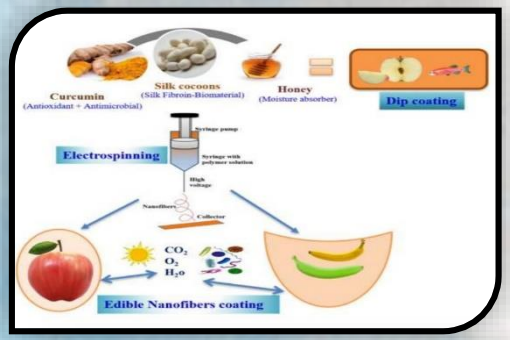
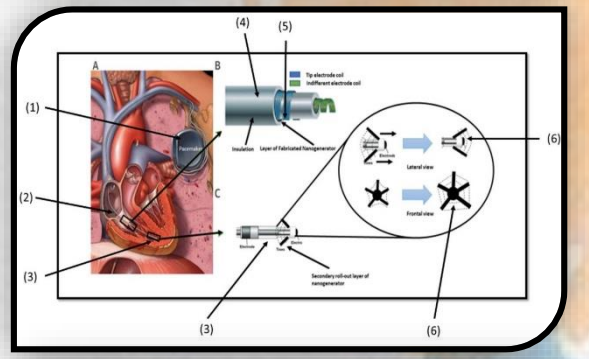
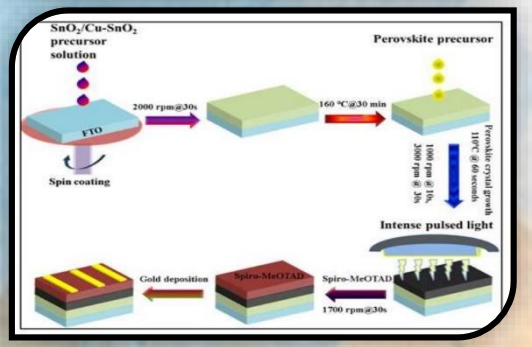
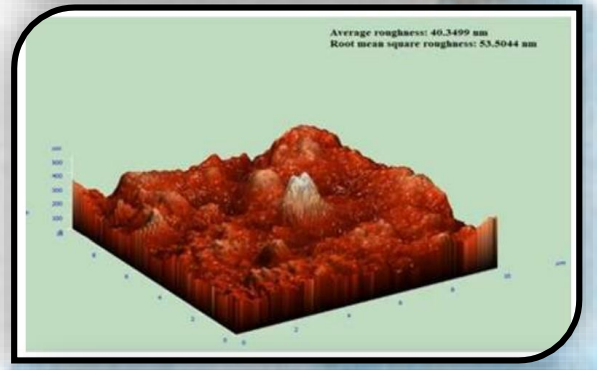
Intellectual Property Rights Cell
Indian Institute of Technology Roorkee

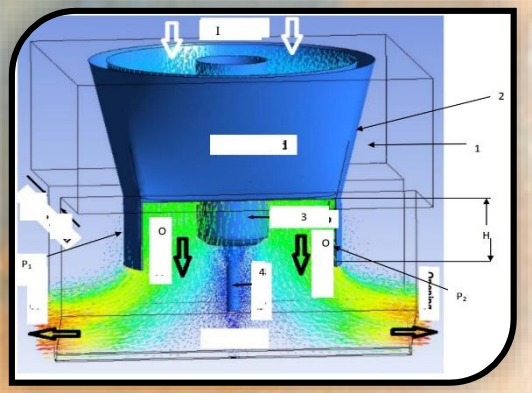


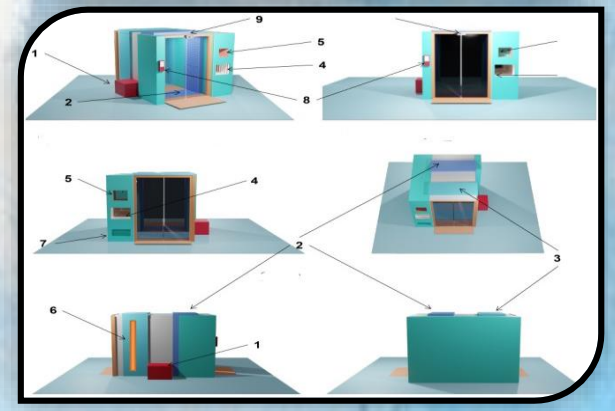


- Patents
- Trademark
- Copyright
- Industrial Design
- PCT Application
- International Patent Application
- Commercialization of IP
- IPR Awareness









IPR Cell IIT Roorkee

Mission:

To create awareness and provide guidance to academic and nonacademic staff, students, scholars, and outside agencies on the practices and the rules of institute regarding intellectual property rights and obligations within the frame work of the IPR policy of the institute.

Objectives:

To promote academic freedom and safeguard the interests of inventor in creation and commercialization of intellectual property with legal support wherever necessary. To create an environment for acquiring new knowledge through innovation, develop an attitude of prudent IP management practices and promote an IPR culture compatible with the educational mission of the institute.

Activities

IP Management

- Facilitating filing of patents and other IP applications.
- Devising IP strategy and IP policy.
- IP licensing Agreement.
- IP valuation and Due diligence.
- Derwent Innovation Software sessions for focused research.

IP Awareness

- Organizing awareness programs (by arraigning lectures by filed experts.
- One to one meeting on addressing their IP related problems with students, faculties & staff.
- Organizing orientation programs on various IP related issues.

IPR Activities at a Glance

Sl. No.	Particulars	Numbers
1.	Number of Patents filed	268
2.	Number of Copyright Registered	12
3.	Number of Trademark Registered	03
4.	Number of International Patents	02
5.	Number of PCT applications	05
6.	Number of Design Patents	06
7.	Number of Granted Patents	28
8.	Number of Technologies Transferred	08

Technologies transferred having direct societal impact (Pro-bono)

Sl. No.	Title of the invention	Inventor
1.	A cam and follower mechanism for reducing the thread count variation in pedal-operated handlooms	Prof. Rajat Agrawal
2.	Mechanized Roller for Felt Making	Prof. R. P. Saini
3.	Variable Speed Solar Based Bageshwari Wool Charkha	Prof. R. P. Saini

Technologies transferred for Industrial use

Sl. No.	Title of the Invention	Inventor
1.	A Method for Producing Synthesis Gas from Biomass Residues	Prof. B. Prasad
2.	Magnetic-field actuated hybrid nanofiber scaffold and apparatus for 4D tissue engineering	Prof. P. Gopinath
3.	A web-based research project management system	Prof. Soham Chakrabarty
4.	A novel bio reactor system for solid state fermentation and process of operation thereof	Prof. Sanjoy Ghosh

Technologies transferred under Industry Sponsored project

Sl. No.	Title of the invention	Inventor
1.	Low cost reinforced bipolar membrane fabricated with interface layer	Prof. Sujay Chattopadhyay

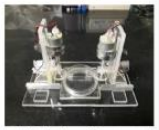
A look at some of IIT Roorkee's most impactful technologies

Magnetic-field actuated hybrid nanofiber scaffold for 4D tissue engineering

S.Uday Kumar ,Vinay Kumar and Dr. Gopinath Packirisamy
Department of Biosciences and Bioengineering
Centre for Nanotechnology
Indian Institute of Technology Roorkee, Uttarakhand India

Product Description:

The present products provides a hybrid multi-layered nanofibrous scaffold and a four dimensional dynamic cell culture apparatus. The magnetic nanoparticles loaded hybrid multilayered nanofibrous scaffold is biocompatible and operates in non-contact mode and it is precisely controlled across all 3- dimensions.



The hybrid scaffold apart from providing the extracellular matrix (ECM)-like scaffold, also meticulously simulates the mechanical stress cycles that cells experience under the *in-vivo* conditions. The scaffold serves as a realistic and relevant platform for studying the role of cytoskeletal proteins and focal adhesion proteins in various diseases in the fields of cardiology, dermatology, metabolism, gastroenterology, oncology and orthopedics.

Figure (1): **Product image** :Magnetic actuator device

Fabricated magnetic multilayered nanofibrous 3D scaffold which attains;

(1) Realistic 3D culture - Supports 3D growth and proliferation of cells on ECM like nanofibrous scaffold.

(2) Dynamic culture - Also imparts mechanical stress cycles to cells under the influence of external magnetic field.

Figure (2): 3D nanofiberous scaffold and scaffoldwhit cells under mechanical stimulation

Figure (3):Cells after mechanical Stimulations

Customers:

1. Various Research Laboratoriesworking on cell mechanics.
2. Health care companies
3. In vitro model fabrication based companies

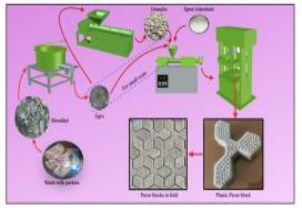
Certifications:

Awarded GYTI 2019 by DBT-BIRAC-SRIST

Gopinath Packirisamy, Uday Kumar SuKumar, "**Magnetic-field actuated hybrid nanofiber scaffold and apparatus for 4D engineering**"**publication no**: 201711007507/36/2018(**Indian Patent Published**)

Development of low-cost sustainable technologies for treating As and F contaminated groundwater for rural people

Process with equipment



Advantages

- Cement less products, reduces CO_2 emission
- Better interlocking and aesthetic look
- Modules are available for small scale as well as large scale production
- Highly cost competitive
- Resale value. Around 25 % money can be recovered after its life
- Non-breakable, long lifetime
- Better interlocking and aesthetic looks

Different Modules

Module for small scale production		Module for large scale production	
Capacity, piece per h	35	Capacity, piece per h	70
Investment, INR in lakh	25	Investment, INR in lakh	40
Floor area requirement, Sq.ft	1500	Floor area requirement, Sq.ft	1800
Payback period, year	3.5	Payback period, year	2.5

N.B. The above values are estimated may vary in real application

Contacts

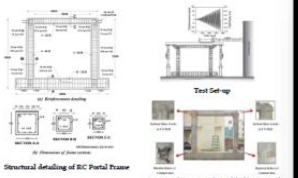
Please contact Professor Prasenjit Mondal, Department of Chemical Engineering, IIT Roorkee for further clarification, email pmondfch@iitr.ac.in , mob no. 9897369605

Use of Rebar Coupling Sleeves in Retrofitting Severely Damaged Reinforced Concrete Frames

Naveen Kothapalli[1], Pankaj Agarwal[2], Siva Chidambaram[3]
[1]Research Scholar, [2]Professor, Department of Earthquake Engineering, IIT Roorkee [3]Scientist, CSIR-CBRI

ABSTRACT

The aim of this project is to make buildings safe which are severely damaged during an earthquake or the structures that are seismically deficient by increasing their lateral load capacity (strength and deformation). An appropriate complete system of retrofitting techniques are developed that are primarily based on the concept of energy dissipation encased with steel bracing as well as conventional retrofitting techniques namely **external** bolted epoxy filled threaded couplers and FRP jacketing. The main objectives of this study will be (i) designing & planning a reliable, efficient and practical retrofit solution for the severely damaged reinforced concrete buildings that can be easily implemented in the field (ii) implementation of proposed retrofitting solution in the severely damaged RC frame and its experimental validation & verifications under earthquake simulated load application in large experimental test facility (iii) updating of retrofitting schemes based on test results and development of analytical model.

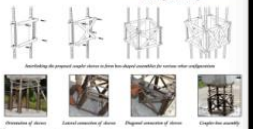


Structural detailing of RC Portal Frame

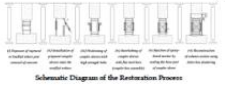
Test Set-up

Damaged Frame with Buckled/ Ruptured Rebars post testing

Proposed Rebar Coupler Sleeve with Rebar Connection



Proposed Methodology of Interlinked Coupler-Box Assembly



Schematic Diagram of the Restoration Process

Hysteresis – Conventional

Hysteresis – Coupler-Box

Comparative Performance

CONCLUSIONS AND OUTCOMES

Demolition of a damaged structure and reconstructing is an expensive process and is laborious. However retrofitting of damaged structure is economical and the structure can be restored in short time.

The technology developed to retrofit the severely damaged RC structure exhibited better hysteresis behavior compared to the conventional specimen. The dissipation of energy is also higher comparatively. In particular this methodology works efficiently in the plastic hinge locations in improving the ductility and damage tolerance capacity.

Use of in-house made threaded coupler is available at an economical cost and is easy to install with a high factor of safety being implicated to eliminate errors during execution. The special confinement action adapted confines the core concrete, thereby improving its shear carrying capacity and ductility. Use of bonding agents between the old and new concrete allowed proper bonding, making the structure intrinsic as a whole. This retrofitting technique adopted proved to be competent both in performance and economic perspectives.

Left Story of Frame
Damaged retrofitted Frame monitored using DIC

Right Story of Frame

Indian patent filed with application No. 202011007735 dated. 24th Feb, 2020 on the proposed Coupler-Box Confinement Technique

A PROCESS FOR THE PRODUCTION OF SYNGAS FROM BIOMASS RESIDUES EMPLOYING MOLTEN CAST IRON REACTOR

Basheshwer Prasad
Department of Chemical Engineering, Indian Institute of Technology Roorkee

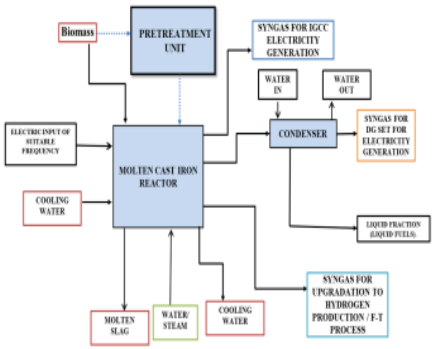
Patent No. ***IN201911009915A***

Salient features of the technology developed

- Gasification in molten cast iron reactor.
- The biomass is subjected to flash pyrolysis at 1200° °C.
- A wide range of size, shape and moisture content tolerance.
- The residual carbon gasified with water/steam.
- The resultant gas heating value 15-21 MJ/Nm^3.
- Hydrogen – a clean fuel can be obtained by further processing by employing water-gas shift reaction route.
- Hydrogen as a feed stock to chemical process industries: refineries and fertilizer manufacturing companies.
- Electricity can be generated employing IGCC and DG sets.
- Liquid hydrocarbons production employing Fischer–Tropsch process.

Types of Feedstocks

- Saw dust
- Rice husk
- Bagasse
- Wild grasses
- Lantana
- Biomass briquettes
- MSW in co-firing mode
- Biomedical wastes



Typical Gas Composition (molar)

CO	35 - 42%
H_2	20 - 37%
CH_4	5 - 11%
CO_2	2 - 7%
C_2H_2	1 - 3%
Higher HCs	1 - 2%
HHV	17-21MJ/Nm^3

Potential Technology Takers

- Crude Oil refining companies
- Natural Gas supplying enterprises
- Ammonia based fertilizer manufacturers
- MSW handling corporations
- Biomedical waste handling companies
- Electricity generating companies

NaturoHeal: A Natural nanofiber based Self-Degradable bio-bandage for acute and chronic wounds

Vinay Kumar and Dr. Gopinath Packirisamy
Department of Biosciences and Bioengineering
Centre for Nanotechnology
Indian Institute of Technology Roorkee, Uttarakhand India

Product Name and Description: *NaturoHeal*

The present product relates to a healthcare product which is biocompatible and self- degradable nanofibrous scaffold or bandages or patches comprising natural proteins extracted from the mulberry silk cocoons and its fabrication process.

The additional advantage of using silk is its inherent antimicrobial property. Thus, this nanofibrous scaffold /bandage can be used with/without any therapeutic agents.

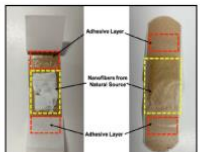


Figure (1): Three section of the bandage (a) Adhesive layer (top and bottom) (b) middle nanofiber layer

The thickness of nanofibrous patches can be increased or decreased depending on the nature of the wound as personalized medicine. Also, a combination of therapeutic agents can be loaded to synergize the therapeutic effect or to overcome the resistance by microbes.

The nanofibrous scaffold exhibits the antibacterial, scar free, self- adhesive and blood clotting properties. Hence, this biomaterial-based nanofibrous scaffold or bandages can be utilized in a wide variety of applications, not

Customers:

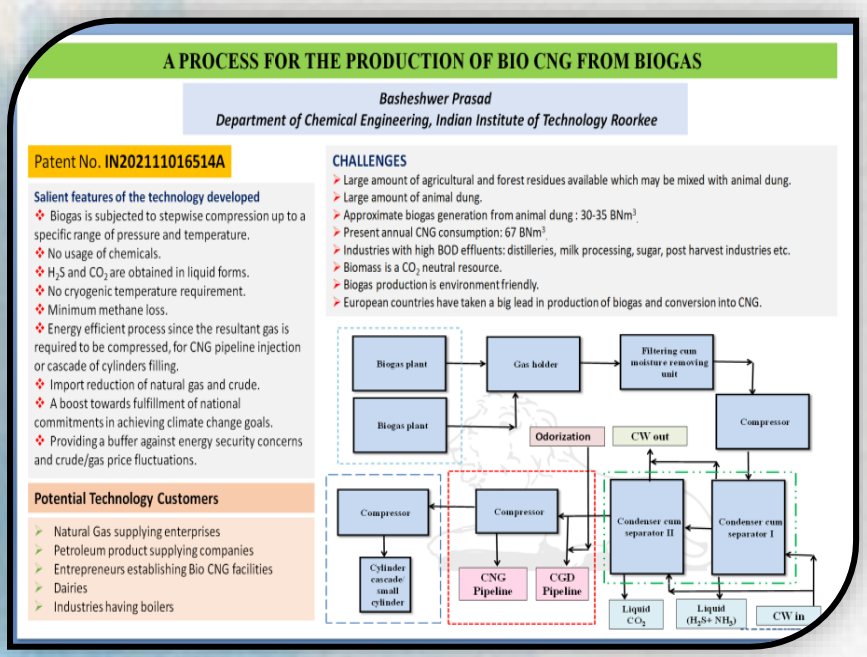
- Customers with acute and chronic wounds can use the NaturoHeal bio-bandage for healing purpose.
- Post-operative wounds in hospitals.
- Cuts and abrasion wounds
- Diabetic wounds and ulcers
- Burns patients

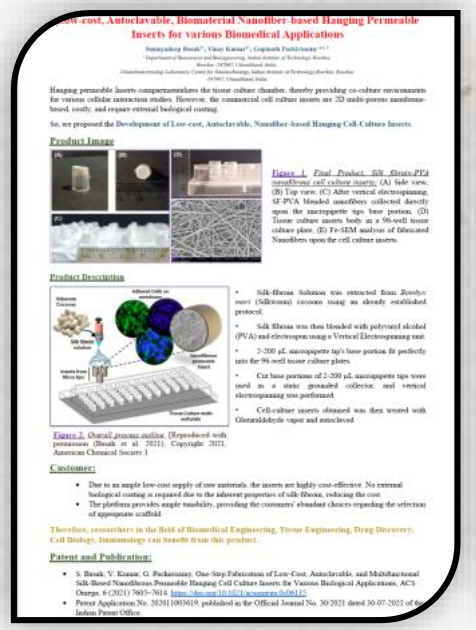
Figure (2): Normal hand and Wounded hand

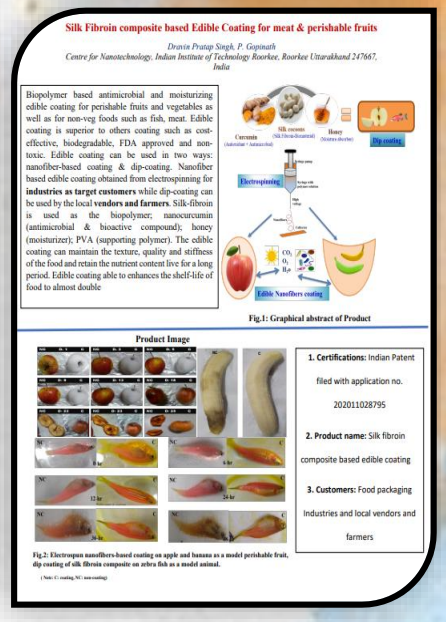
Certifications:

Indian Patent published

Gopinath Packirisamy, Vinay Kumar, "**Fabrication of biodegradable triple layered nanofibrous bandages and applications thereof" publication no**: 202011049934 /10/2020







Under Sustainable Developmental Goals following number of patents have been filed in last one year.

03 patents filed :- Affordable and clean energy

02 patents filed:- Clean water & sanitization

07 patents filed :- Industry, innovation and infrastructure

29 patents filed :- Economic Growth

03 patents filed :- Good health and Wellbeing

Quick FAQ

Q. How to file Patent?
A patent application can be filed with Indian Patent Office either with provisional specification or with complete specification along with fee as prescribed in scheduled. In case the application is filed with provisional specification, then one has to file complete specification with in 12 months from the date of filing of the provisional application. There is no further extension of time to file complete specification after expiry of said period. For more details please contact at ipr-cell@iitr.ac.in

Q. What is provisional patent?
A:- Provisional patent application is generally filed when the invention has been conceived but more work needs to be done on the invention to perfect it. This is also known as 'idea patenting'. Once a provisional application is filed, the applicant has a time period of 12 months to perfect his/her invention and file the complete application.

Q. When a patent application published and what is the role of publication?
A:- Generally, a patent application gets published after 18 months from the priority date of the patent application. However, if an applicant wishes to get the application published before 18 months, he may get the application published earlier by filing a request in the patent office for early publication. The rights of a patentee start from the date of publication of the patent application. Hence, some applicants get the patent application published early.

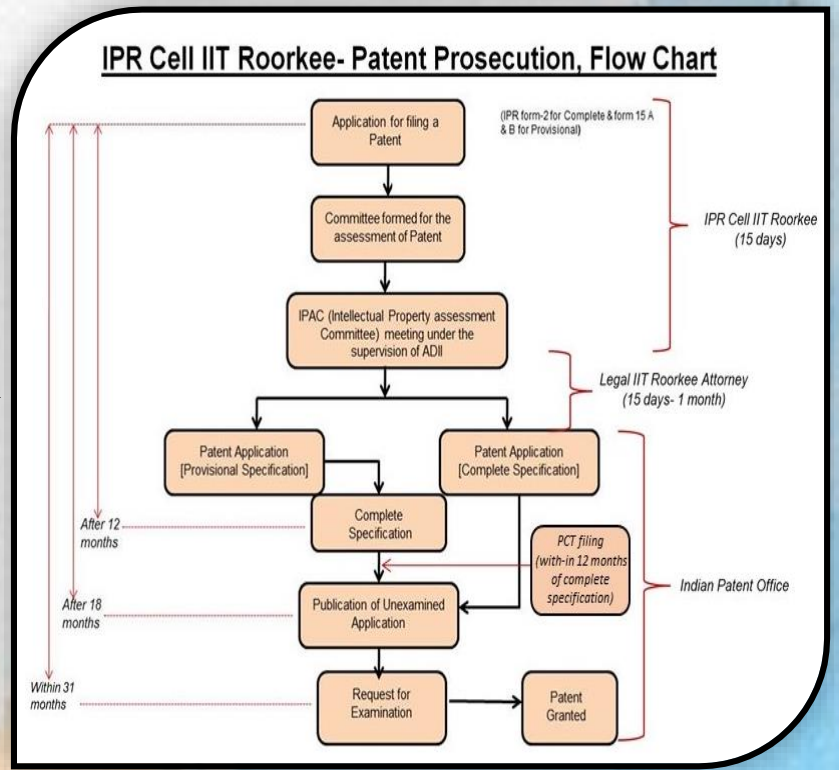
Q When can the request for examination be filled?
Every application for patent is publish after expiry of 187 months from the date of its filing or priority date whichever is earlier.

Q What are patent annuity fees?
A:-Annuities have the purpose of motivating the patent owner to continuously re-examine whether or not his idea is worth paying for. If not, the idea is available to the public and future innovation can take place by someone else out there, may be even you.

Q What is Annuity fees?
A:- Patent annuity is the yearly fee that is paid to a patent office to maintain a granted patent.

Q. What is meant by Technology Transfer?
Technology transfer (TT) refers to the process of conveying result stemming from scientific and technological research to the market place and to wider society, along with associated skill and procedure, and is as such an intrinsic part of the technology innovation process.

Q. Why Technology transfer is important?
Successful transfer and development of the technology helps promote the research institute and its commercial partners. The universities obtain recognition and increases its reputation for their research and innovation potential. The university's investment in the technology help stimulate local economic development.



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