

DEVELOPMENT AND EVALUATION OF NOVEL INTUMESCENT FLAME-RETARDANT COATING FOR TEXTILE STRUCTURE-REINFORCED COMPOSITE

Shubham Agnihotri¹, Javed N Sheikh², S.P Singh³ and B.K Behera²

¹School of Interdisciplinary Research, Indian Institute of Technology Delhi, e-mail: srz218574@iitd.ac.in

²Department of Textile and Fiber Engineering, Indian Institute of Technology Delhi, e-mail: behera@textile.iitd.ac.in, jnsheikh@textile@iitd.ac.in

³Department of Mechanical Engineering, Indian Institute of Technology Delhi, e-mail: singhsp@mech.iitd.ac.in

Abstract: Developing novel intumescent flame-retardant coatings for textile structure-reinforced composites remains the thrust of research in the area of fire safety and structural materials.[1] Intumescent coatings are designed to swell and form a protective char layer when exposed to fire, thereby insulating the underlying substrate and delaying the spread of flames[2]. This study explores the development and application of innovative intumescent formulations using phytic acid, guanidine hydrochloride, and cellulose microcrystalline powder to textile structure-reinforced composites. Through a combination of experimental characterization techniques and performance testing, including cone calorimetry, vertical burning tests, and thermal analysis, the efficacy of these coatings in enhancing fire resistance and preventing ignition is systematically evaluated.[3] Furthermore, the mechanical properties and durability of the coated composites are assessed to ensure the compatibility for structural applications. The findings of this research contribute to the development of advanced fire-retardant solutions for textile structure-reinforced composites, with potential applications in diverse industries such as construction, aerospace, and transportation, where fire safety and structural integrity are of paramount concerns.

Keywords: flame retardant coating, textile structure-reinforced composites, Cone Calorimetry

REFERENCES

- [1] S. Agnihotri, J. N. Sheikh, S. P. Singh, and B. K. Behera, "Flame-retardant textile structural composites for construction application: a review," *J Mater Sci*, Jan. 2024, doi: 10.1007/s10853-023-09312-7.
- [2] M. Bar, R. Alagirusamy, and A. Das, "Flame retardant polymer composites," *Fibers and Polymers*, vol. 16, no. 4, pp. 705–717, 2015, doi: 10.1007/s12221-015-0705-6.
- [3] W. Guo *et al.*, "Multifunctional epoxy composites with highly flame retardant and effective electromagnetic interference shielding performances," *Composites Part B*, vol. 192, no. March, p. 107990, 2020, doi: 10.1016/j.compositesb.2020.107990.

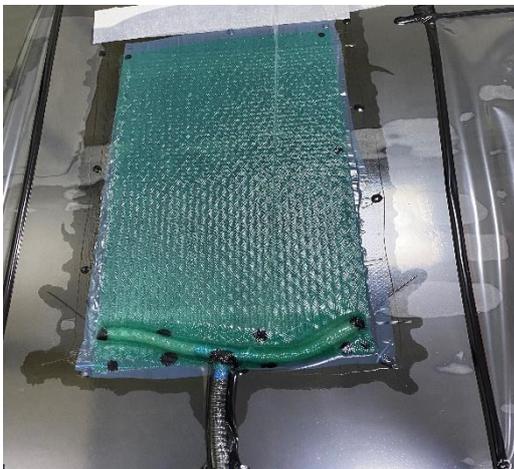


Fig: Vacuum-assisted resin infusion technique