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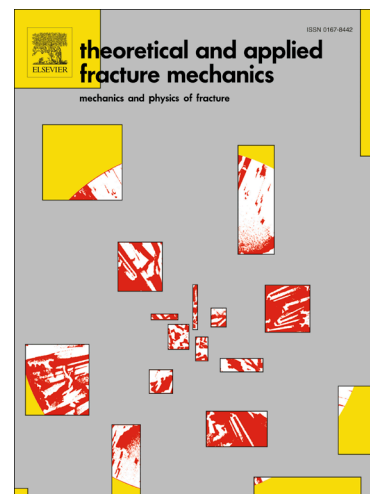
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Fracture assessment of polyacrylonitrile nanofiber-reinforced epoxy adhesive

S.M.J. Razavi¹, R. Esmaeely Neisiany^{2,3}, M.R. Ayatollahi⁴, S. Ramakrishna³, S. Nouri Khorasani², F. Berto¹

¹ *Department of Mechanical and Industrial Engineering, Norwegian University of Science and Technology (NTNU), Richard Birkelands vei 2b, 7491, Trondheim, Norway.*

² *Department of Chemical Engineering, Isfahan University of Technology, Isfahan 84156-83111, Iran.*

³ *Center for Nanofibers and Nanotechnology, Department of Mechanical Engineering, National University of Singapore (NUS), Singapore 117576, Singapore.*

⁴ *Fatigue and Fracture Lab., Centre of Excellence in Experimental Solid Mechanics and Dynamics, School of Mechanical Engineering, Iran University of Science and Technology, Narmak, 16846, Tehran, Iran.*

Abstract:

Electrospun polyacrylonitrile (PAN) nanofibers were incorporated in an epoxy-based adhesive layer to improve the adhesive joint's mechanical performance. The morphological study of the electrospun PAN nanofibers revealed that the fabricated nanofibers were smooth, continuous, and without beads. The average diameter of the nanofibers was determined to be 362 ± 87 nm. The Double Cantilever Beam (DCB) specimens were tested and the fracture energies were determined for the unreinforced and reinforced adhesives. The outstanding reinforcing capability of PAN nanofibers was demonstrated by significant improvements in fracture energy of the adhesive containing PAN nanofibers. A maximum improvement of 127% in the mode I fracture energy of adhesive was achieved by incorporating 2 g/m^2 of PAN nanofibers into the adhesive layer. Moreover, the morphology of the fracture surfaces was examined using the Scanning Electron Microscopy (SEM) technique to evaluate the toughening mechanisms resulting from this improvement.

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