CLEARING THE AIR OF SARS-COV-2

A NEW GENERATION OF HIGH-EFFICIENCY HVAC FILTERS THAT CAN BE USED WITH EXISTING INFRASTRUCTURE TO STOP THE SPREAD OF CORONAVIRUS THROUGH RECIRCULATION OF AIR

NIIMBL® The National Institute for Innovation in Manufacturing Biopharmaceuticals

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INDUSTRY NEED

Filtration of SARS-CoV-2 virus out of indoor air remains an ongoing challenge in reducing the transmission of COVID-19. As a filter removes particles from the air (particle loading), it becomes more difficult for air to pass through, leading to a pressure drop and loss of efficiency. To remove coronavirus, filters must be able to capture anything less than a micron in diameter. While MERV13 filters capture coronavirus, current residential air filtration systems are not powerful enough to counteract the pressure drop that occurs with virus particle loading. The goal in filter design is to optimize this tradeoff; for example, adding pleats to filters can improve efficiency and reduce the pressure loss.

SOLUTION

Dr. Behnam Pourdeyhimi and his team at NC State developed and tested filters of electrostatically charged nonwoven polypropylene and PLA polymers, manufactured using spunbound technology and staple carded methods. They also conducted a computational study to run microscale (fiber level) and macroscale (pleat level) simulations to guide filter design and manufacturing. Based on the simulations, the team created and tested single- and double-layer pleated filters containing various proportions of polypropylene and PLA polymers.

OUTCOME

The team found that the spunbound filter media could be pleated easily and accommodate a high number of pleats to improve filtration efficiency without a rapid rise in pressure drop. The spunbound manufacturing technology has the potential to produce MERV10 all the way to HEPA filters. The carded media was able to retain its electrostatic charge and filter particles with high efficiency, but the manufacturing process would need to be modified to eliminate electrostatic charge that makes web formation challenging. The structure will be charged by the process at the last step by needle punching.

As part of the project, the team also developed various new tools for charging and measuring charge in the filters. The team envisions that computational simulations will guide in the design of filters in terms of structure, fiber selection, and charge to efficiently filter SARS-CoV-2 from indoor spaces.

> *"We have built a very strong technical foundation and new tools for the manufacture of coronavirus filters suitable for use in homes and businesses."*

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