



Office of the Controller General of Patents, Designs & Trade Marks  
Department of Industrial Policy & Promotion,  
Ministry of Commerce & Industry,  
Government of India



#### Application Details

APPLICATION NUMBER 202241004316  
APPLICATION TYPE ORDINARY APPLICATION  
DATE OF FILING 25/01/2022  
APPLICANT NAME  
1. Dr Plyush Gaur  
2. Mr. M.S.Santhosh  
3. Dr. Suyash Yashwantrao Fawar  
4. Mr. Makarand Bhikaji Shrinie  
5. Dr. Koll Gajanan Chandrashekhar  
6. Mr. Berl Venkata Himasekhar Sal  
7. Mr. Prafulla Kumar Sahoo  
8. Dr. Boda Surya Venkata Ramarao  
TITLE OF INVENTION Fatigue Testing For Reliability Assessments Of FRC Polymer Materials In Micro/Nano Systems  
FIELD OF INVENTION PHYSICS  
E-MAIL (As Per Record) mail2patentipr@gmail.com  
ADDITIONAL-EMAIL (As Per Record)  
E-MAIL (UPDATED Online)  
PRIORITY DATE  
REQUEST FOR EXAMINATION DATE --  
PUBLICATION DATE (U/S 11A) 04/02/2022

#### Application Status

APPLICATION STATUS

Awaiting Request for Examination

[View Documents](#)



In case of any discrepancy in status, kindly contact lpo-helpdesk@nic.in

PRINCIPAL  
Sanjeevan Engg. & Tech. Institute  
Somwar Peth, Panhala - 416 201



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Controller General of Patents, Designs & Trade  
Marks  
G.S.T. Road, Gulindy, Chennai-600032  
Tel No. (091)(044) 22502081-84 Fax No. 044 22502066  
E-mail: chennai-patent@nic.in  
Web Site: www.ipindia.gov.in



सत्यमेव जयते

G.A.R.6  
[See Rule 22(1)]  
RECEIPT



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Docket No 33373

Date/Time 2022/04/13 08:15:48

To  
Harish Sharma

Userid: Inpa3649

A-2, Sect.-60, Noida, Uttar Pradesh

## CBR Detail:

Sr. No.	Ref. No./Application No.	App. Number	Amount Paid	C.B.R. No.	Form Name	Remarks
1	E-12/2595/2022/CHE	202241021963	2500	14767	FORM 9	
2	202241021963	TEMP/E-1/23794/2022-CHE	1600	14767	FORM 1	Wireless sensor based monitoring of air pollution Agriculture land

TransactionID	Payment Mode	Challan Identification Number	Amount Paid	Head of A/C No
N-0000950843	Online Bank Transfer	1304220000563	4100.00	1475001020000001

Total Amount : ₹ 4100.00

Amount in Words: Rupees Four Thousand One Hundred Only

Received from Harish Sharma the sum of ₹ 4100.00 on account of Payment of fee for above mentioned Application/Forms.

\* This is a computer generated receipt, hence no signature required.

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Somwar Peth, Panhala - 416 201



<b>FORM 1</b> THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 <b>APPLICATION FOR GRANT OF PATENT</b> (See section 7, 54 and 135 and sub-rule (1) of rule 20)				(FOR OFFICE USE ONLY)	
				Application No.	
				Filing date:	
				Amount of Fee paid:	
				CBR No:	
				Signature:	
<b>1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)</b>					
<b>2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]</b>					
Ordinary (✓)		Convention ( )		PCT-NP ( )	
Divisional ( )	Patent of Addition ( )	Divisional ( )	Patent of Addition ( )	Divisional ( )	Patent of Addition ( )
<b>3A. APPLICANT(S)</b>					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
1. Dr. P. Solainayagi		Indian	India	Associate Professor, Department of Computer Science and Engineering, Aarupadai Veedu Institute of Technology, Paiyanoor, Chennai-603104.	
2. Dr. V. Nivedhitha		Indian	India	Associate Professor, Department of CSE, SSM Institute of Engineering and Technology, Dindigul-Palani Highway, Dindigul – 624002.	
3. Dr. Shashishankar.A		Indian	India	Professor and Head, Department of Civil Engineering, AMC Engineering College, (Affiliated to VTU), Bannerghatta Road, Bengaluru-560083.	
4. Ganesh S S Y		Indian	India	Assistant Professor, Civil Engineering Department,	

1


  
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			AMC Engineering College, (Affiliated to VTU), Bannerghatta Road, Bengaluru-560083.
5. Mr. Shivaprasad D	Indian	India	Assistant Professor, Mechanical Engineering Department, AMC Engineering College, (Affiliated to VTU), Bannerghatta Road, Bengaluru-560083.
6. Mr. Sardar Balaso Deshmukh	Indian	India	Assistant Professor, Mechanical Engineering Department, Sanjeevan Engineering & Technology Institute, Panhala Sanjeevan knowledge city, A/P - Somwar Peth-Injole, Panhala, Tal. Panhala, Dist. Kolhapur - 416201.
7. Mr. Umashanker.L	Indian	India	Associate Professor, Mechanical Engineering Department, AMC Engineering College, (Affiliated to VTU), Bannerghatta Road, Bengaluru-560083.
8. Dr.N. Sivakumar	Indian	India	Professor, Department of Mechanical Engineering, 39D/3A, Vivekkandar Salai, Housing Board Colony, Sarakkal Villai, Nagercoil-629002.
<b>3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]</b>			
Natural Person (✓)		Other than Natural Person	
		Small Entity ( )	Startup ( )      Others ( )
<b>4. INVENTOR(S) [Please tick (✓) at the appropriate category]</b>			
Are all the inventor(s) same as the applicant(s) named above?	Yes (✓)		No ( )
<b>If "No", furnish the details of the inventor(s)</b>			
Name in Full	Nationality	Country of Residence	Address of the Inventor
Same as Applicant			
<b>5. TITLE OF THE INVENTION</b>			
"Wireless sensor based monitoring of air pollution Agriculture land"			



Controller General of Patents, Designs & Trade Marks



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G.A.R.6  
[See Rule 22(1)]  
RECEIPT



Docket No 42255

Date/Time 2022/05/10 20:27:37

Harish Sharma A-2, Sect.-60, Noida, Uttar Pradesh

Sr. No.	Ref. No./Application No.	App. Number	Amount Paid	C.B.R. No.	Form Name	Fee Payment	Remarks
1	202241027022	TEMP/E-1/29893/2022-CHE	1600	18683	FORM 1	Full	ADVANCED ROBOT FOR MANUFACTURING ASSEMBLY SELF-BALANCING ELECTRIC SCOOTER
2	E-12/3424/2022/CHE	202241027022	2500	18683	FORM 9	Full	

TransactionID	Payment Mode	Challan Identification Number	Amount Paid	Head of A/C No
N-0000962922	Online Bank Transfer	1005220026671	4100.00	1475001020000001

Total Amount : ₹ 4100.00

Amount in Words: Rupees Four Thousand One Hundred Only

Received from Harish Sharma the sum of ₹ 4100.00 on account of Payment of fee for above mentioned Application/Forms.

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4. Er.Ashish Kumar Bhateja	Indian	India	Head of Department of Automation and Robotics Gulzar Group of Institutions, Ludhiana, 141401 Ludhiana / Punjab
5. Dr. Koli Gajanan Chandrashekhar	Indian	India	Assistant Professor, Mechanical Engineering Department. Sanjeevan Engineering & Technology Institute, Panhala Sanjeevan knowledge city, A/P - SomwarPeth-Injole, Panhala, Tal. Panhala, Dist. Kolhapur - 416201.
6. Dr. Vinayaka N	Indian	India	Associate Professor, Department of Aeronautical Engineering, Nitte Meenakshi Institute of Technology, Yelahanka, Bengaluru - 560064.
7. Mr. Prajval V	Indian	India	Research Manager, BCX Bioorganics, Bangalore, Karnataka
8. Dr.Amuthan Nallathambi	Indian	India	Professor, Department of Electrical and Electronics Engineering Amc Engineering College, (Affiliated to VTU) Bannerghatta Road Bengaluru, Karnataka-560083
<b>3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]</b>			
Natural Person (✓)		Other than Natural Person	
		Small Entity ( )	Startup ( )      Others ( )
<b>4. INVENTOR(S) [Please tick (✓) at the appropriate category]</b>			
Are all the inventor(s) same as the applicant(s) named above?	Yes (✓)		No ( )
If "No", furnish the details of the inventor(s)			
Name in Full	Nationality	Country of Residence	Address of the Inventor
Same as Applicant			
<b>5. TITLE OF THE INVENTION</b>			
"ADVANCED ROBOT FOR MANUFACTURING ASSEMBLY SELF-BALANCING ELECTRIC SCOOTER"			
<b>6. AUTHORISED REGISTERED PATENT AGENT(S)</b>		IN/PA No.	
		Name	





ORIGINAL

मूल/No : 121603



भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE

डिजाइन के पंजीकरण का प्रमाणपत्र  
CERTIFICATE OF REGISTRATION OF DESIGN

डिजाइन सं. / Design No. : 353912-001  
तारीख / Date : 29/11/2021  
पारस्परिकता तारीख / Reciprocity Date\* :  
देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **A FOLDABLE ELECTRIC VEHICLE CHASSIS** से संबंधित है, का पंजीकरण, श्रेणी **12-11** में **1.Dr. Vinayaka N 2. Dr. Barla Madhav 3.Dr. Koli Gajanan Chandrashekhar 4.Mr. Katkar Ajit Ashok** के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class **12-11** in respect of the application of such design to **A FOLDABLE ELECTRIC VEHICLE CHASSIS** in the name of **1.Dr. Vinayaka N 2. Dr. Barla Madhav 3.Dr. Koli Gajanan Chandrashekhar 4.Mr. Katkar Ajit Ashok**.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्याधीन प्रावधानों के अनुसरण में।

In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

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GEOGRAPHICAL INDICATIONS

निर्गमन की तारीख/Date of Issue : 23/12/2022

  
महानियंत्रक पेटेंट डिजाइन और व्यापार चिह्न  
Controller General of Patents, Designs and Trade Marks

पारस्परिकता तारीख (यदि कोई हो) जिसकी अनुमति देश के नाम पर की गई है। डिजाइन का सत्त्वाधिकार पंजीकरण की तारीख से दस वर्षों के लिए होगा जिसका विस्तार, अधिनियम एवं नियम के निबंधनों के अधीन, पाँच वर्षों की अतिरिक्त अवधि के लिए किया जा सकेगा। इस प्रमाण पत्र का उपयोग विधिक कार्यवाहियों अथवा विदेश में पंजीकरण प्राप्त करने के लिए नहीं हो सकता है।  
\*The reciprocity date (if any) which has been allowed and the name of the country. Copyright in the design will subsist for ten years from the date of Registration, and may under the terms of the Act and Rules, be extended for a further period of five years. This Certificate is not for use in legal proceedings or for obtaining registration abroad.

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Ministry of Science & Technology  
Government of India

## Project Proposal On

*"Harnessing Artificial Intelligence and CST Technology for Smart Fish  
Drying Enhancing Food Safety and Quality for Fisherfolk"*

**Submitted to**

**Division :SEED**

**Programme or Scheme : STI Hub for SC Community**

**Submitted by**

**Project Investigator:**

**Dr. KOLI GAJANAN CHANDRASHEKHAR**

**SANJEEVAN ENGINEERING AND TECHNOLOGY INSTITUTE,  
PANHALA-PANHALA**

**PRINCIPAL**

**Sanjeevan Engg. & Tech. Institute**

## Part 1 : General Information

### General Information:

Name of the Institute/University/Organisation submitting the Project Proposal :

SANJEEVAN ENGINEERING AND  
TECHNOLOGY INSTITUTE,  
PANHALA

State : Maharashtra

Principal Investigator Name: Dr. KOLI GAJANAN CHANDRASHEKHAR

Category: OBC

Type of the Institute : Academic Institutions (Private)

Project Title : Harnessing Artificial Intelligence and CST Technology for Smart Fish Drying  
Enhancing Food Safety and Quality for Fisherfolk

Division : SEED

Programme Or Scheme : STI Hub for SC Community

Academic Area : Mechanical Engineering,

Application Area : Energy, Food and agriculture,

Government National Initiative : Make in India, Startup India,

Type of Proposal : Proposal Against Call

Project Duration : 3 Years

Proposal Submit Date : 30/07/2023

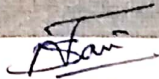
Project Keywords : Artificial Intelligence, CSM, Smart Fish Drying, and Fisherfolk

### Project Summary :

The innovative project aims to improve food safety and quality for fisherfolk by harnessing the power of Artificial Intelligence AI and CST Cognitive Sensing Technology for smart fish drying. The system will utilize AI algorithms and CST sensors to monitor and optimize the fish drying process, ensuring uniformity and reducing the risk of spoilage and contamination. Real-time data analysis will enable timely interventions, preserving essential nutrients and enhancing the overall quality of dried fish products. By empowering fisherfolk with advanced technology, this project strives to create sustainable economic opportunities while promoting safer and healthier food practices in coastal communities.

## Part 2: Particulars of Investigators

### Principal Investigator:

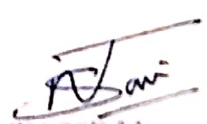
  
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Somwar Peth, Panhala - 416 201



**1. Name:** Dr. KOLI GAJANAN CHANDRASHEKHAR  
**Gender:** Male  
**Date of Birth:** 12/06/1982  
**Designation :** ASSOCIATE PROFESSOR  
**Department:** MECHANICAL ENGINEERING  
**Institute/University:** SANJEEVAN ENGINEERING AND TECHNOLOGY INSTITUTE, PANHALA  
**State:** Maharashtra  
**District:** Kolhapur  
**City/Place:** PANHALA  
**Address:** SOMWAR PETH-INJOLE, PANHALA, DIST KOLHAPUR  
**Pin:** 416201  
**Communication Email:** gckoli@gmail.com  
**Alternate Email:**  
**Mobile:** 7722076379  
**Phone:**  
**Fax:**  
**Category:** OBC

**Co-Investigator:**

**1. Name:** Dr. Sanjeev N Jain  
**Gender:** Male  
**Date of Birth:** 23/01/1968  
**Designation :** Principal  
**Department:** Electronics engineering  
**Institute/University:** SANJEEVAN ENGINEERING AND TECHNOLOGY INSTITUTE, PANHALA

  
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Sanjeevan Engg. & Tech. Institute  
Somwar Peth, Panhala - 416 201





**State:** Maharashtra  
**District:** Kolhapur  
**City/Place:** Panhala  
**Address:** Sanjeevan Engineering amp Technology Institute  
 Panhala, MH, India  
**Pin:** 416201  
**Communication Email:** gckoli@gmail.com  
**Alternate Email:**  
**Mobile:** 7722076379  
**Phone:**  
**Fax:**  
**Category:** General

### Part 3: Suggested Refrees

**Suggested Refrees: NA**

### Part 4: Financial Details

#### Financial Details:

#### A. Non - Recurring

##### Equipment

S.	Equipments	Qty.	Justification	1 Year	Total
1.	Linear Fresnel lenses	2	This is the main piece of equipment that will be used to dry the fish. The dryer should be able to control the temperature and humidity levels to ensure that the fish is dried safely and evenly.	400000	400000
<b>Total</b>				<b>400000</b>	<b>400000</b>

#### B. Recurring

##### Project Staff

S.	Project Staff	No.	Justification	1 Year	2 Year	3 Year	Total
1.	Others	2	Mechanical Engineer, and CST Technology expert	266000	266000	266000	798000

*[Signature]*  
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2.	Project Manager	1	The project manager will be responsible for overseeing the entire project, from planning to implementation. They will be responsible for ensuring that the project stays on track and within budget.	133000	133000	133000	399000
<b>Total</b>				<b>399000</b>	<b>399000</b>	<b>399000</b>	<b>1197000</b>

### Consumables

S.	Items	Qty.	Justification	1 Year	2 Year	3 Year	Total
1.	camera	3	The camera will be used to monitor the fish drying process. The camera will be able to capture images of the fish at regular intervals, which will be used by the AI to assess the drying process and make adjustments as needed.	300000	0	0	300000
2.	Food Safety Testing Equipment	2	Laboratory equipment for testing fish quality and safety, including microbial testing, moisture content analysis, and chemical analysis.	60000	0	0	60000
3.	Kuro WorkStation Model C1	1	The computer will be used to run the AI software. The software will analyze the images captured by the camera and make recommendations on how to adjust the drying process.	200000	0	0	200000
4.	Networking Equipment	1	Routers, switches, and cables: For setting up a local network between the AI hardware, IoT devices, and data collection systems.	150000	0	0	150000
5.	Temperature and Humidity Sensors	4	These sensors are essential to monitor the drying conditions inside the dryer and provide data for AI analysis and control.	24000	0	0	24000
<b>Total</b>				<b>734000</b>	<b>0</b>	<b>0</b>	<b>734000</b>

### Contingency

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1.	other expenses and unexpected cost	other expenses and unexpected cost	25000	25000	25000	75000
<b>Total</b>			<b>25000</b>	<b>25000</b>	<b>25000</b>	<b>75000</b>

### Travel

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1.	Experts Travel	Experts Travel and expenses.	35000	35000	35000	105000
2.	Transporting the equipment and consumables	Transporting the equipment and consumables	30000	30000	30000	90000
<b>Total</b>			<b>65000</b>	<b>65000</b>	<b>65000</b>	<b>195000</b>

### Overhead

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1.	unexpected expenses and other cost	unexpected expenses and other cost	25000	25000	25000	75000
<b>Total</b>			<b>25000</b>	<b>25000</b>	<b>25000</b>	<b>75000</b>

## Budget Head Summary in (INR)

Budget Head	Year-1	Year-2	Year-3	Total
<b>1- Non-Recurring</b>				
Equipment	400000	0	0	400000
Subtotal (Capital)	400000	0	0	400000
<b>2- Recurring</b>				
Project Staff	399000	399000	399000	1197000
Consumables	734000	0	0	734000
Contingency	25000	25000	25000	75000
Travel	65000	65000	65000	195000
Overhead	25000	25000	25000	75000
Subtotal (General)	1248000	514000	514000	2276000





Total Project Cost (Capital + General)	1648000	514000	514000	2676000
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## Part 5: PFMS Details

### PFMS Unique Code Available: No

**Type of Registration :** Academic Institutions (Private)

**PAN Number :** -

**Agency Name :** SANJEEVAN ENGINEERING AND TECHNOLOGY INSTITUTE, PANHALA

**Act Registration No. :** AICTE ID: 1-8019451

**Registering Authority :** Any Other

**Registering Authority Other :** ALL INDIA COUNCIL FOR TECHNICAL EDUCATION NEW DELHI

**TIN Number :** -

**TAN Number :** KLPP024OGB

**GST Number :** -

**Block No /Building /Village /Name of Premises :** SANJEEVAN ENGINEERING & TECHNOLOGY INSTITUTE, PANHALA

**Road/Street/Post Office :** SOWWAR PETH - INJOLE

**Area/Loacality :** SANJEEVAN KNOWLEDGE CITY

**City :** PANHALA

**Pin Code :** 416201

**State :** Maharashtra

**District :** Kolhapur

**Contact Person :** Dr.Koli Gajanan Chandrasehekhar

**Designation :** ASSOCIATE PROFESSOR

**Phone Number :** 02312686600

**Mobile Number :** 7722076379

**Email ID :** gckoll@gmail.com

*Dr. Koli*  
**PRINCIPAL**  
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 Somwar Peth, Panhala - 416 201

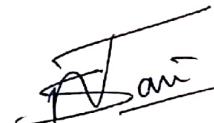




Bank Name : The Cosmos Cooperative Bank Ltd  
Branch Address of the Bank : Laximpuri Branch  
Bank Branch Name : Laximpuri branch  
Bank Account Number of the Beneficiary : 088100102356  
IFSC Code of the bank : COSB0000088  
MICR Code of the bank : COSB00000

### Part 6: Current Ongoing Project

Current Ongoing Project: NA



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पेटेंट कार्यालय  
शासकीय जर्नल

OFFICIAL JOURNAL  
OF  
THE PATENT OFFICE


निर्गमन सं. 11/2022  
ISSUE NO. 11/2022

शुक्रवार  
FRIDAY

दिनांक: 18/03/2022  
DATE: 18/03/2022

पेटेंट कार्यालय का एक प्रकाशन  
PUBLICATION OF THE PATENT OFFICE

The Patent Office Journal No. 11/2022 Dated 18/03/2022

  
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Somwar Peth, Panhala, Dist. Kolhapur. (MS)



  
HOD

16363

Department of Computer Science  
& Engineering  
Sanjeevan Engg. & Tech. Institute  
Somwar Peth, Panhala-416 204

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202241010481 A

(19) INDIA

(22) Date of filing of Application :27/02/2022

(43) Publication Date : 18/03/2022

(54) Title of the invention : AI BASED SMART METER FOR MUNICIPAL WASTE WATER TREATMENT BY ELECTROCHEMICAL TECHNIQUE AND QUALITY MONITORING USING IOT

(51) International classification :G01F0015060000, G01F0015000000, G06Q0050060000, G01F0001075000, E03B0007070000

(86) International Application No :PCT//  
Filing Date :01/01/1900

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA  
Filing Date :NA

(62) Divisional to Application Number :NA  
Filing Date :NA

(71)Name of Applicant :

1)Santosh M Nejakar

Address of Applicant :Nejakar Technologies, Siddadevanagar, Near Head Post Office -----

2)PRASHANT BASAVARAJ BHAGAWATI

Name of Applicant : NA

Address of Applicant : NA

(72)Name of Inventor :

1)PRASHANT BASAVARAJ BHAGAWATI

Address of Applicant :Assistant Professor, Civil Engineering, Annasaheb Dange College of Engineering and Technology Ashta Ashta Maharashtra India 416301 -----

2)B. RAMESH BABU

Address of Applicant :Professor Process Engineering Division, CSIR-Central Electrochemical Research Institute Karaikudi, Tamilnadu India 630003 -----

3)DR. SUHAS GAJANAN SAPATE

Address of Applicant :Professor Computer Science and Engineering, Annasaheb Dange College of Engineering and Technology Ashta Ashta Maharashtra India 416301 -----

4)SAYED AHMED IMRAN BELLARY

Address of Applicant :Professor Mechanical Engineering, Anjuman-I-Islam's Kalsekar Technical Campus, Plot# 2 and 3, Sector 16, Near Thank Naka New Panvel, Navi Mumbai Maharashtra India -----

5)DR. SANTOSH M HERUR

Address of Applicant :Associate Professor and Head, Dept of ECE, Jain Institute of Technology Bada Cross Davanagere Karnataka India 577005 -----

(57) Abstract :

Due to the drawback highlighted in the existing system, there should be a meter which can overcome all this drawbacks and this can be done by installing our Smart Water Meter in your building/Apartment. Smart Water Meter which provides the water consumption details (with the help of water flow sensor) and checks if any leakage detection and quality of water(Turbidity sensor) can be checked. we can check all this things with the help of our website and with our App, both are developed to check the consumption details and we can make an billing through the website/App and we can monitor the quality of water also through this website/App and the details can be exported to the excel sheet and we can analyze the consumption of water on monthly basis according to requirements of the user and main admin can check the consumption of each house holders in the Apartment/building by using their login credentials and the house holders can check their water consumption details with helpof their login credentials which will be provided by the main admin while installing this Smart Water Meter. And if any waste water is entered through the valve it will be detected by our smart meter and the indication will be sent to the App as a pop-up message and eventually user can use that water if the needed or else he can stop that water or else water can be exited in other exit valve. And in the same manner if any leakage is found anywhere in the connection(pipe) Smart Meter will show the indication with the help of website/App to the user by sending the pop-up and then the action can be taken, by the respective users(house holders).

No. of Pages : 12 No. of Claims : 3

The Patent Office Journal No. 11/2022 Dated 18/03/2022

  
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## 1. Patent Search

Ai Based Smart Meter For Municipal Waste Water Treatment By Electrochemical Technique And Quality Monitoring Using Iot

ORDINARY APPLICATION

published



# **Ai Based Smart Meter For Municipal Waste Water Treatment By Electrochemical Technique And Quality Monitoring Using Iot**

## Documents

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- Information
- Documents

Due to the drawback highlighted in the existing system, there should be a meter which can overcome all this drawbacks and this can be done by installing our Smart Water Meter in your building/Apartment.

Smart Water Meter which provides the water consumption details (with the help of water flow sensor) and checks if any leakage detection and quality of water(Turbidity sensor) can be checked.

we can check all this things with the help of our website and with our App, both are developed to check the consumption details and we can make an billing through the website/App and we can monitor the quality of water also through this website/App and the details can be exported to the excel sheet and we can analyze the consumption of water on monthly basis according to requirements of the user and main admin can check the consumption of each house holders in the Apartment/building by using their login credentials and the house holders can check their water consumption details with helpof their login credentials which will be provided by the main admin while installing this Smart Water Meter.

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Application ID 202241010481

Invention Field PHYSICS

Date of Application 2022-02-27

Publication Number 11/2022

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DR. SANTOSH M HERUR	Associate Professor and Head, Dept of ECE, Jain Institute of Technology Bada Cross Davanagere Karnataka India 577005	India	India

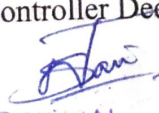
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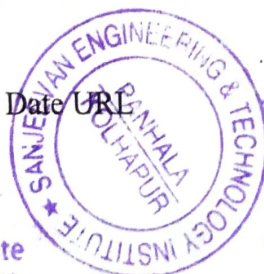
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## Orders

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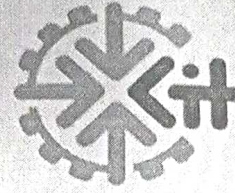
  
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KOLHAPUR

Accredited 'A' Grade by NAAC, Bengaluru

Ref.: KIT/CEK/ No 02076

Date: 27/12/2022

27 DEC 2022

To,  
The Registrar,  
Shivaji University, Kolhapur

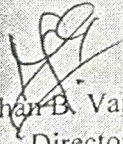
Subject: Regarding Research Proposal under Diamond Jubilee Research Initiation Scheme

Dear Sir,

Dr. Udaysinh Shivaji Bhapkar, Professor, Department of Mechanical Engineering, Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur is submitting research proposal entitled "Chemical synthesis of SnO<sub>2</sub>-Polymer nanocomposites for coating and study of anticorrosive properties of coated steel." for the Diamond Jubilee Research Initiation Scheme.

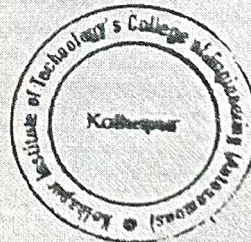
You are requested to accept the proposal

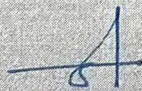
Regards,

  
Dr. Mohan B. Vanarotti  
Director

Kolhapur Institute of Technology's  
College of Engineering (Autonomous), Kolhapur

**Director**  
Kolhapur Institute of Technology's  
College of Engineering (Autonomous)  
Kolhapur

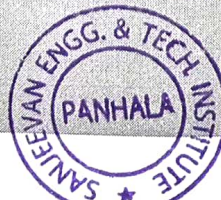


  
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A Research Project Proposal

Under

Diamond Jubilee Research Initiation scheme

Shivaji University, Kolhapur

Entitled

Chemical synthesis of  $\text{SnO}_2$ -Polymer nanocomposites for coating  
and study of anticorrosive properties of coated steel.

Submitted by



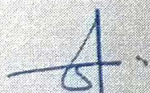
Dr. UDAYSINH SHIVAJI BHAPKAR

Department of Mechanical Engineering

Kolhapur Institute of Technology's

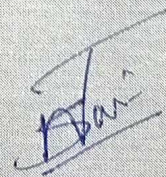
College of Engineering (Autonomous), Kolhapur-416234 (MS)

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**SHIVAJI UNIVERSITY, KOLHAPUR**  
**DIAMOND JUBILEE**  
**RESEARCH INITIATION SCHEME**  
**Format for Submission of Proposal for Research Project**

**PART-I**

- 1) Broad Subject: Material Science Faculty: Mr. Dhananjay Vasantao Patil  
 2) Area of Specialization: Anticorrosive Coating  
 3) Duration: 36 months  
 4) Principal Investigator:

i)	Name	Dr. U.S.Bhapkar
ii)	Sex	Male
iii)	Date of Birth	05/03/1977
iv)	Qualification	Ph.D. Mechanical Engineering Thermal and Fluids Engineering
v)	Designation	Professor
vi)	Address Office : Residence :	KIT's College of Engineering, (Autonomous) Kolhapur.
vii)	Date of joining the service as a teacher	01/07/2004
viii)	Date of confirmation	01/07/2004

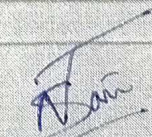
- 5) Co-Investigator(s) (If any):

i)	Name	Mr. Dhananjay Vasantao Patil
ii)	Sex	Male
iii)	Date of Birth	09/10/1986
iv)	Qualification	M.E. Mechanical Engg.
v)	Designation	Assistant Professor
vi)	Address Office : Residence :	Sanjeevan Engineering and Technology Institute, Panhala. At/p.Vadanage, Tal. Karveer, Dist.Kolhapur. 416229.

- 1) Co-Investigator(s) (If any):

i)	Name	Dr. S.S. Potdar
ii)	Sex	Male
iii)	Date of Birth	20/12/1982

  
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iv)	Qualification	MSc. Ph.D.
v)	Designation	Assistant Professor
vi)	Address Office : Residence :	Sanjeevan Engineering and Technology Institute, Panhala. At/p.Vadanage, Tal. Karveer, Dist.Kolhapur. 416229.

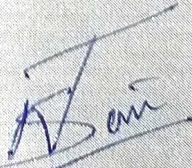
- 6) Details of the College/Institution where the project will be undertaken:
- Department: **Mechanical Engineering Department**
  - Name of the College: **KIT's College of Engineering, (Autonomous)  
Kolhapur.**

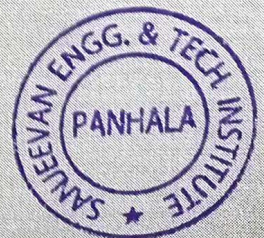
7) Teaching and Research Experience of Principal Investigator:

a.	Teaching experience	21 Years
b.	Research experience	06 Years
c.	Title of Ph.D./M. Phil. thesis if PI has been awarded	Experimental Investigation of Fluid Flow, Heat Transfer and Acoustic Aspects of Impinging Synthetic Jets
d.	Publications	Peer reviewed Journals – 17 International Conferences - 03
	i. Papers Published Accepted Communicated	
	ii. Books Published	

(Please enclose the list of papers and books published and/or accepted during last five years)

  
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## Part II

### 8) Proposed Research work:


#### i) Project title

Chemical synthesis of  $\text{SnO}_2$ -Polymer nanocomposites for coating and study of anticorrosive properties of coated steel.

#### ii) Introduction

##### a) Origin of the research problem and interdisciplinary relevance:

Corrosion is an undesirable natural process that has arisen from the use of metallic materials; therefore, serious efforts to prevent this phenomenon are ongoing through this century. Corrosion is defined as an attack on a material by its reaction to the environment and the resulting deterioration of the material's properties. Most often, it is related to an electrochemical reaction with a liquid or gaseous medium [1]. Aside from industrial dangers, corrosion affects our lives as we travel to school, work, and for leisure. Endangering public safety and resulting in significant repair costs are the effects of corrosion on bridges, parking structures, buildings, electrical towers, highways, etc. should these collapses, because of a weak, corroded section and disaster could result. The most effective method of preventing the harmful effect of the corrosion attack on the parts is adding a protective barrier between the part and the corrosive environment. Protective coatings have been widely used for metal corrosion control. The use of conducting polymers for the inhibition of corrosion is an area which is very recently gaining increasing attention [2]. There are many types of coatings available, but all work toward the same outcome lengthening the life and usability of parts, components, machinery, products, etc. the protection of these elements not only helps to maintain an industry's equipment but can help protect human lives as well. Various strategies, such as metal surface coating, environmental modifications, the use of corrosion inhibitors, and changes in pH and potential by cathodic or anodic reaction, are used to lower corrosion rate. Recently, nanostructured materials have attracted great interest due to their electrical, optical, magnetic and mechanical properties contributed by confining the dimensions of materials, and the entire behaviors of nanostructured materials show combination of surface and bulk properties. Low-dimensional nanostructured materials have been

  
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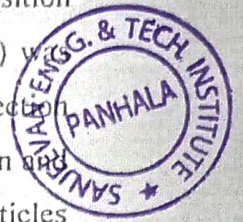
successfully synthesized and have drawn much attention because of their fundamental roles in understanding the quantum size effect and great potential applications in light-emitting diodes, gas sensors, Nano thermometers, solar cells, fuel cells, anti-corrosive testing, etc. Nanomaterial's and their additives are effective corrosion inhibitors because they have a higher surface-to-volume ratio than traditional macroscopic materials [3]. By inhibiting active sites on metal surfaces, nano compounds limit surface reactions and control corrosion rates. The most important application of nanoparticles in the industrial field is their ability to protect metals from corrosion in different environments.

**b) Review of research and development in the subject:**

Aisha Ganash [2] experimentally tested anticorrosive properties of Poly (o-phenylenediamine)/ZnO nanocomposites coated stainless steel. Poly (o-phenylenediamine) and poly (o-phenylenediamine)/ZnO (PoPd/ZnO) nanocomposites coating were prepared on type-304 austenitic stainless steel (SS) using  $H_2SO_4$  acid as electrolyte by potentiostatic methods. Fourier transforms infrared spectroscopy and scanning electron microscopy techniques were used to characterize the composition and structure of PoPd/ZnO nanocomposites. The corrosion protection of polymer coatings ability was studied by Eocp-time measurement, anodic and cathodic potentiodynamic polarization and impedance techniques in 3.5 % NaCl as corrosive solution. It was found that ZnO nanoparticles improve the barrier and electrochemical anticorrosive properties of poly (o-phenylenediamine). Ana Karen Acero-Gutierrez *et al.* [4] studied to improve corrosion resistance; carbon steel is successfully coated with  $SiO_2$  by the sol-gel process. The addition of  $SnO_2$  nanoparticles to the coating has a significant effect on the formation of the sol-gel film and thus the resistance of the coated substrate in the corrosive medium. The sol-gel  $SiO_2$  incorporation of tin oxide (IV) coating helps protect A36 steel from corrosion. Very low and very high  $SnO_2$  concentrations led to reduced inhibition, and the optimal concentration of  $SnO_2$  nanoparticles was found to be 2.5 vol %. Muna Ibrahim *et al.* [5] investigated enhanced corrosion protection of Epoxy/ZnO-NiO nanocomposite coating on steel. The sol-gel method ZnO-NiO nanocomposite with epoxy coating a mild steel was fabricated. The structural and morphological characterization of the metal oxide nanocomposite was carried out. Electrochemical impedance spectroscopy authenticated that the corrosion resistance has improved for the nanocomposites of



ZnO-NiO coated along with epoxy on steel in comparison to that of the pure epoxy-coated steel. Rasoul Babaei-Sati *et al.* [6] studied electrodeposition of polypyrrole/metal oxide nanocomposites for corrosion protection of mild steel. Electrodeposition of polypyrrole (PPy) and PPy-metal oxide nanocomposites on mild steel (MS) was carried out in oxalic acid solution by constant potential technique. The protective properties of coatings were studied in 0.5M H<sub>2</sub>SO<sub>4</sub> solution by Tafel polarization and electrochemical impedance spectroscopy (EIS). The effect of different nanoparticles (Al<sub>2</sub>O<sub>3</sub>, ZnO, TiO<sub>2</sub>, CeO<sub>2</sub> and SnO<sub>2</sub>) on the protection performance of the nanocomposite coatings was compared. The results reveal that PPy/Al<sub>2</sub>O<sub>3</sub> nanocomposite provided the best performance for corrosion protection of the MS by reducing its corrosion current density by 18 times. Shihui Qiu *et al.* [7] investigated long-term corrosion protection of mild steel by an epoxy coating containing self-doped polyaniline nanofiber sulfonated polyaniline (SPANI). SPANI was synthesized via the copolymerization of 2-aminobenzenesulfonic acid and aniline and then characterized. The SPANI/epoxy composite coatings on the steel substrate were prepared for the anti-corrosive investigations in a 3.5 wt % NaCl solution via electrochemical impedance spectroscopy and polarization curves. It turned out that composite coatings with SPANI exhibited excellent protective performance with high impedance modulus during the 120 days immersion while blank epoxy coating was invalid after 80 days immersion. Ali Olad *et al.* [8] have worked on preparation and corrosion resistance of nanostructured PVC/ZnO-polyaniline hybrid coating. They were prepared, characterized the composition and structure of ZnO-polyaniline nanocomposite. The ZnO-polyaniline nanocomposite was mixed with polyvinyl chloride (PVC) through a solution mixing method. Three components PVC/ZnO-polyaniline hybrid material was applied as coating on iron coupon by the solution casting method. Corrosion protection efficiency of hybrid coating studied by open circuit potential and Tafel technique in 3.5 % NaCl solution as corrosive environment. It was found that ZnO nanoparticles improve the barrier and electrochemical anticorrosive properties of polyaniline and addition of PVC increases the barrier effect of polyaniline coating. M. Kantorova *et al.* [9] investigated mixed metal oxides with the structure of perovskite for anticorrosion organic coatings. Mixed metal oxides pigments of TiO<sub>2</sub>.ZnO, 2TiO<sub>2</sub>.ZnO, Zn<sub>2</sub>TiO<sub>4</sub>, MgTiO<sub>3</sub>, CaTiO<sub>3</sub>, TiO<sub>2</sub>.ZnO.MgO, and TiO<sub>2</sub>.ZnO.SrO were synthesized from corresponding oxides or carbonates at high temperature. The obtained metal mixed oxides were characterized






by means of X-ray diffraction analysis, measurement of particle sizes and scanning electron microscopy. The synthesized metal mixed oxides were used to produce epoxy-ester coatings with 10 % PVC for a synthesized pigment. The coatings were tested for physical-mechanical properties and in corrosion atmospheres. The results of corrosion tests were compared with standard alumino zinc phosphomolybdate. The outcome was the synthesized pigment displayed higher anticorrosion efficiency than the commonly applied aluminum-zinc phosphomolybdate based anticorrosion pigment. J.N. Hasnidawani *et al.* [10] experimented ZnO nanoparticles as anticorrosion nanocoating on carbon steel. Mild carbon steel was used as the substrate for the epoxy-zinc oxide coating. The corrosion behavior mechanism of mild steel was investigated in different media, namely freshwater, NaCl solution, HCl solution and NaOH solution. Immersion test was conducted and studied for a period of 60 days, with daily and weekly weighing and immersing. The corrosion rate was calculated and mild steel corrodes in the different environment and degrades in the following trend; HCl  $\rightarrow$  NaCl  $\rightarrow$  NaOH  $\rightarrow$  H<sub>2</sub>O. A.V. Radhamani *et al.* [11] reviewed nanocomposite coatings on steel for enhancing the corrosion resistance. Nanocomposite coating is being explored as the preferred strategy to improve corrosion resistance for steel. They discussed the various coating materials, deposition techniques and the challenges involved in realizing the most suitable coating on steel. They find that composite coating material with low coefficient of thermal expansion and high gas permeation resistance can resist delamination and corrosion. Optimum concentration of filler material with good dispersion on the metal matrix can lengthen the penetration path of the aggressive ions and prolongs the life time of steel. However, SnO<sub>2</sub> nanoparticles have not been much investigated as anticorrosive coating material, despite its excellent intrinsic properties required for good anticorrosive material such as wide band gap (~3.7 eV), excellent transparency, and high chemical stability. It is well known that, the size of metal oxide nanoparticles can influence the anticorrosive properties; therefore optimizing particle size of anticorrosive material is crucial. So, a few chemical synthetic approaches for SnO<sub>2</sub> nanoparticles preparation are overviewed herein. Shaheen Naz *et al.* [12] investigated a simple low cost method for synthesis of SnO<sub>2</sub> nanoparticles and their characterization. SnO<sub>2</sub> nanoparticles were synthesized by a simple chemical coprecipitation method followed by annealing the obtained nanoparticles at different temperatures. Several characterization techniques were carried out to analyze the

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structure, size, morphology, elemental composition and optical properties of the prepared SnO<sub>2</sub> nanoparticles. Kāvitha Balakrishnan *et al.* [13] synthesized Tin oxide (SnO<sub>2</sub>) nanoparticles by the co-precipitation method, and the synthesized nanoparticles were annealed at various temperatures for characterization. Structural characterization was performed by X-ray diffraction to confirm the crystalline nature of the films with a tetragonal structure. SEM analysis of the powder concluded that the nanoparticles produced were spherical particles composed of small, clustered and aggregated nanoparticles. The transition type and band gap of the synthesized nanoparticles were estimated from the absorption spectra. The optical (UV-visible) spectrum reveals a nicely described absorption which is appreciably blue shifted associated with the height absorption of bulk SnO<sub>2</sub> indicating quantum size effect. C. Thenmozhi *et al.* [14] studied Synthesis and characterization of SnO<sub>2</sub> nanoparticles by microwave – assisted solution method. They synthesized SnO<sub>2</sub> nanoparticles by microwave assisted hydrothermal method using SnCl<sub>2</sub>.2H<sub>2</sub>O as a precursor. The synthesized SnO<sub>2</sub> nanoparticles were characterized to find their structure and crystal size, functional group, particle morphology, surface morphology etc. The broad peaks in the X-ray diffraction indicate that the obtained powder is SnO<sub>2</sub> and size of nanoparticles was found to be in the range of 10-21 nm.

### c) Significance of the study:

The nanocomposite is a great way to resist the cost of corrosion. Polymers and nanomaterials are used for nanocomposite preparation. The organic components of nanocomposite provide flexibility, improvement in compatibility, and reduction of porosity and defects. The most used organic polymers for preparation of nanocomposite coating are epoxy [5,19], polyurethane [21], polyethylene glycol (PEG) [22], polyaniline (PANI) [23], polystyrene [24], polyacrylic [25], polyvinyl alcohol (PVA) [8, 26], polypyrrole [6] *etc.* Polymers have been used as host matrices in various composite films. Organic or inorganic particles can be mixed with or incorporated into the polymers to modify their morphology, stability and different physical properties for corrosion protection. It is reported that corrosion current density ( $I_{corr}$ ) and corrosion rate (CR) decreased with an increasing amount of nanoparticles in polymeric composite and coating efficiency increased.

According to literature survey, PANI/SnO<sub>2</sub> composite exhibited excellent anticorrosion performance ( $E_{corr} = -196.0$  mV,  $I_{corr} = 0.210$   $\mu$ A/cm<sup>2</sup>, CR = 0.177 mpy)



[23] than well-known ZnO, NiO *etc* and their composites. However, SnO<sub>2</sub> and its composite with different polymers are less investigated for anticorrosion [23, 27]. Therefore, preparing SnO<sub>2</sub> – Polymer nanocomposite as an anticorrosion agent for steel. Utilizing a simple and inexpensive chemical method with various compositions is a bottleneck problem that must be thoroughly researched.

#### d) Research Problem:


Up to now, different composites such as, SnO<sub>2</sub>/SiO<sub>2</sub>, epoxy/ZnO-NiO, polypyrrole/metal oxide, sulfonated polyaniline and epoxy, PVC/ZnO-polyaniline hybrid coating, epoxy-zinc oxide, TiO<sub>2</sub> [4-9] *etc.* coatings were successfully used as corrosion resistance coatings for steel substrate. Moreover, SnO<sub>2</sub> is an n-type semiconductor with a band gap of 3.7 eV. SnO<sub>2</sub> is an important material due to its high degree of transparency and good chemical, physical and thermal properties [4]. Recent advancement in SnO<sub>2</sub> has been increased with a wide range of applications such as gas sensors, transistors, catalyst electrodes, anticorrosion coating *etc.*

Therefore, Polymer-SnO<sub>2</sub> nanoparticles composite will be synthesized using the Sol-gel method in the proposed research. The structural, morphological, and compositional study of synthesized material will be carried out by using different characterization techniques. The performance of synthesized Polymer-SnO<sub>2</sub> nanocomposite material will be studied for corrosion resistance properties in different mediums by Tafel polarization and electrochemical impedance spectroscopy (EIS) on steel.

#### iii) Objectives:

The following objectives are identified as a part of this proposed research.

1. To synthesize SnO<sub>2</sub> nanoparticles by using a Sol-gel method.
2. To prepare different compositions of polymer-SnO<sub>2</sub> by adding SnO<sub>2</sub> nanoparticles in a different polymer matrix.
3. To characterize synthesized composite by applying different characterization techniques like XRD, SEM, TEM, UV-visible, EDAX, FTIR *etc.*
4. To study the corrosion protection performance of polymer-SnO<sub>2</sub> nanocomposite materials over 304 austenitic stainless steel by using the Tafel polarization curve and electrochemical impedance spectroscopy (EIS) in different mediums.

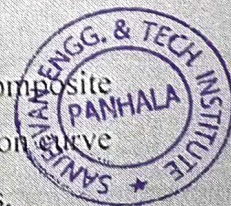
  
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iv) Methodology:

1. In detail, additional literature survey will be carried out for anticorrosion coating of steel substrate.
2. The 304 austenitic stainless steel samples to be used in the experiments will be prepared with suitable dimensions. These samples will be chemically cleaned, and the suitable method will be used for coating deposition on the sample.
3. Sol-gel method will be used for synthesis of SnO<sub>2</sub> nanoparticles. Different size SnO<sub>2</sub> nanoparticles will be synthesized by changing the different preparative parameters.
4. The synthesized SnO<sub>2</sub> nanoparticles will be characterized for their structural determination, surface morphology, optical and compositional properties by different characterization methods like XRD, SEM, TEM, UV-Visible, EDAX, FTIR, etc.
5. Synthesize and coat different polymer compositions with optimum-sized SnO<sub>2</sub> nanoparticles on steel using a suitable coating technique. Also, the influence of coating thickness on steel for anticorrosion properties will be studied.
6. Evaluate corrosion protection properties of synthesized nanocomposites in a different corrosive environment (acid, base, salt) by Tafel polarization and electrochemical impedance spectroscopy.

v) Year wise Plan of work and targets to achieve:

Table: Distribution of work for three years						
Milestones Target to achieve	Target Months					
	1-6	7-12	13-18	19-24	25-30	31-36
<ul style="list-style-type: none"> <li>➤ Literature Survey</li> <li>➤ Synthesis of SnO<sub>2</sub> nanoparticles of different size by Sol gel method.</li> <li>➤ Study of structural and morphological properties.</li> <li>➤ SnO<sub>2</sub> nanoparticles coating on 304 austenitic stainless steel by deep coating method.</li> <li>➤ Test its performance for corrosion protection.</li> </ul>						
<ul style="list-style-type: none"> <li>➤ Synthesis of SnO<sub>2</sub>- first Polymer</li> </ul>						

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(PVA or polyurethane) nanocomposite.						
<ul style="list-style-type: none"> <li>➤ Study of structural and morphological properties.</li> <li>➤ Test its performance in different medium for corrosion protection by Tafel polarization and EIS.</li> </ul>						
<ul style="list-style-type: none"> <li>➤ Synthesis of SnO<sub>2</sub>- second Polymer (PMMA or PVC) nanocomposite.</li> <li>➤ Study of structural and morphological properties.</li> <li>➤ Test its performance in different medium for corrosion protection by Tafel polarization and EIS.</li> </ul>						
<ul style="list-style-type: none"> <li>➤ Comparing and finding optimum corrosion coating thickness of Polymer-SnO<sub>2</sub>,</li> </ul>						
<ul style="list-style-type: none"> <li>➤ Project report writing and submission.</li> </ul>						

vi) Details of collaboration, if any intended

9) Financial Assistance required

Item	Estimated Expenditure
A) Non-recurring component *: (upto 70% of the project cost)	
i) Equipment which may include Characterization like XRD, SEM, TEM, UV-Visible, EDAX, FTIR etc., Experimental Setup etc., laptop	1,75,000/-
ii) Books/Journals	30000/-
B) Recurring component :	
(i) Hiring Services	-----
(ii) Field Work and Travel	50,000/-
(iii) Chemicals and glassware	50,000/-
(iv) Contingency (including special needs)	20,000/-
Total (Rs.)	3,25,000/-

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\*Justification for the purchase of the equipment be provided.  
 10) (a) Details of the project/scheme completed or on going with the P.I

Name of the Equipment	Year	Total Infrastructural facilities obtained	Agency	Started	Completed
-----	-----				
-----	-----				

(b) Institutional and Departmental facilities available for the proposed work

Equipment: Magnetic stirrer with hot plate, muffle furnace, digital weight balance, digital pH meter, chemical hot bath.

11) Any other information which the investigator may like to give in support of this proposal which may be helpful in evaluating.

To certify that:

- a) General physical facilities, such as furniture/space etc., are available in the College / Institution.
- b) I/we shall abide by the rules governing the scheme in case assistance is provided to me/us from the University for the above project.
- c) I/we shall complete the project within the stipulated period. If I/we fail to do so and if the University is not satisfied with the progress of the research project, the University may terminate the project immediately and ask for the refund of the amount received by me/us.
- d) The above Research Project is not funded by any other agency.

Name and Signature

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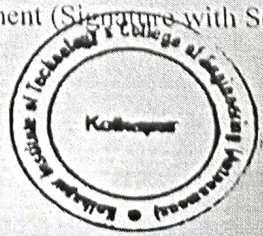
(a) Principal Investigator *Dr. U.S. Bhapkar* *UBS*

(b) Co-Investigator  
 ① *Mr. Dhananjay V. Patil*, *DP*  
 ② *Dr. S.S. Potdar*, *SP*

*Ami*  
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(c) Principal/Head of the University Department (Signature with Seal)

*Director*  
 Kothapur Institute of Technology's  
 College of Engineering (Autonomous),  
 Kolhapur





Publications in reputed Journals

S. No.	Author(s)	Title	Name of Journal	Volume	Year
1	Bhapkar U., Srivastava A., Agrawal A	Acoustic and heat transfer aspects of an inclined impinging synthetic jet	International Journal of Thermal Sciences	74	2013
2	Bhapkar U., Srivastava A., Agrawal A	Interferometry based whole-field measurements of an impinging turbulent synthetic jet	International Communications in Heat and Mass Transfer	58	2014
3	Bhapkar U., Srivastava A., Agrawal A	Acoustic and heat transfer characteristics of an elliptical synthetic jet generated by acoustic actuator	International Journal of Heat and Mass Transfer	79	2014
4	Bhapkar U., Srivastava A., Agrawal A	Proper cavity shape can mitigate confinement effect in synthetic jet impingement cooling	Experimental Thermal and Fluid Science	68	2015
5	Bhapkar U., Yadav H., Agrawal A	PIV study of radial wall jet formed by normal impinging turbulent synthetic jet	International Journal of Flow Visualisation and Image Processing	26 (2)	2019
6	Bhapkar U., Patil S., Sawant A., Manthan Y., Pawar S., Bhat J.	Innovative Battery-less Power House for Mobile Devices	Accepted for AIP conference proceedings	-	2021
7	Bhapkar U., Khan J., Bhat J., Chougule A., Sangale S.	Design and development of smart solar powered street sweeping machine	Materials Today	46	2021.
8	Bhapkar U., Desai M., Bhat J.,	Optimization of process parameters by Hybrid Taguchi-Grey Relational Analysis for thermal behaviours of lubricant oil of worm gearbox	Materials Today	--	2021.
9	Bhapkar U., Desai M., Sonawane B., Bhat J.	The compound Taguchi and grey relational analysis used to optimize the tribological parameters of worm gear under wet condition	Materials Today	47	2021
10	Bhapkar U. and Benade M.,	Modelling and fatigue analysis of the composite material camshaft using	Advances and applications in mathematical	20	2021

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Somwar Path, Panhala, Dist. Solapur, Maharashtra





07/08/2022

To,  
The coordinator,  
RGSTC Scheme,  
Dr. Babasaheb Ambedkar Technological University,  
Vidyavihar, Lonere

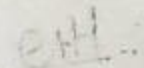
**Subject: Submission of Project-Pre-Proposal.**

Respected Sir,

I am submitting herewith my Project-Pre-Proposal entitled, "Novel herbal composition and method to improve milk production, fat, lactation period and reproductive health in cattle." under the RGSTC's University Scheme. I hope that the Proposal is up to the expectation of the RGSTC's University Scheme. Kindly acknowledge the receipt. An early and favorable decision of the same is solicited.

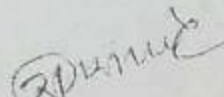
Thanking you.

Yours faithfully,

  
Dr. Vishal S. Patil


Asst. Prof.

SETI, Panhala

  
Dean

Research & Development

SETI, Panhala

  
Principal

SETI, Panhala

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1) **Title of the project proposal:** Novel herbal composition and method to improve milk production, fat, lactation period and reproductive health in cattle.

2) **Name of the Institution where the work will be carried out:**  
Department of Basic Sciences and Humanities, Sanjeevan Engineering and Technology Institute Panhala, Dist- Kolhapur, Maharashtra 416201

3) **Name of the investigator:**

3.1) Name - Dr. Vishal S. Patil

3.2) Department – Basic Sciences and Humanities

3.3) Designation - Assistant Professor

3.4) Organization and Institute name - Sanjeevan Engineering and Technology Institute, Somwar Peth, Panhala

3.5) Address: Sanjeevan Engineering and Technology Institute, Somwar Peth, Panhala, Dist- Kolhapur, Maharashtra 416201

E-Mail: [vishalpatil.chem@gmail.com](mailto:vishalpatil.chem@gmail.com) Contact no.- 9049439898

4) **Name of the co-investigator:**

4.1) Name - Dr. Dhanshri V. Patil

4.2) Department – Chemistry

4.3) Designation - Assistant Professor

4.4) Organization and Institute name – Krishna Mahavidyalaya Rethare Bk.

4.5) Address: Krishna Mahavidyalaya Rethare Bk. Tal- Karad, Dist- Satara, Maharashtra 415108 E-Mail: [dtp:phy@gmail.com](mailto:dtp:phy@gmail.com)

5) **Objective of the project:**

- i) To provide a novel herbal composition for enhancing milk production, fat and lactation period in cattle.
- ii) To maintain normal duration of an estrous cycle and helps cattle to conceive in time.
- iii) To develop a commercially viable composition to boost dairy farming in India.
- iv) To tackle the dairy farming problem for the betterment of mankind.