DESIGN OF A REFERENCE POROUS MEDIUM FOR CALIBRATING THROUGH THICKNESS PERMEABILITY SETUP

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Abstract

The introduction of ISO 4410:2023[1] for in-plane permeability marks a significant milestone in addressing a reliable approach for permeability measurement. However, achieving consistent and comparable results requires the development of a dependable reference medium, which has yet to be established. This study aims to fill this gap by utilizing advanced 3D printing techniques to fabricate textile-like reference structures [2]. These structures are designed to act as consistent benchmarks for permeability measurements, addressing the complexity of fluid flow within textile preforms. Unlike previous approaches that focused solely on in-plane permeability, our research introduces through thickness porosity and nesting effects, extending the versatility of the reference medium for broader applications. The research is a collaborative effort between the Luxembourg Institute of Science and Technology (LIST), Swinburne University of Technology, Faserinstitut Bremen, and KU Leuven. The team designed and manufactured porous cylindrical structures using additive manufacturing techniques, aiming to create a standard reference medium. The collaborative effort across institutions and the integration of advanced manufacturing and simulation techniques represents a significant step forward in establishing a reliable, consistent reference medium for permeability measurement in LCM processes. This research not only addresses the limitations of existing methods but also provides a foundation for more accurate benchmarking in both in-plane and through-thickness permeability calibration. The outcomes of this study have the potential to significantly improve the accuracy and comparability of permeability measurements in composite manufacturing processes, offering new opportunities for future research and industrial application.

[1] ISO 4410:2023, 2023.
[2] Bodaghi, D. Ban, M. Mobin, C. H. Park, S. V. Lomov, and M. Nikzad, “Compos Part A Appl Sci Manuf, vol. 139, p. 106119, Dec. 2020, doi: 10.1016/j.compositesa.2020.106119