

LI-ION BATTERY FROM INDUSTRIAL WASTE WATER

INVENTOR: NOR AZLIN BINTI YAH
FACULTY: Faculty of Chemical and Processes Engineering Technology
UNIVERSITY: UNIVERSITY MALAYSIA PAHANG
EMAIL: azlinyh@gmail.com
CO-INVENTORS: DR ROHANA BINTI ABU



INTRODUCTION

RESEARCH BACKGROUND

Exo-polysaccharide
 can undergo modification
 wound healing material
 high tensile strength, flexibility, high water holding capacity (WHC)

MOTIVATION

Impregnating AgNPs into BC by hydrothermal synthesis

BC has attracted as an ideal wound dressing materials

Ability to hold water capacity and show good biocompatibility

The size of AgNPs is 1-100 nm which has relative large surface area.

PROBLEM STATEMENT

- Impregnating Ag into BC has shown good antimicrobial properties
- But, it affect the properties of BC such as WHC and WRR

OBJECTIVE

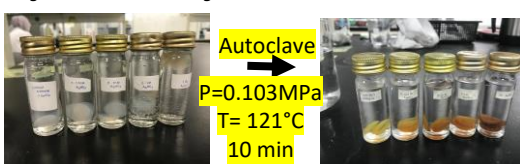
To investigate the water holding and release properties of BC-AgNPs.

SCOPES OF STUDY

- Synthesis of BC-AgNPs by hydrothermal synthesis with different concentration of AgNO₃ (0.001M, 0.01M, 0.1M and 1M).
- Characterization of BC-AgNPs using FTIR for chemical functional group and FESEM for surface morphology.
- Determination of water holding capacity (WHC) of BC-AgNPs.
- Determination of water release rate (WRR) of BC-AgNPs.

METHODOLOGY

Hydrothermal Synthesis



The BC kept in vials that contain different concentration of AgNO₃ (0 M;CS, 0.001M, 0.01M, 0.1M and 1.0M).

FTIR & FESEM Analysis

BC samples were analysis of its characteristic using FTIR and FESEM



BC samples were weighed at initial and after freeze dry.

WRR Analysis

BC samples were immersed in distilled water for 24 hours.

Leave at room temperature

BC samples were weighed every 1 hours until a constant dried weight were achieved

RESULTS

Characterization of BC-AgNPs Using FTIR for Chemical Functional Group

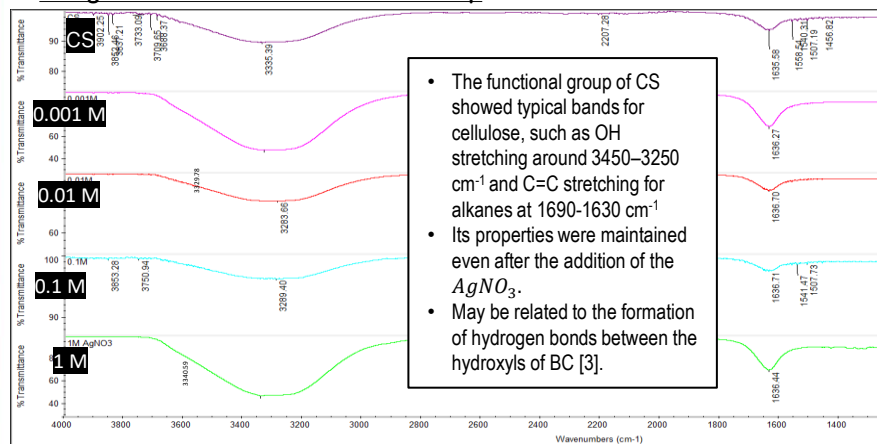


Figure 1 FTIR spectrum of freeze-dried of BC-AgNPs at different concentration a; 0 M (CS), 0.001M, 0.01M, 0.1M and 1M of AgNO₃

Using FESEM for Surface Morphology

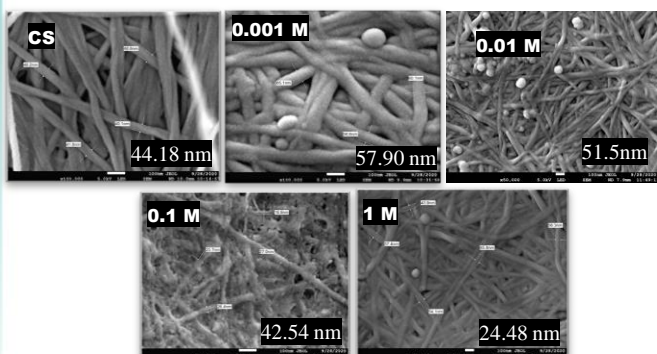


Figure 2 FESEM image of CS as control sample and 0.001M, 0.1M, 1M and 1M of BC-AgNPs

- The fibrils of BC-AgNPs had compact arrangements compared to control sample
- The pores present on the surface of 1M of AgNO₃ are almost completely filled with Ag molecules
- The filling of empty spaces by the AgNO₃ layers ultimately results in a reduction of the total pore volume
- That can lead to the WHC decreased as the compact arrangement decreased in increasing of concentration of AgNO₃.

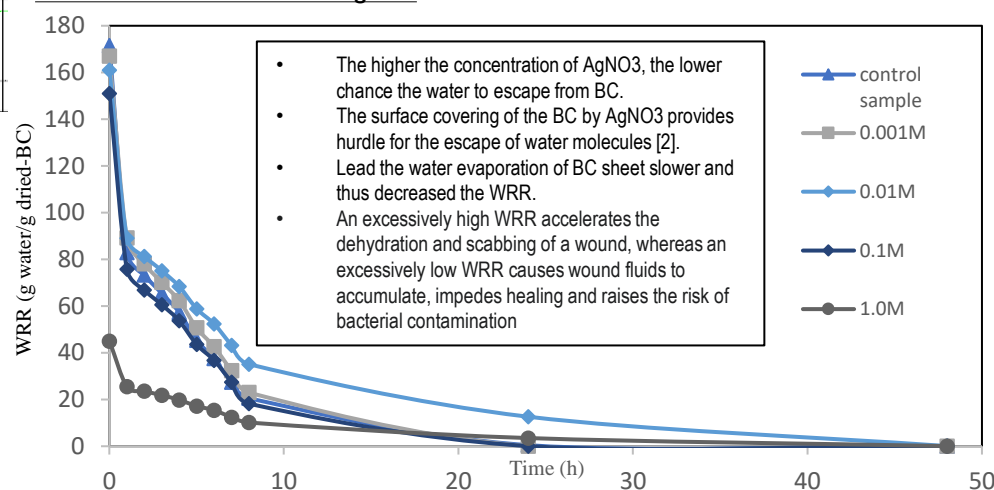
Determination of WHC of BC-AgNPs

Table 1: WHC of BC and BC-AgNPs at different concentration

Concentrations of AgNO ₃	WHC (g water/ g dried BC)
Control sample	171.54 ±3.87
0.001M	167.95 ±2.98
0.010 M	160.97 ±5.66
0.100 M	150.88 ±3.46
1.000 M	44.88 ±0.86

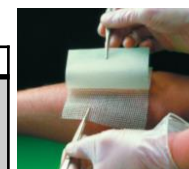
- WHC decreases with increasing of AgNO₃ concentration
- Due to the presence of AgNO₃ particles on the surface and inside the BC matrix, which reduces the space for penetration and adsorption of water molecules [2].
- In order to maintain the wound hydrated as well as to be able to absorb large amounts of exudates, high WHC is required.

Determination of WRR of BC-AgNPs.



ECONOMIC POTENTIAL

Type Description	Unit	Price	Total price
Cost Price of Raw Material			
-BC samples	15	RM5	RM 75
- chemical (AgNO ₃)	8.49g	RM500 (100g)	RM 42.45
Gross expense			RM117.45
Selling Price of Product			
-Gauze dressing wound healing	15 plies	-	RM130
Gross profit			RM12.55



REFERENCES:

- [1]. De Sousa Moraes, P. R. F., Saska, S., Barud, H., DeLima, L. R., Da Conceicao Amaro Martins, V., De Guzzi Plepis, A. M., Ribeiro, S. J. L., & Gaspar, A. M. M. (2016). Bacterial cellulose/collagen hydrogel for und healing. Materials Research, 19(1), 106–116. <https://doi.org/10.1590/1980-5373-MR-2015-0249>
- [2] Ul-Islam, M., Khan, T., & Park, J. K. (2012). Water holding and release properties of bacterial cellulose obtained by in situ and ex situ modification. Carbohydrate Polymers, 88(2), 596–603. <https://doi.org/10.1016/j.carbpol.2012.01.006>
- [3] Mohamed, M. A., Jaafar, J., Ismail, A. F., Othman, M. H. D., & Rahman, M. A. (2017). Fourier Transform Infrared (FTIR) Spectroscopy. In Membrane Characterization. <https://doi.org/10.1016/B978-0-444-63765-0.00001-2>

CONCLUSION

- The WHC and WRR were correlated to the changes in different parameters: micro-fibril arrangements, pore size, pore volume and surface area.
- The free water that is able to penetrate and to escape the BC sheets is responsible for the maintenance of the hydration level that is crucial for the wound dressing application
- BC that have prepared with 0.01 M AgNO₃ presented no significant difference when comparing with control sample as it is respect to the requirement.