Celebrating National Technology Day

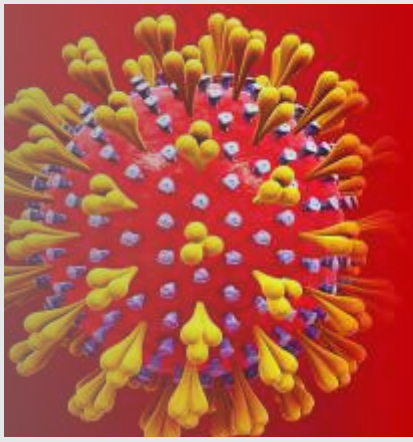
R&D Newsletter

Indian Institute of Technology Kanpur









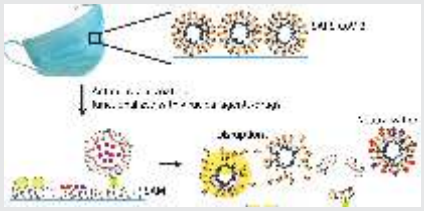
Special Issue on

Research & Innovation

Covid 19





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Volume 8, Issue 2, May 2020

PRODUCT & PROTOTYPE

PIPES : PPE Kit

Team: Profs. Nitin Gupta, Raju Gupta, Saikat Ghosh, Saumyen Guha, Shilpi Gupta

The PIPES (Polythelene-based Improvised Protective Equipment under Scarcity) Kit is designed based on thin cylindrical rolls/pipes of Polyethylene which are non-porous and commonly used in the industry for packaging and making plastic-bags. Polythene material makes airtight enclosure for required protection. The design and the production process of the PIPES Kit is kept open-source through the website *www.pipeskit.org* , so that any small /medium-scale factory can start manufacturing them in large quantities. The manufacturing cost is envisaged to be less than Rs. 100. Cops of Agra have already started to use this low cost PIPES Kit.

OUTREACH

UAVs for Surveillance

Team: Profs. A.K. Ghosh, Manindra Agrawal and VTOL Aviation India Ltd

The drone will be used for surveillance of an area of radius up to 15 km. It has high-resolution camera with night vision capabilities. The endurance of these UAVs ranges from 1.5 to 10 hours. The team is working with the Kanpur city administration to help them in the day and night surveillance of the hotspots in the city.

PRODUCT & PROTOTYPE

Invasive Ventilator

Team: NOCCA Robotics, Profs. Amitabha Bandyopadhyay, Sameer Khandekar, Arun Saha

Nocca Robotics designed and developed a high-end yet affordable, indigenous ventilator necessary for providing life support to critically ill COVID19 patients under the overall supervision of IIT Kanpur team led by Prof Amitabha Bandyopadhyay.

Salient Features

- Modular design, high end ventilator.
- Rapidly manufacturable at large scale across India.
- Low Power Pressure controlled (Version 1), Pressure and Volume Control (Version 2).
- Versatile operations: works with both medical air / ambient air + oxygen.
- IoT-based system to create a Ventilator Management System.
- Easy transition from invasive to non-invasive ventilation.

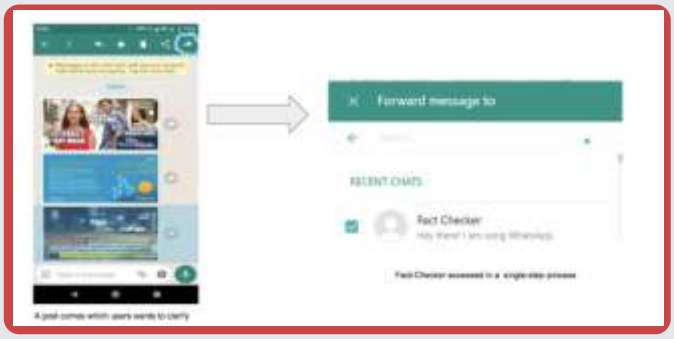
Bharat Dynamics Ltd, leading defence PSU under the Ministry of Defence, Govt. of India, has signed MoU with IIT Kanpur for the large scale production of the device .

OUTREACH

Fake News Verification App

Team: Profs. Swaprava Nath, Hamim Zafar

This is an user-friendly solution for fake-news detection on instant messaging & microblogging platforms. The app Won the second prize in the MHRD AICTE SAMADHAN competition in response to COVID19. The Beta version of the app is ready and currently it is being tested in a closed group.

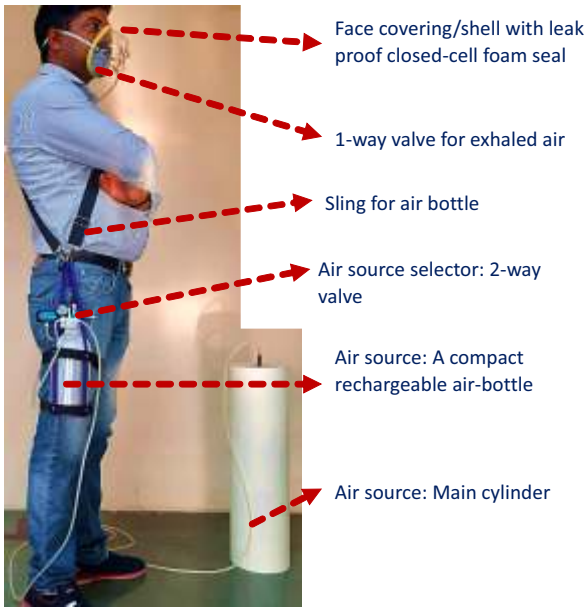


Positive Pressure Respiratory System

STARTUP INCUBATION AND INNOVATION CENTRE IIT KANPUR

Team: Prof. Nachiketa Tiwari, Prof. Devendra Gupta, In-charge, Covid-19 ICU (SGPGI), Lucknow

The team has developed a working prototype of a Positive Pressure Respirator System to addresses the problem of the acute global scarcity of N95 respirators. It provides uncontaminated air and isolates the health professionals from the exposure to the virus.



Salient Features

- Relies on positive pressure to stop entry of contaminated air.
- Universal (one size fits all) design.
- Fail safe and rugged design.
- Easy to follow production process.
- IoT-based system to create a Ventilator Management System.
- Easy transition from invasive to non-invasive ventilation.

Oxygen Concentrator

STARTUP INCUBATION AND INNOVATION CENTRE IIT KANPUR

Team: Profs. Shikhar Krishn Jha, Saikat Ghosh, Shobit Omar

This economic, indigenous design will separate oxygen from the atmosphere to be used by a homemade respirator. Unlike an air filter/purifier (which only removes dust and bacteria), this device will selectively filter out oxygen from air which can then be compressed to serve acute respiratory problems. The advantage is that it will be no longer required to store and carry oxygen cylinders.

The device is currently undergoing incubation for commercialization. It is in the testing stage in the Regency Hospital, Kanpur.

Reusable N95 and N99 Masks

Team: Profs. Sri Shivakumar, Thiruvancheril G. Gopakumar, Raja Angamuthu, Drs. Prabhat Diwedi and Manish Kulkarni, E-Spin Nano Tech Pvt. Ltd.

Sponsor: Department of Science & Technology (DST's Nano Mission)

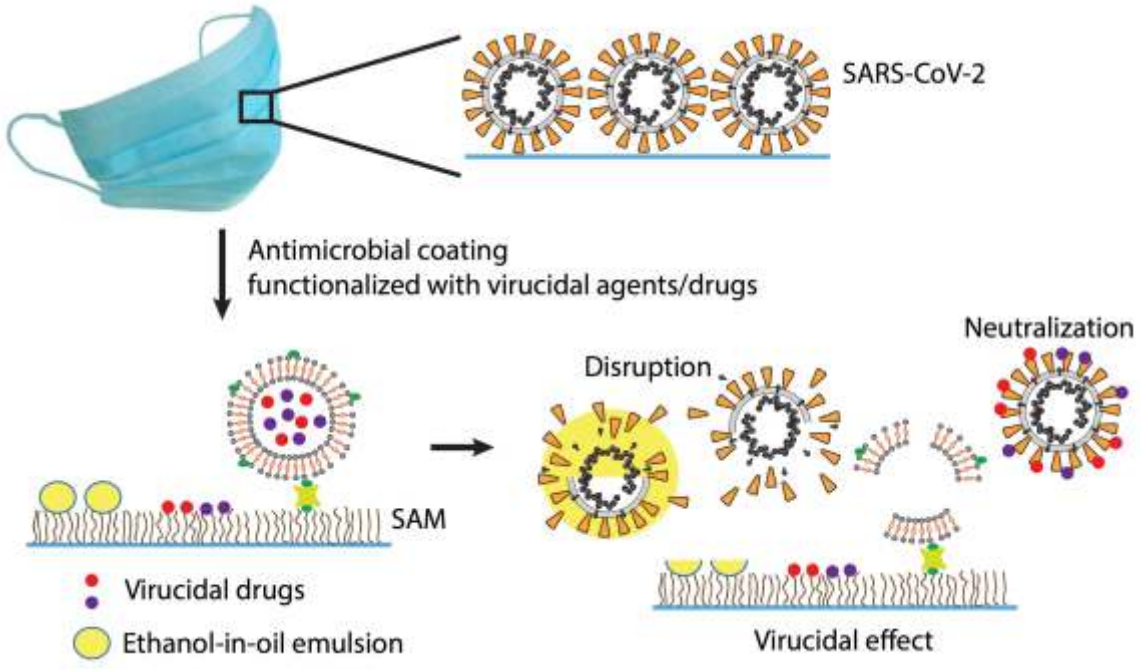
These advanced reusable masks have three filters: a Nonwoven filter, a Coarse filter, a Nanofiber filter, and a supporting layer. The supporting layer can kill coronavirus as soon as it enters the mask filter. These masks will be eqipped to eliminate the secondary source of contamination.

Preventive and Cost-effective Surface Coating

Team: Profs. Nagma Parveen, Ashish K. Patra, MLN Rao

Sponsor:SERB

The objective of the project is to develop virucidal coatings for inanimate surfaces used in healthcare settings such as surgical masks for the prevention of infectious diseases caused by highly contagious pathogens like SARS-CoV-2. The concept is based on a combination of antimicrobial polymer coating and functionalized virucidal drugs/agents to attain a synergistic anti-viral effect.

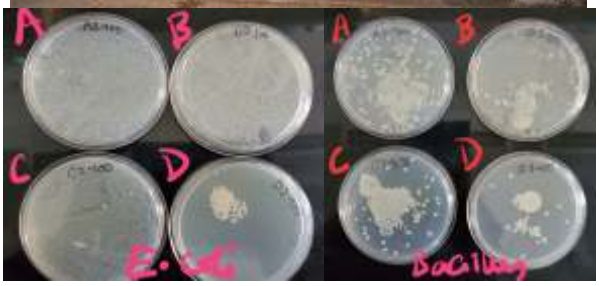


Chemical and Thermal Disinfecting System

Team: Profs. Manindra Agrawal, Deepu Philip, J Ramkumar, Mainak Das, Santanu Misra, S Ganesh

The product combines two disinfection approaches to achieve a cost-effective & rapid disinfection process. The system utilizes two chambers, viz., atomization chamber and thermal shock chamber. Initially, the individual will be sprayed with disinfectant solution safe for external human use and this will be followed by exposure to thermal shock in a drying chamber. This two-stage process is aimed to achieve a high rate of personnel disinfection within 2 minutes.

The system is deployable at various facilities where safe access control is necessary. Currently the system is in use at five places inside the campus. Local hospitals & district administration have approached IITK to implement this system at different strategic locations in Kanpur.



Novel Electrostatic Sprayers

Team: Prof. J Ramkumar, Dr. Amandeep Singh, E-Spin Nano Tech Pvt. Ltd.

This electrostatically charged Air-assisted sprayer will result in better surface adhesion of the disinfectant. The quantity of disinfectant used can be limited. The expected rate of consumption of disinfectant solution is 10 ml/min. The nozzle is designed keeping in mind current manufacturing and assembly constraints. The system can be used to disinfect public spaces in an effective and efficient manner.

Solar-powered Natures Box Smart Bin system

Team: Profs. Tarun Gupta, Sumit Kalra (IIT Jodhpur), NatureSense Technologies

Nature box is a Smart Bin system which ensures maximum hygiene and timely cleaning of the bins. .

Salient Features

- Inlet mouth of Natures Box has special coating that reduces the life of Corona Viruses on it by up to 95% as compared to its life on plastic or other bins.
- The systems are made up of steel with indigenous designs that prevents access to animals and thus ensuring zero possibility of pathogens and garbage getting littered outside the bins.
- The system has been indigenously developed by integrating an IoT module that provides fill level information of each bin on the map and informs about past cleaning of each bin, load on each bin and required frequency for cleaning of bins. This empowers the authority with tools to monitor and manage the timely cleaning of bins. This also reduce the man power and resource consumption in cleaning of bins by up to 80%.

Image of a Under-construction piece for demonstration purpose only (not scaled)

Development of Alternative Mask Material

Team: Profs. J Ramkumar, Tarun Gupta , E-Spin Nano Tech Pvt. Ltd.

This low-cost protective face mask is equivalent to N95 face mask for the front line medical staff and people. The team has tested various available filter media and developed the low-cost protective respirator. A filter testing rig equipped with an aerosol laser spectrometer will be set up with identification of non woven polypropylene based 3-4 layer material for making such mask.

Vaccine against the COVID-19

PI: Profs. Dibyendu Das, Saravanan Matheshwaran, Appu Kumar Singh

The objective is to create a live attenuated and replication-competent virus vaccines against Novel coronavirus (SARS-CoV-2) based on attenuated recombinant vesicular stomatitis virus (rVSV) vectors expressing the novel corona virus spike (s) glycoprotein (rVSV-SARS-CoV- 2S). Simultaneously, it is also being aimed for the candidate antivirals, which has potential to stop the viral infection. For this purpose the team has designed a cell based in-vitro infectivity assay for screening potential antiviral therapeutics.

Modelling & Forecasting of COVID-19

PI: Prof. Mahendra K. Verma

Sponsor:SERB

The project aims for Modelling and Forecasting of COVID19 pandemic. After analyzing the real-time infection data of COVID-19 epidemic for nine nations, the researchers have identified daily infection count and number of infected individuals as the key parameters. It is envisaged that the long-term community transmission may be inducing power law growth of the epidemic. The project is granted under SERB's Short-term MATRICS special call on Mathematical Modeling and Computations for COVID-19 Infections.

Optimization of Lockdown, Testing & Isolating Strategies to contain COVID-19 in India

PI: Prof. Harshwardhan H. Katkar

Sponsor:SERB

This is another project granted under SERB's call on Mathematical Modeling and Computations (MATRICS) for COVID-19 Infections. The objective of the project is the optimization of strategies related to lockdown period, successful testing and isolating.

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