

Mechanical Properties of Uniaxial Natural Fabric *Grewia tilifolia* Reinforced Epoxy Based Composites: Effects of Chemical Treatment

J. Jayaramudu^{1*}, G. Siva Mohan Reddy, K. Varaprasad, E. R. Sadiku, S. S. Ray¹, and A. Varada Rajulu²

Department of Polymer Technology, Tshwane University of Technology, CSIR Campus, Pretoria, South Africa
¹DST/CSIR Nanotechnology Innovation Centre, National Centre for Nano-Structured Materials,
Council for Scientific and Industrial Research, Pretoria 0001, South Africa

²Department of Polymer Science and Technology, Sri Krishnadevaraya University, Anantapur 515003, India

Abstract

The effects of chemical treatment on the mechanical, morphological, and chemical resistance properties of uniaxial natural fabrics, *Grewia tilifolia*/epoxy composites, were studied. In order to enhance the interfacial bonding between the epoxy matrix and the *Grewia tilifolia* fabrics, two different types of treatment: alkali treatment (5 % NaOH) and (3-aminopropyl)-triethoxysilane coupling agent (CA), were used. The epoxy composites containing 0-15 wt% of *Grewia tilifolia* fabric were prepared by hand lay-up technique, at room temperature. The tensile and flexural properties of the untreated, alkali-treated and coupling agent treated *Grewia tilifolia* reinforced epoxy composites were determined as a function of fabric loading. The 9 % wt *Grewia tilifolia* fabric reinforced epoxy composites showed improved tensile and flexural moduli when compared to the neat epoxy matrix. Significant improvement in the mechanical properties was obtained when both alkali and coupling agent treated fabrics were used as reinforcement. Morphological studies demonstrated that better adhesion between the fabrics and the matrix was achieved especially when the alkali-treated and coupling agent treated *Grewia tilifolia* fabrics were used in the composites. For the water absorption and chemical resistance studies, various solvents, acids and alkalis were used on the epoxy composites. This study has shown that *Grewia tilifolia* fabric/epoxy composites are promising candidates for structural applications, where high strength and stiffness are required.