



IIT Mandi researcher develop an anti-bacterial self-cleaning material for Face Mask and PPE equipment

Indian Institute of Technology Mandi researchers have developed a virus-filtering, self-cleaning and antibacterial material that can be used to make face masks and other PPE equipment. This path breaking development of Dr. Amit Jaiswal, Assistant Professor, School of Basic Sciences, IIT Mandi, along with his research scholars, Mr. Praveen Kumar, Mr. Shounak Roy, and Ms. Ankita Sarkar comes at a time in which it has become imperative to develop techniques to stop the second wave of the COVID-19 pandemic in the country. Results of this work have recently been published in the prestigious journal of the American Chemical Society – Applied Materials & Interfaces.



IIT Mandi
Researchers Develops
Self-Cleaning
Reusable Face Masks

 The team headed by Dr Jaiswal developed a novel virus-filtering, self-cleaning & antibacterial material that can be used to make reusable face masks

 They incorporated nanometre-sized sheets, a 100,000 times smaller than width of human hair that can kill microbes & are solar light-cleanable

 It can also filter more than 96% of particles that are in the size range of Covid without compromising on breathability of the fabric

“Keeping the urgency of the pandemic situation and cost-effectiveness in mind, we have developed a strategy to repurpose existing PPEs, especially face masks, by providing an antimicrobial coating to these protective clothing/textiles,” **said Dr. Jaiswal.** For this, the research team has used nanomaterials to confer antimicrobial properties to polycotton fabric.

Dr. Jaiswal and his team has incorporated nanometre sized sheets of molybdenum disulphide, MoS₂, the sharp edges, and corners of which act as tiny knives that pierce bacterial and viral membranes, thus killing them. *“The ‘nanoknife’-modified fabrics demonstrated excellent antibacterial activity even after 60 cycles of washing,”* **said the lead researcher,** which makes this an excellent way to reuse masks and reduce biological waste generation.

In addition to puncturing the microbial membranes, the nanosheets of molybdenum sulfide enable disinfection when exposed to light. Molybdenum sulphide exhibits photothermal properties, i.e., it absorbs solar light and converts it into heat, which kills the microbes. *“Within 5 min of solar irradiation, all the MoS₂-modified fabrics showed 100% killing of both E. coli and S. aureus,”* **wrote the authors in their recently published paper.** Thus, merely hanging out the masks in bright sunlight can clean the mask and make it ready to wear again.

The researchers have developed prototypes of a 4-layered face mask using the MoS₂ modified fabric. They report that these masks, in addition to killing microbes and being light-cleanable, can also filter >96% of particles that are in the size range of the COVID Virus (~120 nanometre), without compromising on the breathability of the fabric, and could thus be a powerful tool to prevent the spread of coronavirus and other microbial infections. *“We expect that the impact of this innovation on society will be immense and immediate, considering the current situation of global COVID-19 pandemic,”* **said Dr. Jaiswal.** The proposed materials can also be used to fabricate screens/sheets for creation of makeshift isolation wards, containment cells and quarantines for holding individuals who come in contact with pathogens.