

INVESTIGATION OF THE EFFECT OF CHITIN NANO WHISKERS ON THE STRUCTURAL AND PHYSICAL PROPERTIES OF HIGH IMPACT POLYPROPYLENE/CHITIN COMPOSITES

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ABSTRACT

Biopolymers are known for their beneficial properties such as having antimicrobial abilities, being renewable, biocompatible and biodegradable¹. This made biopolymers, such as chitin, very popular in recent studies for applications in the latest medical, industrial and environmental developments. Composites that contain the acid hydrolyzed derivatives of chitin, chitin nanowhiskers (chnw), are also becoming of increasing importance in these types of applications. Chnw have a much higher surface area, smaller dimensions and are more crystalline than chitin³. In this study chnw was incorporated into high impact polypropylene (HiPP) in order to investigate the effects that this filler have on the mechanical and structural properties of the polymer matrix. The poor interaction between chnw and HiPP made it necessary to investigate the use of compatibilisers². The effect of two types of compatibilisers, poly-graft maleic anhydride (PPgMA) and poly (ethylene-vinyl alcohol) (EVOH), were investigated for the use of making improved and compatible HiPP composites. Injection molding was mainly used to incorporate chnw into the HiPP matrix. Electrospinning and melt pressing of electrospun fiber mats containing chnw and EVOH was an additional method of incorporation that was investigated. The fiber mats were sandwiched between two HiPP films to create a composite. Tensile testing was done on the films and injection molded bars to analyze the mechanical properties of the composites. SEM, TEM, ATR-FTIR and DSC and TGA were used to investigate the structural and thermal properties respectively. It was found that after incorporation of chnw along with each of the compatibilisers, improvement in some mechanical properties of the polymer matrix can be seen, however the influence that each type of compatibiliser has, varies depending on the wt% of the compatibiliser and the chnw with regard to the polymer matrix.

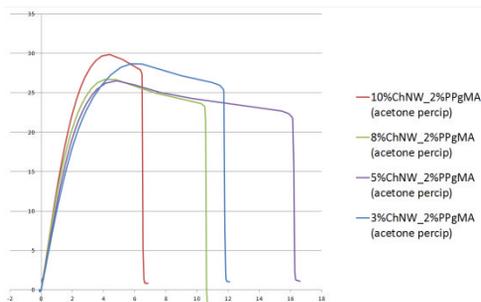


Fig. 1: Stress strain curve of 3%, 5%, 8% and 10%wt chnw incorporated into high impact polypropylene containing 2%_PPgMA compatibiliser

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References

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