<<<<<<<06

Request

2 messages

Chandra Sekhar Tiwary <chandra.tiwary@metal.iitkgp.ac.in>

Thu, Jan 11, 2024 at 3:14 PM

To: aruproy07 <aruproy07@gmail.com>

Cc: bifashime@gmail.com, Femi Olu <foluemm@gmail.com>, solomon demiss <solomondemiss@gmail.com>

Dear Arup ji,

I would like to host Bifashime as well.
Please send him the required documents.

Thank you for all your help and support.

With best wishes and regards
Chandra Sekhar

Arup Roy <aruproy07@gmail.com>

Thu, Jan 11, 2024 at 3:38 PM

To: bifashime@gmail.com

Cc: Femi Olu <foluemm@gmail.com>, solomon demiss <solomondemiss@gmail.com>, Chandra Sekhar Tiwary <chandra.tiwary@metal.iitkgp.ac.in>, Associate Dean International Relation <adeanir@adm.iitkgp.ac.in>, Shruti Gupta <shruti@adm.iitkgp.ac.in>, "IIT Kharagpur Office of Dean, International Relations" <ir-office@adm.iitkgp.ac.in>

Dear Bifashime,
Greetings from the Office of Alumni Affairs & International Relations!
Thanks for your interest in pursuing an internship at IITKGP.

We would recommend you to please:

- 1) Visit our international relations website at [<https://international.iitkgp.ac.in/portal/register/>]
- 2) Register on our online portal as a new student.
- 3) Follow the instructions for filling up the preliminary application form online for the Non-Degree programs.
- 4) Make an application fee payment of INR 500.00 and remember to keep the payment receipt (https://international.iitkgp.ac.in/offline_appl_fees/).
- 5) Make sure that you have all the supporting documents/academic transcripts ready with you before you start filling the form and all the information provided is correct and complete.

You may write back to me in case you face any concerns/issues while doing this process.

Just in case, you face any technical problems while applying online or making payment then please follow the below steps:

1. Please download and send the preliminary application form filled out carefully along with all the supporting documents and transcripts* (https://international.iitkgp.ac.in/static/website/Internal%20Documents/Application_Form_non_degree_short-term_foreign%20visits%2023.07.2020.pdf)
2. If you encounter a 'payment error', take a screenshot of the 'payment error' message and send it along with your application form as requested in Point 1.
3. We shall guide you about how to make the payment after seeing the screenshot. Please be rest assured that non-payment will not affect the processing of your application .
4. Once we receive your application , we shall start processing the same and you shall receive step by step guidance in the future course of time.
5. Also, we shall advise you to go through our International Relations website and explore the information meant for the foreign students at [<https://international.iitkgp.ac.in/>]
It shall help you to prepare yourself better.

SPECIAL NOTE:

* All documents should be properly scanned and saved in PDF format ONLY. Please name the files in their respective certificate names and underscore your name.

HANDHELD SCANNED DOCUMENTS ARE STRICTLY NOT ACCEPTABLE.

for e.g., If you have to scan and save your BTech certificate:
First, scan then save in the pdf format then name the file as



Head
Department of Metallurgical
and Materials Engineering
Indian Institute of Technology
Kharagpur-721302, India



Arup Roy <aruproy07@gmail.com>

Application documents of Bifa Shimelis

1 message

Bifa Shimelis <bifashime@gmail.com>

Fri, Jan 12, 2024 at 8:57 PM

To: Arup Roy <aruproy07@gmail.com>

Cc: chandra.tiwary@metal.iitkgp.ac.in, Femi Olu <foluemm@gmail.com>

Good afternoon Mr. Arup Roy? Here I have attached my all necessary documents(zip file) . With best regards.



Bifa file.zip

5036K

**OFFER LETTER**

Dated: 16.02.2024

To:**Mr. Bifa Shimelis Haile
Bishoftu, Oromia, Jimma, Somali,
Kebri Dahar, Ethiopia.**Subject: Your application for short term visit to IIT Kharagpur for research/coursework not leading to a degree.**Dear Mr. Bifa Shimelis Haile,**

Greetings from Office of International Relations, IITKGP!

We are pleased to accept your application for a short-term visit to IIT Kharagpur (IITKGP) for research/coursework (not leading to a degree). Your duration of stay at IITKGP will be tentatively from February, 2024 to August, 2024.

Your short visit will be for carrying out research work in the area of 'Hydrogen Evolution reactions and Oxygen Evolution Reactions' at IIT Kharagpur. You will be attached with the Metallurgical and Materials Engineering department and will work under the mentorship of Prof. C. S. Tiwary (chandra.tiwary@metal.iitkgp.ac.in). You have been approved to work in his lab during this visit.

Our records indicate that your travel expenses will be arranged by yourself. Accommodation and food at IITKGP will be supported by the project (project Code: VOF) of Prof. Chandra Sekhar Tiwary, MME Department. Kindly confirm the same in the blank field given below. However, it is understood that if any cost is not being covered under this sponsorship program then it will be borne by the student himself.

Your accommodation shall be arranged by Prof. Chandra Sekhar Tiwary during your stay at IITKGP. Your stay will be governed by our Institute policy and relevant statutes of India.

If you accept this offer, please (i) sign on this letter below, (ii) fill up the attached MHRD form, and (iii) email back the scanned copies no later than **23.02.2024**. Upon receipt, our office will send you the formal invitation letter for your visa application.

We look forward to welcoming you to our Institute.

Sincerely,



Chakravarty
16/2/2024
Associate Dean AA&IR

I accept this offer: Yes/No**Source(s) and details of funding:**

*Funding of local stay and food from
the fund of Prof. C.S. Tiwary, MME*

Signature of Mr. Bifa Shimelis Haile

Enclosure: MHRD, GoI Clearance Form.

Copy to: (1) Dean, FoEA, (2) HoD-MME, (3) Faculty mentor- Prof. C.S. Tiwary, (3) Registrar, IITKGP.

Associate Dean, Alumni Affairs and International Relations
भारतीय प्रौद्योगिकी संस्थान खड़गपुर
Indian Institute of Technology Kharagpur



Office of Alumni Affairs & International Relations
Indian Institute of Technology
Kharagpur-721302

FORM FOR MINISTRY CLEARANCE
GOVERNMENT OF INDIA
FOR VISIT OF FOREIGN NATIONALS TO
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR, INDIA

1	Name :	BIFA SHIMELIS HAILE
2	Nationality :	Ethiopian
3	Date of birth :	25 AUG 1994
4	Place of birth :	GIMBICHU
5	Number, Date & Place of Issue of Passport :	EP 7909028, ADDIS ABABA 28 FEB 2023
6	Visa Number (if available)	VN0426604
7	Current residential address :	Jimma, Ethiopia
8	Permanent residential address :	Jimma, Ethiopia
9.	Profession :	PhD student scholar
10.	Place of Employment:	
11.	Academic Credentials:	PhD
12.	Purpose of visit:	Research Visiting
13.	Period of visit:	6 month
14.	Email:	bifashime@gmail.com
15.	Day time Phone:	+251932393244
16.	Address of Indian Embassy where you will be applying for your visa:	ADDIS ABABA, ETHIOPIA
17.	Coordinator of your visit at IITKGP/Dept :	Prof. C.S. Tiwary, MME

**वीज़ा
VISA**

भारत गणराज्य REPUBLIC OF INDIA VN 0426604



VN0426604

उपनाम और नाम / Surname and Given Name
HARVEY FERRIS BUNN

HAILE BIFA SHIMELIS

पासपोर्ट नम्बर / Passport No
EP7909028

वीजा टाइप / Visa Type
S-5

प्रवेशों की संख्या No Of Entries
DOUBLE

जारी करने की तिथि / Date of Issue
11/03/2021

समाप्ति की तिथि/Date of Expiry (DD/MM/YYYY)

1470272024

13/08/2024

विशेषपूछांकन / Special Endorsement

FOR PHD RESEARCH WORK AT IIT KHARAGPUR INDIA



TO CARRY VALID YELLOW FEVER AND ORAL POLIO VACCINATION CERTIFICATES

प्रयोजन बदलने का अनुमति नहीं है / Change of Purpose Not Allowed.

VSINDHAILE<<BIFA<SHIMELIS<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
VND4266042ETH9408252M2408138ETHAV012D924<00



ጤና ሚኒስቴር - አዋጽ
MINISTRY OF HEALTH - ETHIOPIA
የጤና ሚኒስቴር አዋጽ



የኢትዮጵያ ፌዴራላዊ ዲሞክራሲያዊ ሪፐብሊክ

የጤና ሚኒስቴር

የኢትዮጵያ የዕብረተሰብ ጤና ኢንስቲትዩት

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

MINISTRY OF HEALTH

ETHIOPIAN PUBLIC HEALTH INSTITUTE

በጤና አስተዳደር የጤና የክትትል ምክር ቤት

International Certificate of Vaccination
Certificat International De Vaccination

ETH No. 106844

Information for physicians

1. The dates of vaccination on each certificate are to be recorded in the following sequence; date, month, year-the month in letters. Example: January 1, 1981 is written as 1 January 1981.
2. If vaccination is contraindicated on medical grounds, the physician should provide the traveler with a written opinion, which health authorities should take into account.
3. Vaccination certificate requirements of countries are published by WHO in vaccination certificate requirements and health advice for international travel. Additionally, to find the list of designated yellow fever vaccinating centers and for up-to-date travel health alerts/notices please visit the Ethiopian Public Health Institute official website
4. Please be sure always to consider that your patient may have a travel associated illness.

Information pour les médecins

1. Les dates de la vaccination sur chaque certificat doivent être enregistrées dans l'ordre suivant: jour, l'année-mois, l'année-mois dans des lettres. Exemple: janvier 1, 1981 est écrit le 1 janvier 1981.
2. Si la vaccination est contre-indiquée pour des raisons médicales, le médecin doit fournir le voyageur avec une opinion écrite, qui les autorités sanitaires devraient prendre en compte.
3. Les exigences en matière de certificat de vaccination des pays sont publiées par l'OMS dans les exigences en matière de certificat de vaccination et les conseils sanitaires pour les voyages internationaux. De plus, pour trouver la liste des centres de vaccination contre la fièvre jaune désignés et pour les alertes/avis de santé aux voyageurs à jour, veuillez visiter le site Web officiel de l'Institut éthiopien de santé publique <https://ephi.gov.et/travel-health-service/>
4. Veuillez toujours à considérer que votre patient peut avoir une course-maladie associée.

INTERNATIONAL CERTIFICATE
YELLOW
CERTIFICAT INTERNATIONAL
LA FIEVRE

This is to certify that
Il s'agit de certifier que

Whose signature follows
Dont la signature suit

has on the date indicated been vaccinated against yellow fever
A sur la date indiquée été vaccinés ou revaccinés contre la fièvre jaune

BDP
SHM

Date	Signature and professional status of vaccinator La signature et le statut professionnel du vaccinateur
12 FEB 2014	

OF VACCINATION AGAINST
FEVER
DE VACCINATION CONTRE
JAUNE

Date of birth
Date de naissance

Sex
Sexe

28 Aug 84
M

Manufacturer and batch no. of vaccine fabricant Fabricant et numéro de lot. du fabricant de vaccins	Official stamp of vaccination center Cachet officiel du centre de vaccination



भारत गणराज्य REPUBLIC OF INDIA VN 0426604

VN0426604

HAILE BIFA SHINELIS

पासपोर्ट नं./Passport No.
EP7909028

वीजा टाईप / Visa Type
S-5

प्रवेशों की संख्या No Of Entries
DOUBLE

जारी करने की तिथि /Date of Issue
11/03/2025

समाप्ति की तिथि/Date of Expiry(DD/MM/YYYY)

14/02/2024

समाप्त की तिथि/Date of Exp
13/08/2024

विशेषपृष्ठानकन / Special Endorsement

FOR PHD RESEARCH WORK AT IIT KHARAGPUR INDIA



TO CARRY VALID YELLOW FEVER AND ORAL POLIO VACCINATION CERTIFICATES

प्रयोजन बदलने की अनुमति नहीं है / Change of Purpose Not Allowed.

VSINDHAILE<<BIFA<SHIMELIS<<<<<<<<<<<<<<<<<<<<<
VN04266042ETH940825M2408138ETHAV012D924<<00

**OFFER LETTER**

Dated: 16.02.2024

To:**Mr. Bifa Shimelis Haile
Bishoftu, Oromia, Jimma, Somali,
Kebri Dahar, Ethiopia.****Subject: Your application for short term visit to IIT Kharagpur for research/coursework not leading to a degree.****Dear Mr. Bifa Shimelis Haile,**

Greetings from Office of International Relations, IITKGP!

We are pleased to accept your application for a short-term visit to IIT Kharagpur (IITKGP) for research/coursework (not leading to a degree). Your duration of stay at IITKGP will be tentatively from February, 2024 to August, 2024.

Your short visit will be for carrying out research work in the area of 'Hydrogen Evolution reactions and Oxygen Evolution Reactions' at IIT Kharagpur. You will be attached with the Metallurgical and Materials Engineering department and will work under the mentorship of Prof. C. S. Tiwary (chandra.tiwary@metal.iitkgp.ac.in). You have been approved to work in his lab during this visit.

Our records indicate that your travel expenses will be arranged by yourself. Accommodation and food at IITKGP will be supported by the project (project Code: VOF) of Prof. Chandra Sekhar Tiwary, MME Department. Kindly confirm the same in the blank field given below. However, it is understood that if any cost is not being covered under this sponsorship program then it will be borne by the student himself.

Your accommodation shall be arranged by Prof. Chandra Sekhar Tiwary during your stay at IITKGP. Your stay will be governed by our Institute policy and relevant statutes of India.

If you accept this offer, please (i) sign on this letter below, (ii) fill up the attached MHRD form, and (iii) email back the scanned copies no later than **23.02.2024**. Upon receipt, our office will send you the formal invitation letter for your visa application.

We look forward to welcoming you to our Institute.

Sincerely,



Chakraborty
16/2/2024
Associate Dean AA&IR

I accept this offer: Yes/No**Source(s) and details of funding:**

Signature of Mr. Bifa Shimelis Haile

Enclosure: MHRD, GoI Clearance Form.

Copy to: (1) Dean, FoEA, (2) HoD-MME, (3) Faculty mentor- Prof. C.S. Tiwary, (3) Registrar, IITKGP.

आचार्य, प्रमुख, कर्मन्तः मन्त्रालय (अंतराष्ट्रीय संबंध)
Associate Dean, Alumni Affairs and International Relations
भारतीय प्रौद्योगिकी संस्थान खड़गपुर
Indian Institute of Technology Kharagpur

**INVITATION LETTER**

Dated: 16.02.2024

To:
Mr. Bifa Shimelis Haile
Bishoftu, Oromia, Jimma, Somali,
Kebri Dahar, Ethiopia.

Subject: Invitation for short term visit to IIT Kharagpur for research/coursework not leading to a degree.

Dear Mr. Bifa Shimelis Haile,
 Greetings from Office of International Relations, IITKGP!

We are pleased to invite you for a short-term visit to IIT Kharagpur (IITKGP) for research/coursework (not leading to a degree). Your duration of stay at IITKGP will be tentatively from February, 2024 to August, 2024.

Your short visit will be for carrying out research work in the area of 'Hydrogen evolution reactions and Oxygen evolution reactions' at IIT Kharagpur. You will be attached with Metallurgical and Materials Engineering department and will work under the mentorship of Prof. Chandra Sekhar Tiwary (chandra.tiwary@metal.iitkgp.ac.in). You have been approved to work in his lab during this visit.

We have noted your passport details as follows:

Name:	Bifa Shimelis Haile	Place of Issue:	Ethiopia
Nationality:	Ethiopian	Issue Date:	28.02.2023
Country of present domicile:	Ethiopia	Expiry Date:	27.02.2028
Passport Number	EP7909028	Date of Birth:	28.08.1994

Your accommodation shall be arranged by Prof. Chandra Sekhar Tiwary in an on-campus student's Hall of Residence/Guest House (as per availability) during your stay at IITKGP. Our records indicate that your travel expenses will be arranged by yourself. Accommodation and food at IITKGP will be supported by the project (Project code: VOF) of Prof. C.S. Tiwary, MME Department. In addition, you are advised to have your own comprehensive medical insurance while you are in India. Please note that you are required to bring your updated health and immunization records. Your stay will be governed by our Institute policy, and relevant statutes of India.

We look forward to welcoming you to our Institute.



Sincerely,

Shahab
 16/2/2024

Associate Dean AA&IR

Copy to:

- 1) Dean, FoEA,
- 2) Prof. Shiv Brat Singh-HoD, MME
- 3) Faculty Mentor- Prof. C.S. Tiwary, MME
- 4) Registrar, IITKGP

सह-संकायक, पूर्वजन्म मामले एवं अंतर्राष्ट्रीय संबंध
 Associate Dean, Alumni Affairs and International Relations
 भारतीय प्रौद्योगिकी संस्थान खड़गपुर
 Indian Institute of Technology Kharagpur