

UNIVERSITI TEKNOLOGI MARA

**PERFORMANCES OF
PLA/TBF/NANO-AG
NANOBIOCOMPOSITE**

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ABSTRACT

Poly(lactic acid) (PLA) is a natural based thermoplastic which has gained great interest in composite industry due to its biocompatibility and biodegradability. However, PLA has its drawbacks such as brittleness, rigid behavior, low heat distortion temperature and poor thermal stability. These problems can be overcome by blending PLA with natural fibers. The environmental friendly of natural fiber has been the key factor why it is getting much more attention in composites. Banana Fiber (BF) has been selected as the best replacement for man-made fiber. BF will undergo NaOH-silane treatment to remove the impurities and to enhance properties of BF. In order to produce a PLA/Treated Banana Fiber (TBF) biocomposite which is suitable for food container, an additive has to be added as antimicrobial agent. The application of Ag as an antimicrobial agent has also proven effective when incorporated into a variety of materials including polymers. Mechanical, thermal, morphology, elementary analysis and anti-microbial test have been conducted on nano-biocomposite samples. Mechanical, thermal stability and SEM analysis have been analyzed to obtain the best ratio of PLA to TBF. 10 wt% of TBF has been selected based on the mechanical properties performance. Range of 0-2 wt% nanoAg was used for this research. nanoAg doesn't affect the mechanical properties; tensile, flexural and izod impact strength due to small usage of nano loading. From thermal stability analysis, TBF and nanoAg metal decreased the thermal degradation stability of neat PLA but results in higher char ash content. Roughen surface for sample that obtaining nanoAg, indicating that the sample has a strength and stiff. EDX analysis output detecting elemental mapping region for Ag particle on the surface of nanobiocomposite. Higher value of FTIR was due to addition of nanoAg to PLA which increase the nucleation rate and nucleation density. From anti-microbial assessment, 1 wt% of nanoAg loading shows the best performance against fungus formation which only allowed the fungus starts to growth only at eighth day. It was conclude that 1 wt% of nanoAg loading is the most compatible formulation to compatible with PLA/TBF biocomposite against microbes.

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