

MelnPak – Reusable Infection Control Kit

Motivation

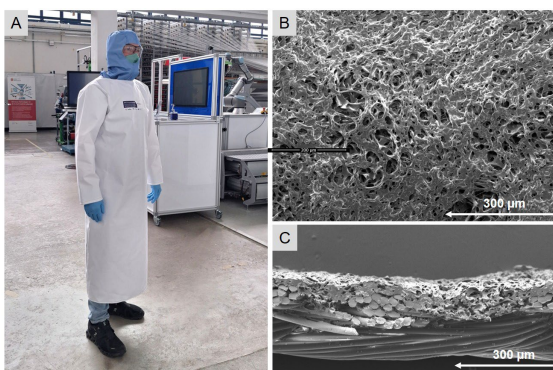
The COVID-19 pandemic has shown that products designed to protect against infection, such as medical face masks (FFP2 masks) and protective gowns, consist largely of single-use items, which, because they are used only once, generate an enormous amount of waste and, when demand increases, create a heavy reliance on global supply chains and production capacities. The goal of this collaborative project was to develop a multilayer composite material consisting of at least one filtering functional layer (meltblown nonwoven fabric, foam coating, or nanomembrane), either partially combined with one another or in combination with a textile. The developed composites were used to manufacture custom-fit protective masks, gowns, and hoods that are washable multiple times and are designed to comply with the PPE Regulation as well as meet the requirements for dual use as medical devices.



Approach and Results

The goal of the STFI subproject was to develop filtering composites based on nonwovens and foam coatings. The project demonstrated that, compared to the developed TPU meltblown nonwovens, the coatings exhibited superior properties in terms of washability and filtration efficiency. Compacted foam coatings with a particle-filtering effect were successfully developed. By combining the fabric, foam formulation, application and compaction parameters, the structure of the coating, and thus its properties, could be specifically influenced. With application weights of 46–68 g/m², very good filtration properties (P_SARS_CoV-2 (0.15 µm) < 6 % and bacterial filtration according to EN 16683 > 96.4 %), high water vapor permeability (> 11,540 g/m²/24h), and the targeted air permeability values in the range of 5–30 l/m²/s were achieved. Only the water tightness of the systems was limited to a maximum of 70 mbar, and the breathing resistance was still too high. As part of the overall project, the composite materials from the production trials were used to manufacture an infection control package consisting of a mask, a gown, and a cap.

Based on the parameters achieved in the project, the product can already be used as a protective smock and head cover.



Ready-to-use infection control kit consisting of a mask, gown, and cap (A) and SEM images of the foam coating (B = surface and C = cross-section).

Acknowledgment

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The final report on this project is available on request.

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