UNIVERSITI TEKNOLOGI MARA

OPTIMIZATION OF NANOPAPER PREPARATION FROM TROPICAL PIONEER SPECIES

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ABSTRACT

This study shows about optimization of nanopaper preparation from tropical pioneer species in Peninsular Malaysia like Mahang wood which by adding nanocrystalline cellulose (NCC) into paper. Nanotechnology developments in areas of fiber science, minerals and other additives will give papermakers the means to put order and structure into the designs of a sheet (Innova, 2004). NCC has the capability of turning into an imperative class of renewable nanomaterials, which could discover numerous helpful applications. The main application of NCC is for the reinforcement of polymeric matrix in nanocomposite materials (Peng, Dhar, Liu, & Tam, 2011). Besides that, NCC can improves barrier properties in nanocomposite. Furthermore, the addition of NCC in papermaking process has been identified as a method to improve physical and mechanical properties of paper, however there is a possibility that some of the NCC added are lost in the whitewater due to its small size. This results in significant property improvement. Hence, there is a need to identify the optimum papermaking process protocol which retains most of the NCC to be effective as an additive. The desired structure obtained in the study is NCC with average length of the NCC is 514.9nm and the hydrolysis yield is 12.06%. The optimum pH for grafted NCC is ph11. There are six samples of grafted NCC nanopaper with different concentrations, 0%, 0%, 1%, 2.5%, 5%, and 10% respectively. The tensile strength of Sample 1, 2, and 3 is decrease linearly, 1.64kN/m, 1.52kN/m, 1.424kN/m then the tensile strength of Sample 4, 5, 6 is increase linearly, 1.744kN/m, 2.072kN/m, 2.44kN/m.

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CHAPTER 1
INTRODUCTION

1.1 Research Background

Nanotechnology is a rising territory of science and technology that will revolutionize use in the 21st century. The moderately unrefined and unsophisticated technology on which we presently depend will be replaced with very productive and environmentally friendly nanotechnologies (Wegner & Jones, 2009). The finding of novel materials, procedures, and phenomena at the nanoscale and the development of new experimental and theoretical techniques for research give crisp chances to the improvement of creative nanosystems and nanostructured materials (Bharat, 2010).

The papermaking application of employing nanoparticle systems has evolved to become more of a "properties" management system during papermaking, and beyond the mill at converting operations and printers. Nanotechnology developments in areas of fiber science, minerals and other additives will give papermakers the means to put order and structure into the designs of a sheet (Innova, 2004). NCC has the capability of turning into an imperative class of renewable nanomaterials, which could discover numerous helpful applications. The main application of NCC is for the reinforcement of polymeric matrix in nanocomposite materials (Peng, Dhar, Liu, & Tam, 2011). Besides that, NCC can improves barrier properties in nanocomposite. In particular, food packaging materials require both mechanical strength and barrier for such molecules as gases (mainly oxygen), moisture migration, flavour and aroma control. Barrier property investigations of NCC-improved materials have mainly focused on water vapour transmission and oxygen permeability (Brinchi, Cotana, Fortunati, & Kenny, 2013).

1.2 Objective

a) To identify optimum papermaking protocol for nanocellulose retention.

b) To identify property improvement in paper containing nanocellulose.