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# Influence of the microstructure of non-woven media on filtration performance at different operational regimes.

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In this work, we study the efficiency of the filter media at different operational regimes. In particular, we focus on how the media microstructure influences the efficiency performance, which is quantified by macroscopic parameters. We investigate the microscale characteristics since the filtration is an intrinsically multiscale process. On one hand, contaminant adsorption onto the fibre surface occurs at the pore-scale of the non-woven filter media, i.e., it is a microscale process. On the other hand, we are interested in the overall performance of the filter media, which is a macroscale characteristic, and how the performance changes for different macroscopic characteristics, such as porosity and thickness of the filter media and operational conditions. Filtration processes at both scales are fully coupled. Therefore, to model this problem we use the method of multiple scales, which is an upscaling technique that models variations at macroscale while accounting for filtration processes at microscale. The advantage of this multiscale method is that the coupled micro- and macroscale behaviour is captured without the computational expense of globally resolving the microscale filtration problem. We account for: a single-phase fluid flow through the filter medium, the contaminant transport with convection, diffusion and adsorption and the evolution of the filter medium microstructure due to the contaminant adsorption. Using developed simulation framework, we perform extended numerical study to investigate the influence of microstructure on the filtration performance at different filtration regimes.

## References

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