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A study of the effects of acid, plasticizer, cross-linker, and extracted chitin nanofibers on the properties of chitosan biofilm

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Abstract: A comprehensive research was conducted to compare mechanical, optical, and water absorption properties of chitosan/chitin nanofiber (ChNF) nanocomposites, prepared by acetic acid in form of uncross-linked biofilms and adipic acid in form of physically (uncured) and chemically (cured) cross-linked biofilms. The chemical and morphological characterizations revealed that the isolated ChNFs contained almost 88% chitin, with crystallinity and average diameter of 84% and 21nm. Mechanical properties of uncross-linked chitosan biofilms increased with loading ChNFs up to 5 weight percent (wt.%), albeit their elongations at break declined—this reduction was then compensated using plasticizer. Moreover, it was found that the cured biofilms containing 5 wt.% ChNFs and 20 wt.% glycerol showed the highest strength. The superior resistance to water absorption was also observed in case of the cured biofilms, and transparency test showed that adding ChNFs and glycerol could reduce the transparency of chitosan biofilms.

Keywords: A. Polymer-matrix composites (PMCs); A. Biocomposite; A. Natural fibers; A. Nano-structures

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