OPTIMIZATION OF HYDROLYSIS CONDITIONS FOR NANOCRYSTAL CELLULOSE (CNXL) FABRICATION

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Final Year Project Submitted In
Partial Fulfillment of the Requirements For The
Bachelor of Science (Hons.) Polymer Technology
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May 2008

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ABSTRACT

OPTIMIZATION OF HYDROLYSIS CONDITIONS FOR NANOCRYSTAL CELLULOSE (CNXL) FABRICATION

This study describes an acid hydrolysis technique with subsequent ultrasonification time to produce nanocrystal cellulose (CNXL) from microcrystalline cellulose (MCC). The microcrystalline cellulose was hydrolyzed at difference conditions. The concentration of 40%, 50% and 55% of sulphuric acid were used. Hydrolysis was done at room temperature and 50^{o} C for 30 minutes, 60 minutes and 90 minutes. The colloidal suspension of nanocrystal cellulose produced undergoes centrifugation, followed by filtration, ultasonication and drying in vacuum oven. The nanocrystal cellulose produced was characterized using SEM and Polarized Light Microscope. Difference in hydrolysis conditions affected the size distribution of nanocrystal cellulose produced. The range size distribution of the nanocrytal produced was wide between 85nm-333nm.

CHAPTER 1

INTRODUCTION

1.1 Background

Cellulose by far is the most abundant natural polymer that exists on this planet and presents scientists with the advantage to utilize it as an inexhaustible source of raw material in the synthetic development of environmentally friendly and biocompatible products. Due to its availability and low cost, cellulose and its derivatives are extensively used in industries consisting of textiles, plastics, wood and paper products, coatings, and pharmaceuticals among others. Its structural framework consists of extensive intra and intermolecular hydrogen bonding that makes it completely insoluble in normal aqueous solvents and solutions. Cellulose fibrils contain highly crystalline regions that co-exist with amorphous regions, which has a capacity of holding relatively large amounts of water, thus making it a very hygroscopic molecule. These crystalline regions can be conveniently separated from the low order regions to form rod-like cellulose microcrystallites. The rod-like particles can be coupled with various synthetic polymer structures forming hybrid copolymer blocks that display properties of amphiphiles.(Abhishek Dhawan,2007)