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PHENOLIC EPOXY RESIN/COTTON WASTE BIOCOMPOSITES PREPARATION AND CHARACTERIZATION

Assist. Prof. Dr. Ulku SOYDAL
Karapınar Aydoğanlar Vocational School, Selcuk University, Konya, Turkey
Department of Biochemistry, Faculty of Science, Selcuk University, Campus, Konya, Turkey
orcid no: 0000-0002-9381-4139
Assoc. Prof. Dr. Suheyla KOCAMAN
Department of Chemical Engineering, Faculty of Engineering and Natural Sciences, Konya Technical University, 42022, Campus, Konya, Turkey
orcid no: 0000-0001-5199-8577
Prof. Dr. Gulnare AHMETLİ
Department of Chemical Engineering, Faculty of Engineering and Natural Sciences, Konya Technical University, 42022, Campus, Konya, Turkey
orcid no: 0000-0002-9381-4139

ABSTRACT

In recent years, the increasing interest in the use of waste natural fillers in composites is due to desirable properties such as biodegradability, renewability, low density, environmental friendliness, and cost-effectiveness (Saba, Jawaid, Paridah, Al-othman, 2016). Cotton waste consisting of cotton stems, leaves, and husks, has a high cellulose content. Phenol novolac epoxy resins are multifunctional epoxy resins manufactured from phenol novolac resin and epichlorohydrin. When cured, they form cured materials that possess a mesh structure with a high cross-linking density. They also demonstrate excellent performance in heat and chemical resistance and are used in composite materials, resists, and laminates (Kocaman, 2020). In this study, cotton waste (CtW) was utilized firstly as raw waste filler material in phenolic novolac-type epoxy (EPN) resin to preparation of biocomposites. For characterization of biocomposites, scanning electron microscopy (SEM) analysis, tensile, hardness and water sorption tests were performed. The effect of the CtW dose on the mechanical, and water sorption properties of the composites were investigated. The tensile strength of the neat EPN was determined to be 96.6±4.77 MPa, while the composite with the appropriate amount of filler 20% by weight had a tensile strength of 95.6±6.20 MPa. CtW filler increased the water uptake percentage of the EPN matrix (0.85%) and it was determined as 3.39% at 20 wt% CtW during 30 day. Epoxies can absorb 0.1-5% water depending on its formulation and type (Licari, 2003). However, this trend and the slight decrease in mechanical properties are not critical obstacles for the use of CtW in the manufacture of inexpensive epoxy- and bio-based eco-friendly products.

Keywords: Cotton waste, Phenol novolac epoxy resin, Biocomposite.

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