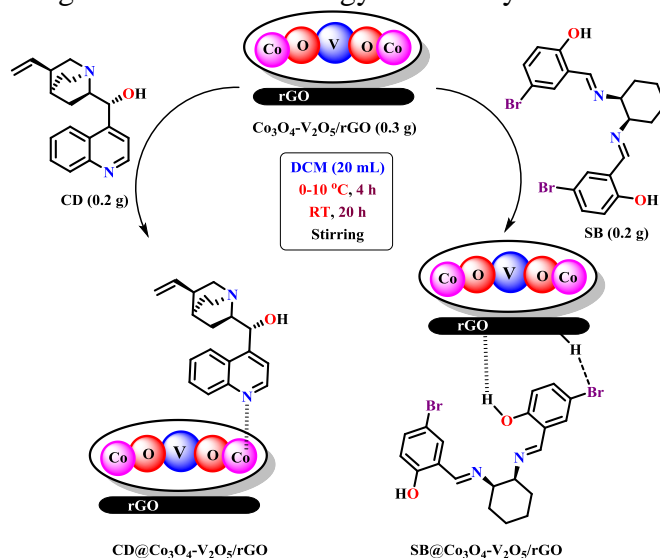


PROJECT COMPLETION REPORT		
1	Project Title:	DST NO. CRG/2019/000962
	Design of Ship In A Bottle Complexes and Zeolite-Y Supported Nanocatalysts For C-Cl Bond Activation and C-C Coupling Reactions.	
2	PI (Name & Address):	Date of Birth
	Dr. KUSUM KUMAR BANIA, Dept of Chemical Sciences, Tezpur University Napaam, 784028, Assam , India	17-10-1981
3	Co-PI (Name & Address): NA	Date of Birth: NA
4	Broad Area of Research: Chemical Sciences	
	4.1. Sub Area: Inorganic Chemistry	
5	Approved Objective of the Proposal	
	<ol style="list-style-type: none"> 1. Synthesis of mesoporous zeolite-Y 2. Preparation of homogeneous chiral and achiral metal Schiff-base complexes 3. Encapsulation of metal Schiff-base complexes in mesoporous zeolite-Y 4. Synthesis of metal nanoparticles using zeolite-Y as a support and internal hard templating agent 5. Chiral modification of zeolite-Y supported metal nanocatalysts 6. Characterization of the synthesized homogeneous and heterogeneous catalysts using various spectrochemical and physicochemical techniques 7. To study the catalytic ability of the synthesized catalysts in various cross C-C coupling reactions 	
Date of Start: 29-01-2020		Total cost of Project: Rs. 2982000
Date of completion: 28-01-2023		Expenditure as on : Rs. 2783458
6. Methodology		
6.1. Synthesis of Zeolite-Y Supported mixed valent CuO and Iron (III) Oxide Nanocatalyst (Fe₂O₃-Y, CuO-Y)		
<p>Zeolite-Y supported Fe(III) oxide nanocatalyst was synthesized via following procedure. In a 100 mL round bottom (RB) flask, 2 g of zeolite-Y was suspended in 50 mL of 0.01 M aqueous solution of Fe(NO₃)₃·9H₂O (0.202 g) and the solution was made basic (pH ~8-9) by the addition of 1 M KOH solution under stirring at room temperature (RT). The precipitate of iron salt formed as iron hydroxide on the zeolite-Y surface. The resultant solution was then filtered through Whatman No. 1 filter paper, the leftover material was repeatedly washed in hot water, and finally, contaminants were extracted using the Soxhlet method. The material was obtained, dried for 12 hours at 327 °C (600 K) in an oven, and then dried for 3 hours under vacuum. The zeolite-Y-supported Fe₂O₃ nanoparticles are light brown color. i.e., Fe₂O₃-Y.</p> <p>The mixed valent CuO-nanoparticles supported on zeolite-Y. Initially, Na-Y zeolite was heated for 24 h at 393 K. After that, in a 100 mL round bottom (RB) flask, 1 g of zeolite-Y was suspended with 50 mL of 0.02 M aqueous solution of CuCl₂·2H₂O (0.170 g). The pH of the solution was</p>		

maintained between 8-9 using NaOH solution. To the copper-containing zeolite-Y, 1 mL of isopropanol was added as an internal reducing agent. The reaction mixture was then stirred at room temperature for 30 h. After this the reaction vessel was connected to a vacuum pump and further stirred by applying a pressure of 0.3 millibar (mb) for 8 h. The stirring was done with a time interval of 20 min after stirring for 1 h and the process was repeated for 8 times. The resulting solution was filtered using Whatman No 1 filter paper and the residual part washed several times by using deionized water. Complete removal of Cl⁻ ion was confirmed by doing AgNO₃ test. CuO supported zeolite was dried for 12 h in an oven at 493 K and finally dried under vacuum to obtain light greyish colour of CuO-nanoparticle supported zeolite-Y (CuO-Y) and then material subjected for characterization.

6.2. Synthesis of Chirally modified Co₃O₄-V₂O₅/rGO with cinchonidine (CD), schiff base (SB) ligand.

The methods, shown in Scheme 1, were used to modify chiral compounds with cinchonidine (CD). A cinchonidine solution of 0.2 g in 20 mL of dichloromethane was added to 0.3 g of Co₃O₄-V₂O₅/rGO nanocatalyst and agitated for 4 hours at 0-10 °C. Further stirring the final reaction mixture for 20 hours at room temperature. Then allow the solvent to slowly evaporate, the reaction mixture was let to stand. The residue that resulted was collected and allowed to air dry. Our own produced Schiff base (SB) ligand underwent another chiral modification with the help of the CD modification process utilising the same methodology and finally formed SB@Co₃O₄-V₂O₅/rGO.



Scheme 1. Schematic representation of chiral modification of Co₃O₄-V₂O₅/rGO with CD and SB ligand.

6.3. Synthesis of copper oxide (CuO) nanocatalyst supported on Mg²⁺-exchanged zeolite-Y (CuO-Mg-Y).

Mg²⁺-Y synthesized by taking 2 g of Sodium-Y (Na-Y) zeolite was suspended in an aqueous solution containing 0.01 M (0.0507 g in 25 mL water) of MgCl₂.6H₂O and stirred at 60 °C under refluxing for 24 hours and filtered the solution to get Mg exchange zeolite-Y. Then the CuO was deposited on the surface of zeolite-Y by precipitating, where 0.1 M of sodium hydroxide (NaOH) mixed with CuCl₂.2H₂O solution containing Zeolite-Y. The colour of the synthesized materials was gray, i.e. CuO-Mg-Y.

7. Salient Research Achievement.

7.1. Summary of Progress:

To create a superior solid phase catalyst for organic transformation processes, we created a Copper Oxide (CuO) nano-catalyst based on zeolite-Y. This is a great advancement for more environmentally friendly approaches or methods because it functions as a mechanochemical process

without the use of a solvent. In CuO-Y catalyst, the CuO nanoparticles were in both Cu(I) and Cu(II) state and obtained mixed valent catalyst used for solvent-free synthesis of nitro-aldol product, benzyl alcohol oxidation, benzaldehyde reduction reaction.

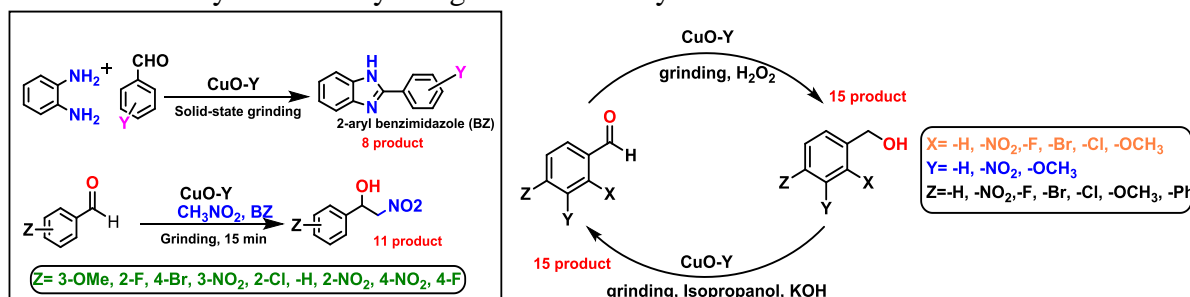
Production of C2 di-indolyl indolones and isatins using a cost-effective and reusable Fe-oxide catalyst supported on zeolite-Y was designed. The Fe₂O₃-Y activity was found to be superior to that of other noble metal-based catalysts. Instead of chromatographic separation, force precipitation can be used to extract the majority of the C2 trimerized molecules. The catalyst could also be reused up to five times without having any impact on the yield of the intended product.

To design a chiral catalyst, we synthesized a chirally modified cobalt-vanadate grafted on battery waste derived layered reduced graphene oxide for enantioselective photooxidation of 2-naphthol.

CuO nanoparticle supported on Mg²⁺-exchanged zeolite-Y performed as an efficient metal catalyst for the selective dehydrogenation of ethanol to acetaldehyde and production of cinnamadehyde derivative. The main advantages of the present catalyst is it's a cheaper, less toxic and provides a scope for wide range of substrates.

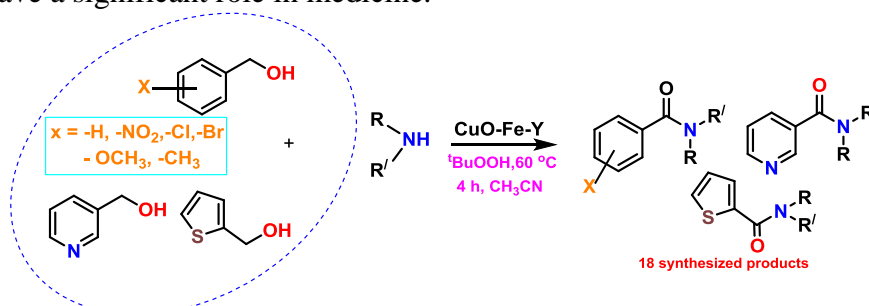
7.2. New Observations

(i) The C-C bond formation via nitro-aldol was done *via* Cu-based catalyst known to be most effective for such conversion. The solvent-free synthesis of this was less known, so by using synthesized CuO-Y catalyst performed such C-C bond formation (nitro aldol) under liquid assisted grinding method and perform selective benzyl alcohol oxidation, benzaldehyde reduction. In this nitro-aldol reaction the benzimidazole derivatives (BZ), act as a proton abstracting source accelerated the reaction to a greater extent retaining the high product selectivity, where benzimidazole are synthesized by using the same catalyst i.e. CuO-Y



Scheme 1. Synthesis of benzimidazole derivatives, nitro-aldol product and benzaldehyde reduction, benzyl alcohol oxidation *via* solid-assisted grinding method using CuO-Y catalyst.

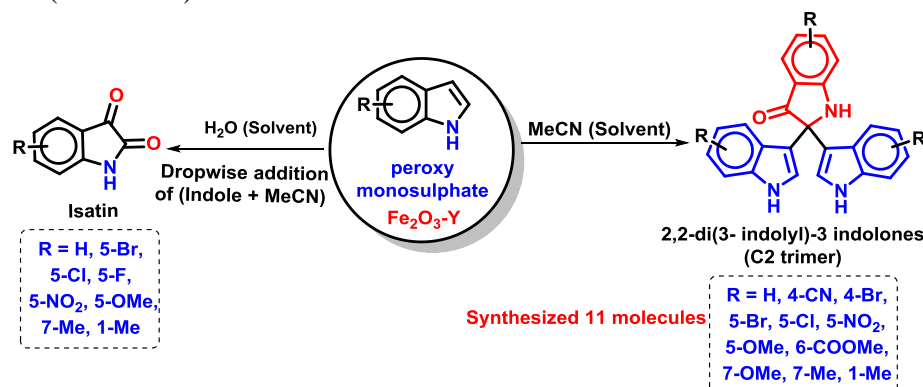
(ii) In addition to this we have able to do C-N bond formation reaction using low-cost CuO supported on Fe-exchange Zeolite-Y catalyst for amide synthesis reaction using alcohol and amine. These amides have a significant role in medicine.



Scheme 2. Synthesis of amide from alcohol and amines *via* CuO supported on Fe-zeolite-Y

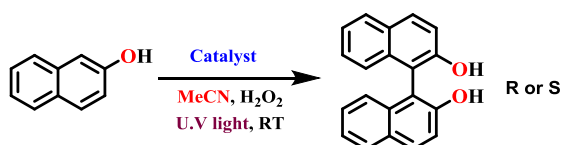
(iii) Created a low-cost, environmentally friendly, and recyclable zeolite-Y supported Fe-oxide catalyst for the peroxy monosulfate-aided synthesis of 2,2-di(3-indolyl)-3-indolones and isatins from different substituted and unsubstituted indoles by only altering the solvent system and method of

reagent addition. (Scheme 3).



Scheme 3. Synthesis of C2, C3 trimers, and isatins in presence of $\text{Fe}_2\text{O}_3\text{-Y}$ nanocatalyst.

(iv) There are numerous uses for Co_3O_4 and V_2O_5 , or its mixed valent oxides. Rarely such $\text{Co}_3\text{O}_4\text{-V}_2\text{O}_5$ oxides employed in photochemical organic transformation processes. The synthesis of chirally modified Co-V oxide nanocatalyst on reduced graphene oxide and comprehension of their behaviour in the asymmetric photo-oxidation of 2-naphthol facilitated by this process. Through non-covalent interactions, the chiral modifiers interacted with the $\text{Co}_3\text{O}_4\text{-V}_2\text{O}_5/\text{rGO}$ catalyst to form a chiral environment that allowed for the excess production of C2-symmetric R and S 1,1'-Bi-2-naphthol (BINOL).

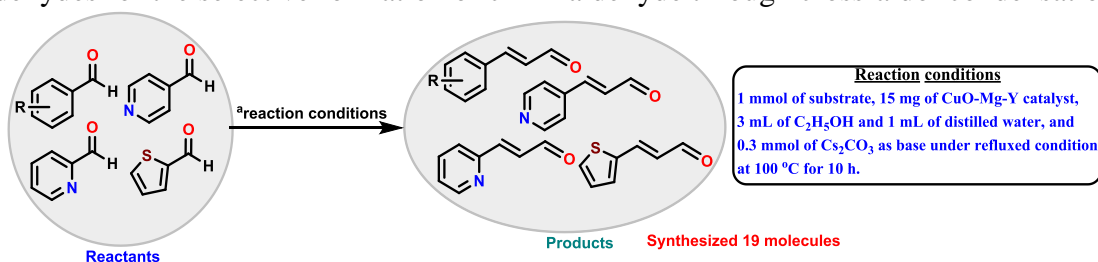


Reaction Condition

5.2 mmol of 2-naphthol, 15 mg of catalyst, 20 mL solvent (MeCN),
1.5 mmol H_2O_2 under photocatalytic condition (450 W medium pressure mercury lamp, 254 nm)
at RT for 30 min

Scheme 4. Oxidative coupling of 2-naphthol to BINOL in presence of synthesized cobalt-vanadium oxide catalysts under optimized conditions

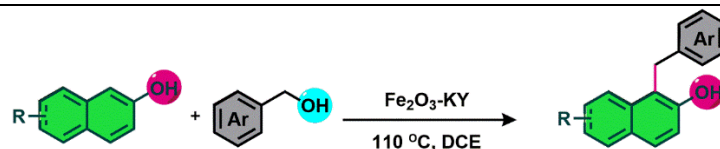
(v) We create a copper oxide (CuO) nanocatalyst supported on Mg^{2+} -exchanged zeolite-Y (CuO-Mg-Y) for the in situ generation of CH_3CHO from $\text{C}_2\text{H}_5\text{OH}$ and its condensation with various benzaldehydes for the selective formation of cinnamaldehyde through cross-aldol condensation.



Scheme 5. Synthesis of different α, β -unsaturated aldehydes or cinnamaldehyde derivatives in presence of CuO-Mg-Y catalyst.

(vi) Iron oxide nanocatalyst supported on potassium exchanged zeolite-Y appeared as an efficient reusable catalyst to promote the selective α -H functionalization of 2-naphthols with various aromatic primary alcohols. The reaction happened at 110°C in dichloroethane and required 6 h for completion. The product yields were found to vary with respect to the nature of the substituents. Benzyl alcohols with electron donating groups gave the maximum yield up to 90%.

The nature of cations (Na^+, K^+) in zeolite-Y framework played an important role through cation- π interaction.



● Direct strategy for C(1)-H functionalization
 ● Extensive substrates study (26 examples)
 ● Base free,
 ● Low cost Heterogeneous Catalyst

7.3 Innovations: Developed new methodologies for the synthesis of C-2 trimer product of indole, nitroaldol product, cinnamadehyde using cost-effective material of $\text{Fe}_2\text{O}_3\text{-Y}$, CuO-Y , and CuO-Mg-Y respectively. Also, synthesized chiral BINOL product from naphthol by chirally modified $\text{Co}_3\text{O}_4\text{-V}_2\text{O}_5/\text{rGO}$.

7.4 Application Potential: The synthesized indole C-2 trimerized product, nitro-aldol product and other cinnamaldehyde product having pharmaceutical properties. The synthesized chiral BINOL product are regarded as important chiral auxiliaries. Also our synthesized materials have lot more potential towards organic synthesis like cross-coupling reaction, oxidation reaction etc.

- i. As the project tenure comes to an end, so we will try to compile our whole work and will also attempt to finish all the write up of our remaining manuscripts for submission
- ii. At the earliest starting of the project, COVID-19 pandemic was at it peak henceforth the labwork was affected. However, the other remaining proposed work such as C-Cl bond activation by our newly synthesis material is going on.

Ph. D. Produce no: Nil	Technical Person Trained	Research Publication arising out of the present project:
One student registered for Ph.D.	01	15

List of Publications from this Project (including title, author(s), journals (s))

(A) Papers publish only in cited Journals (SCI)

1. Subir Biswas, Dipankar Barman, Gautam Gogoi, Nazimul Hoque, Arpita Devi, Siddhartha K. Purkayastha, Ankur Kanti Guha, Jayanta K. Nath and Kusum K. Bania, Heterogeneous Iron Catalyst for C (1)-H Functionalization of 2-Naphthols with Primary Aromatic Alcohols. *Organic & Biomolecular Chemistry*, 21(2023):1657. **IF= 3.876**
2. Nazimul Hoque, Seonghwan Lee, Young-Bin Park, Subhasish Roy, Manash J. Baruah, Subir Biswas, Gautam Gogoi, Tonmoy J. Bora, Rupjyoti Dutta, and Kusum K. Bania, "Dual Matrix Influence on Ni (II) Rich Hybrid Catalyst for Electrochemical Methanol Oxidation Reaction." *ChemNanoMat*, 2022 **IF= 3.154**
3. Salma A. Khanam, Nazimul Hoque, Seonghwan Lee, Young-Bin Park, Gautam Gogoi, Kusum K. Bania, "Tubular Nickel Hydroxide Embe dded in Zeolitic Cobalt Oxide for Methanol Oxidation Reaction." *ACS Applied Energy Materials* 5 (2022): 12651-12662. **IF =6.024**
4. Nazimul Hoque, Baruah, M.J., Biman, A.H., Biswas, S., Gogoi, G., Dutta, R. and Bania, K.K., Impregnating rhodium (0) sites through zeolite-Y templation in a hybrid Rh-Ni catalyst for alcohol electro-oxidation with low CO poisoning. *ACS Applied Energy Materials*, 5(5):2022, 6118-6128. **IF =6.024**

5. Gautam Gogoi, Jayanta K. Nath, Nazimul Hoque, Subir Biswas, Nand K. Gour, Dhruba Jyoti Kalita, Smiti Rani Bora, and Kusum K. Bania, "Single and multiple site Cu (II) catalysts for benzyl alcohol and catechol oxidation reactions." *Applied Catalysis A: General* 644 (2022): 118816. **IF= 5.706**
6. Gautam Gogoi, Manash J. Baruah, Subir Biswas, Nazimul Hoque, Seonghwan Lee, Young-Bin Park, Lakshi Saikia, and Kusum K. Bania, "CuO-Fe (III)-Zeolite-Y as efficient catalyst for oxidative alcohol-amine coupling reactions." *Molecular Catalysis* 528 (2022):112458. **IF= 5.062**
7. Subir Biswas, Manash J. Baruah, Gautam Gogoi, Nazimul Hoque, Seonghwan Lee, Young-Bin Park, Lakshi Saikia, and Kusum K. Bania. "Dehydrogenation of ethanol over CuO–Mg–Y for cross-aldol condensation with aryl aldehydes." *Microporous and Mesoporous Materials* (2022): 111893. **IF= 5.58**
8. Manash J. Baruah, Anurag Dutta, Subir Biswas, Gautam Gogoi, Nazimul Hoque, Pradip K. Bhattacharyya and Kusum K. Bania. "Fe₂O₃ Nanocatalysts Supported on Zeolite-Y for the Selective Synthesis of C2 Di-Indolyl Indolones and Isatins." *ACS Applied Nano Materials* 5 (2022): 1446-1459. **IF= 5.097**
9. Manash J. Baruah, Tonmoy J. Bora, Gautam Gogoi, Nazimul Hoque, Nand K. Gour, Suresh K. Bhargava, Ankur K. Guha, Jayanta K. Nath, Biraj Das, and Kusum K. Bania. "Chirally modified cobalt-vanadate grafted on battery waste derived layered reduced graphene oxide for enantioselective photooxidation of 2-naphthol: Asymmetric induction through non-covalent interaction." *Journal of Colloid and Interface Science* 608 (2022): 1526-1542. **IF= 9.965**
10. Nazimul Hoque, Manash J. Baruah, Seonghwan Lee, Young-Bin Park, Rupjyoti Dutta, Subhasish Roy, and Kusum K. Bania. "Cu (OH)₂-Ni (OH)₂ engulfed by zeolite-Y hydroxyl nest and multiwalled carbon nanotube for effective methanol oxidation reaction." *Electrochimica Acta* 397 (2021): 139313. **IF= 6.901**
11. Manash J. Baruah, Tonmoy J. Bora, Rupjyoti Dutta, Subhasish Roy, Ankur Kanti Guha, and Kusum K. Bania. "Fe (III) superoxide radicals in halloysite nanotubes for visible-light-assisted benzyl alcohol oxidation and oxidative C-C coupling of 2-naphthol." *Molecular Catalysis* 515 (2021): 111858. **IF=5.062**
12. Gautam Gogoi, Pinku Saikia, Manash J. Baruah, Seonghwan Lee, Young-Bin Park, Rupjyoti Dutta, and Kusum K. Bania. "Mixed valent copper oxide nanocatalyst on Zeolite-Y for mechanochemical oxidation, reduction and C–C bond formation reaction." *Microporous and Mesoporous Materials* 326 (2021): 111392. **IF= 5.58**
13. Manash J. Baruah, Mukesh Sharma, Biraj Das, Pinku Saikia, Lakshi Saikia, Subhasish Roy, Galla V. Karunakar, Pradip K. Bhattacharyya, and Kusum K. Bania. "Boosting multiple photo-assisted and temperature controlled reactions with a single redox-switchable catalyst: Solvents as internal substrates and reducing agent." *Journal of Catalysis* 388 (2020): 104-121.
IF= 8.047
14. Biraj Das, Mukesh Sharma, Manash J. Baruah, Bedanta P. Mounash, Galla V. Karunakar, and Kusum K. Bania. "Gold nanoparticle supported on mesoporous vanadium oxide for photo-oxidation of 2-naphthol with hydrogen peroxide and aerobic oxidation of benzyl alcohols." *Journal of Environmental Chemical Engineering* 8(2020): 104268. **IF= 5.876**
15. Biraj Das, Pinku Saikia, Mukesh Sharma, Manash J. Baruah, Subhasish Roy, and Kusum K. Bania "Direct cyanidation of silver sulfide by heterolytic C–CN bond cleavage of acetonitrile." *RSC Advances* 14 (2020): 8314-8318. **IF= 4.036**

(B) Papers published in Conference Proceedings, Popular Journals etc. Nil

Patents filed/ to be filed: Nil					
Major Equipment (Model and Make)					
S No	Sanctioned List	Procured (Yes/ No) Model & make	Cost (in Rs)	Working (Yes/ No)	Utilisation Rate (%)
1	Rotary evaporator	Yes, Model No.: #8766.RV0.00 (Roteva)	471450	YES	100%

REQUEST FOR ANNUAL INSTALMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

1. SERB Sanction order No & date:	Sanctioned order: CRG/2019/000962 (SERB/F/8963/2019-2020 dated 21 January 2020)
2. Name of the PI	Dr. KUSUM KUMAR BANIA
3. Total Project Cost:	Rs. 3149025/-
4. Revised Project Cost: (if applicable)	NA
5. Date of Commencement:	29-01-2020
6. Statement of Expenditure (Month wise expenditure incurred during current financial year, 2022-23)	
Month and Year	Expenditure incurred in Rs.
Apr,2022	31000
Jun, 2022	2450
July,2022	96194
August 2022	60868
Sept,2022	248392
Nov, 2022	62000
Dec,2022	29809
Jan, 2023	118468
1. Grant received in each year:	
a. 1st Year:	Rs. 1382000
b. 2nd Year:	Rs. 800000
c. 3rd Year:	Rs. 800000
c. Interest, if any:	Rs. 17662
d. Total (a+b+c+d):	Rs. 2999662

KD Bania

Statement of Expenditure

For the Financial Year 2022-23, From 1-04-2022 to 28-01-2023

Sr. NO (I)	Sanctioned Heads (II)	Total Funds Allocated (sanctioned) in Rs. (III)	Expenditure Incurred in Rs.				Total Expenditure 6II. (VIII = IV + V + VI + VII)	Balance as on (date) (IX = III - VIII)	Requirement of Funds upto 31 st March 2022	Remarks (if any)
			1st Year (29 th Jan-2020 to 31 st March 2020) (IV)	2nd Year (V) April-2020 to 31 st March 2021)	3rd Year (VI) April-2021 to 31 st March 2022)	4 th Year (VII) (April 2022 to Jan 28, 2023				
1	Equipment	498750	Nil	471450	-	-	471450	27300*	Refunded	
2	Manpower	883250+800000+	56655	59078	372000	338000	825733	171242		
3	Consumable	800000	303134	414760	150140	186392	1054426			
4	Travel		-	-	-	18492	18492			
5	Contingencies		50000	50711	21950	4421	127082			
6	Overhead Expenses		64134	118285	1980	101876	286275			
7	Interest	4381+8723+838+3720	-	-	-	-	-	17662		
8	Total	2999662	473923	1114284	546070	649181	2783458	188904		

*The amount (Rs 27300) has been returned to SERB via Demand Draft No. 535166 Dated 1.06.2021

(Dr. Kusum Kumar Bania)

Name and Signature of Principal Investigator:

Date: 8-02-2023

Signature of Competent financial authority:

(with seal)

Date: _____

Finance Officer
Tejpur University

UTILIZATION CERTIFICATE (UC) FOR THE YEAR 2022-23
In respect of **NON-RECURRING**
as on 28th Jan, 2023 to be submitted to SERB
Is the UCProvisional.... (Provisional/Auditod)
(To be given separately for each financial year ending on 31st March)

1. Name of the grant receiving Organization: **Tozpur University, Assam, India, 784028**
2. Name of Principal Investigator (PI): **Dr. Kusum Kumar Barua**
3. SERB Sanction order no. & date: **CRG/2019/000962 (SERB/F/8963/2019-2020 dated 21 January 2020)**
4. Title of the Project: **Design of Shp in A Bottle Complexes and Zeolite-Y Supported Nanocatalysts For C-CI Bond Activation and C-C Coupling Reactions.**
5. Name of the SERB Scheme: **CRG (CRG/NPDF/ECR etc)**
6. Whether recurring or non-recurring grants: **NON-RECURRING**
7. Grants position at the beginning of the Financial year:
 - (i) Carry forward from previous financial year : **Nil**
 - (ii) Others, If any : **Nil**
 - (iii) **Total** : **Nil**

8. Details of grants received, expenditure incurred and closing balances. (Actuals)

Unspent Balance of Grants received previous years (figure as at Sl. No. 7.(iii))	Interest Earned thereon	Interest deposited back to the SERB	Grants received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balances (5-6)
			Sanction No. (i)	Date (ii)	Amount (iii)			
1	2	3	4	5	6	7		
Rs.0.0	Nil	Nil		Rs. 0.0	Rs. 0.0	Rs. 0.0		
			CRG/2019/000962	9-05-2022	Rs.0.00			

Component wise utilization of grants:

Grants-in-aid- General	Grant-in-aid-creation for capital assets	Total
Nil	Nil	Nil

Details of grants position at the end of the year

- (i) Balance available at end of financial year : **Nil**
- (ii) Unspent balance refunded to SERB (If any) : **Nil**
- (iii) Balance (Carried forward to next financial year) if applicable: **N A**

K. Barua




GFR 12 – A
[(See Rule 238 (1))]
UTILIZATION CERTIFICATE (UC) FOR THE YEAR 2022-23
In respect of NON-RECURRING
as on 28th Jan, 2023 to be submitted to SERB
Is the UC Provisional.... (Provisional/Audited)
(To be given separately for each financial year ending on 31st March)

Certified that I have satisfied that the conditions on which grants were sanctioned have been duly fulfilled/are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

- (i) The main accounts and other subsidiary accounts and registers (including assets registers) are maintained as prescribed in the relevant Act/Rules/Standing instructions (mention the Act/Rules) and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.
- (ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.
- (iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.
- (iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.
- (v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.
- (vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.
- (vii) It has been ensured that the physical and financial performance under CRG. (CRG/NPDF/ECR.....etc.) (Name of the scheme has been according to the requirements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes given at Annexure – I duly enclosed.
- (viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry/Department concerned as per their requirements/specifications.)
- (ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure –II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date: 8-02-2023

Place: Tezpur

 (Dr. Kusum Kumar Bania) Signature of PI:	 Signature with Seal : Name: Chief Finance Officer (Head of Finance) Finance Officer Tezpur University	 Signature with Seal..... Name: Head of Organisation Registrar Tezpur University
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(Strike out inapplicable terms)

GFR 12 – A
[(See Rule 238 (1))]
UTILIZATION CERTIFICATE (UC) FOR THE YEAR 2022-23
in respect of RECURRING
as on 28th Jan, 2023 to be submitted to SERB
Is the UCProvisional (Provisional/Audited)
(To be given separately for each financial year ending on 31st March)

1. Name of the grant receiving Organization: Tezpur University, Assam, India,784028
2. Name of Principal Investigator (PI): Dr. Kusum Kumar Banla
3. SERB Sanction order no. & date CRG/2019/000962 (SERB/F/8963/2019-2020 dated 21 January 2020)
4. Title of the Project: **Design of Ship in A Bottle Complexes and Zeolite-Y Supported Nanocatalysts For C-Cl Bond Activation and C-C Coupling Reactions.**
5. Name of the SERB Scheme:CRG..... (CRG/NPDF/ECR etc.)
6. Whether recurring or non-recurring grants: **RECURRING**
7. Grants position at the beginning of the Financial year:

(i) Carry forward from previous financial year : **Rs. 34365**

(ii) Others, If any (Interest) : **Rs 3720**

(iii) **Total** : **Rs. 38085**

8. Details of grants received, expenditure incurred and closing balances. (Actuals)

Unspent Balance of Grants received previous years (figure as at Sl. No. 7(i))	Interest Earned thereon	Interest deposited back to the SERB	Grants received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balances (5-6)
			Sanction No. (i)	Date (ii)	Amount (iii)			
1	2	3	4			5	6	7
Rs. 34365	Rs. 3720	-				Rs. 838085	Rs. 649181	Rs. 188904
			CRG/2019/000962	9-05-2022	Rs. 800000			

Component wise utilization of grants:

Grants-in-aid- General	Grant-in-aid-creation for capital assets	Total
Consumable: Rs. 186392 Overhead: Rs 101876 Contingency: Rs 4421 Manpower: Rs 338000 Travel: Rs. 18492	NA	Rs. 649181

Details of grants position at the end of the year

(i) Balance available at end of financial year : **Rs. 188904**

(ii) Unspent balance refunded to SERB (If any) :

(iii) Balance (Carried forward to next financial year) if applicable:

K Banla


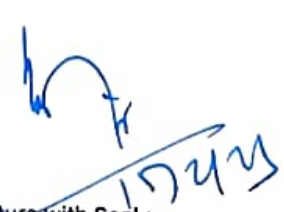
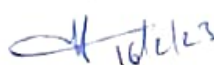
GFR 12 – A
[(See Rule 238 (1))]
UTILIZATION CERTIFICATE (UC) FOR THE YEAR 2022-23
In respect of *RECURRING*
as on 28th Jan, 2023 to be submitted to SERB
Is the UC Provisional (*Provisional/Audited*)
(To be given separately for each financial year ending on 31st March)

Certified that I have satisfied that the conditions on which grants were sanctioned have been duly fulfilled/are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

- (i) The main accounts and other subsidiary accounts and registers (including assets registers) are maintained as prescribed in the relevant Act/Rules/Standing instructions (mention the Act/Rules) and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.
- (ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.
- (iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.
- (iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.
- (v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.
- (vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.
- (vii) It has been ensured that the physical and financial performance underCRG..... (**CRG/NPDF/ECR.....etc.**) (Name of the scheme has been according to the requirements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes given at Annexure – I duly enclosed.
- (viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry/Department concerned as per their requirements/specifications.)
- (ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure –II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date: 8-02-2023

Place: Tezpur

 (Dr. Kusum Kumar Bania) Signature of PI:	 Signature with Seal : Name: Chief Finance Officer (Head of Finance)	 Signature with Seal..... Name: Head of Organisation
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Finance Officer
Tezpur University

Registrar
Tezpur University