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KOLHAPUR INSTITUTE OF TECHNOLOGY'S
COLLEGE OF ENGINEERING
(AUTONOMOUS),
KOLHAPUR

Accredited 'A' Grade by NAAC, Bengaluru

Ref. : KIT/CEK/ No 0 207 6

Date : 27/12/2022

2 7 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_2-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

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

HOD,
Mechanical Engineering
Sanjeevan Engg. & Tech.Institute Panhala

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Somwar Peth, Panhala - 416 201

SANJEEVAN ENGG. & TECH INSTITUTE PANHALA

A Research Project Proposal

Under

Diamond Jubilee Research Initiation scheme

Shivaji University, Kolhapur

Entitled

Chemical synthesis of SnO_2–Polymer nanocomposites for coating and study of anticorrosive properties of coated steel.

Submitted by

SANJEEVAN ENGG. & TECH INSTITUTE PANHALA

Dr. UDAYSINH SHIVAJI BHAPKAR

Department of Mechanical Engineering

Kolhapur Institute of Technology's

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

December 2022

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Annexure-A

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 Vasantrao 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 Vasantrao 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:
   a. Department: **Mechanical Engineering Department**
   b. 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 i. Papers Published Accepted Communicated	Peer reviewed Journals – 17 International Conferences - 03
	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 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 such materials, and the entire behaviors of nanostructured materials show combinations 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-phenylenedia mine) 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 protection properties of coatings were studied in 0.5M H_2SO_4 solution by Tafel polarization and electrochemical impedance spectroscopy (EIS). The effect of different nanoparticles (Al_2O_3, ZnO, TiO_2, CeO_2 and SnO_2) on the protection performance of the nanocomposite coatings was compared. The results reveal that PPy/Al_2O_3 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 $TiO_2.ZnO$, $2TiO_2.ZnO$, Zn_2TiO_4, $MgTiO_3$, $CaTiO_3$, $TiO_2.ZnO.MgO$, and $TiO_2.ZnO.SrO$ were synthesized from corresponding oxides or carbonates at high temperature. The obtained metal mixed oxides were characterized by means of X-fray 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 → NaCl → NaOH → H_2O. 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_2 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_2 nanoparticles preparation are overviewed herein. Shaheen Naz *et al.* [12] investigated a simple low cost method for synthesis of SnO_2 nanoparticles and their characterization. SnO_2 nanoparticles were synthesized by a simple chemical co-precipitation method followed by annealing the obtained nanoparticles at different temperatures. Several characterization techniques were carried out to analyze the structure, size, morphology, elemental composition and optical properties of the prepared SnO_2 nanoparticles. Kavitha Balakrishnan *et al.* [13] synthesized Tin oxide (SnO_2) 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 in appreciably blue shifted associated with the height absorption of bulk SnO_2 indicating quantum size effect. C. Thenmozhi *et al.* [14] studied Synthesis and characterization of SnO_2 nanoparticles by microwave – assisted solution method. They were synthesized SnO_2 nanoparticles by microwave assisted hydrothermal method using $SnCl_2.2H_2O$ as a precursor. The synthesized SnO_2 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_2 and size of nanoparticles was found to be in the range of 10-21 nm.

c) Significance of the study:

The nanocomposite is 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_2 composite exhibited excellent anticorrosion performance (E_{corr} = -196.0 mV, I_{corr} = 0.210 μA/cm^2, CR = 0.177 mpy)

[23] than well-known ZnO, NiO *etc* and their composites. However, SnO_2 and its composite with different polymers are less investigated for anticorrosion [23, 27]. Therefore, preparing SnO_2 – 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_2/SiO_2, epoxy/ZnO-NiO, polypyrrole/metal oxide, sulfonated polyaniline and epoxy, PVC/ZnO-polyaniline hybrid coating, epoxy-zinc oxide, TiO_2 [4-9] *etc.* coatings were successfully used as corrosion resistance coatings for steel substrate. Moreover, SnO_2 is an n-type semiconductor with a band gap of 3.7 eV. SnO_2 is an important material due to its high degree of transparency and good chemical, physical and thermal properties [4]. Recent advancement in SnO_2 has been increased with a wide range of applications such as gas sensors, transistors, catalyst electrodes, anticorrosion coating *etc.*

Therefore, Polymer-SnO_2 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_2 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_2 nanoparticles by using a Sol-gel method.
2. To prepare different compositions of polymer-SnO_2 by adding SnO_2 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_2 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_2 nanoparticles. Different size SnO_2 nanoparticles will be synthesized by changing the different preparative parameters.
4. The synthesized SnO_2 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_2 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 Months					
Target to achieve	1-6	7-12	13-18	19-24	25-30	31-36
➢ Literature Survey ➢ Synthesis of SnO_2 nanoparticles of different size by Sol gel method. ➢ Study of structural and morphological properties. ➢ SnO_2 nanoparticles coating on 304 austenitic stainless steel by deep coating method. ➢ Test its performance for corrosion protection.						
➢ Synthesis of SnO_2- first Polymer						

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(PVA or polyurethane) nanocomposite. ➢ Study of structural and morphological properties. ➢ Test its performance in different medium for corrosion protection by Tafel polarization and EIS.			■			
➢ Synthesis of SnO_2- second Polymer (PMMA or PVC) nanocomposite. ➢ Study of structural and morphological properties. ➢ Test its performance in different medium for corrosion protection by Tafel polarization and EIS.				■		
➢ Comparing and finding optimum corrosion coating thickness of Polymer-SnO_2,						
➢ Project report writing and submission.						■

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.

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Name and Signature

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

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

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

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

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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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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	Dean	I/c Principal
Asst. Prof.	Research & Development	SETI, Panhala
SETI, Panhala	SETI, Panhala	PRINCIPAL Sanjeevan Engg. & Tech. Institute Somwar Peth, Panhala - 416 201

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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:** Departmentof 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 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 – KrishnaMahavidyalaya Rethare Bk.

4.5) Address:Krishna Mahavidyalaya Rethare Bk.Tal-Karad, Dist- Satara, Maharashtra 415108E-Mail: 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.