

Acoustic behaviour of knitted-nonwoven hybrid materials for industrial/automotive noise reduction

Siddhi Vardhan Singh Rao^{*1}, Apurba Das¹, Bipin Kumar¹, and Nandan Kumar²

¹ Department of Textile and Fibre Engineering, Indian Institute of Technology – Delhi, *e-mail: ttz228221@iitd.ac.in

² High Performance Textiles Private Limited, Sonipat

Abstract: Fibrous materials have conventionally functioned as primary solutions for sound absorption and insulation across a spectrum of industrial contexts, encompassing aircraft engine liners, automobiles, ships, power generators, and industrial insulation, where the imperative for effective noise reduction looms large. Mineral fibre mats stand out as amongst the most favoured materials for sound absorption in automotive and industrial exhaust systems in practice. Yet, owing to the brittle nature inherent in glass fibres, needle-punching fails to yield sufficient entanglements within the fibres to withstand aero-mechanical forces, thereby exacerbating the issue of fibre loss. In this regard, a knitted-nonwoven hybrid structure emerges as a promising alternative to mitigate these challenges.

This study contributes significantly to advancing our understanding of the acoustic behaviour exhibited by knitted-nonwoven hybrid materials as shown in Figure 1. Through a systematic investigation, The research explores how different aspects of the knitted structure influence the acoustic performance of these hybrid materials. Furthermore, this research explores the acoustic behaviour of knitted structures crafted from both flat glass and texturized glass roving. By scrutinising and comparing the acoustic properties of these distinct materials, valuable insights are garnered regarding their respective suitability for sound absorption applications. Such detailed analysis provides a foundation for informed decision-making in selecting the most appropriate materials and structural configurations to optimise acoustic performance in diverse industrial settings.

Keywords: Acoustics, Sound absorption, Sound absorbing knit, Exhaust noise, Hybrid sound absorbing material

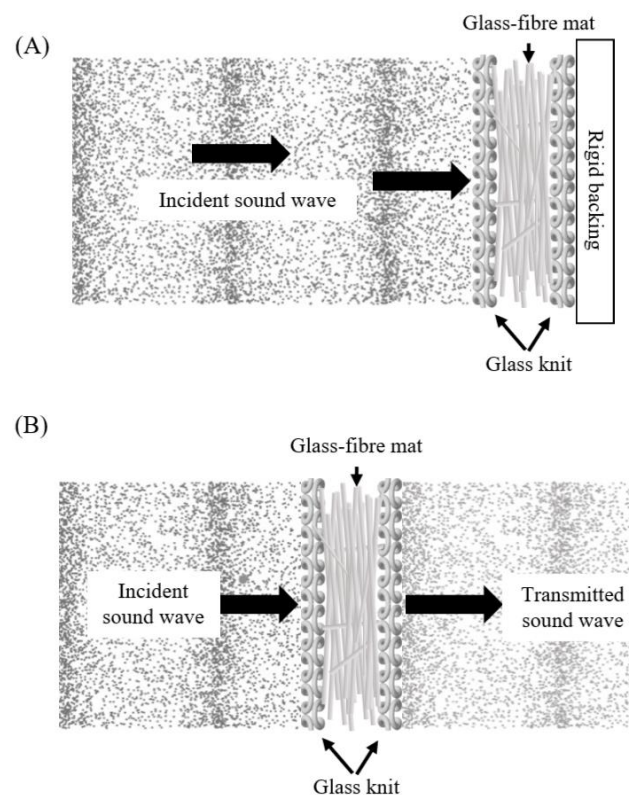


Figure 1 Knitted-nonwoven hybrid material acoustic characterization. (A) Sound absorption; (B) Sound transmission loss.