



UNIVERSITI TEKNOLOGI MARA

BCT465: PHYSICAL AND CHEMICAL PROPERTIES OF CELLULOSIC MATERIALS

Course Name (English)	PHYSICAL AND CHEMICAL PROPERTIES OF CELLULOSIC MATERIALS APPROVED
Course Code	BCT465
MQF Credit	4
Course Description	This course aims in giving student the exposure of physical and chemical properties of cellulosic materials. This course concentrating on theoretical understanding of dimensional instability, permeability, thermal, sugar chemistry and natural durability of cellulosic materials because efficient utilization of those materials for production of bio-composite products demands a good knowledge of its basic properties. Comprehension on those properties is beneficial in understanding decay and protection of cellulosic materials in the wood based industry. This course also focused on weathering and selected biological agents that caused decay of cellulosic materials. The effect of natural weathering on graveyard test is also thought.
Transferable Skills	Able to transfer knowledge by sharing the chemical and Physical properties of cellulosic materials.
Teaching Methodologies	Lectures, Lab Work, Discussion
CLO	<p>CLO1 1. State, define and describe physical and chemical properties of cellulosic materials (LO1; C2; A2)</p> <p>CLO2 2. Classify and explain the relationship between basic cellulosic material properties and dimensional instability, permeability, thermal and decay properties.(LO1; C5; A3)</p> <p>CLO3 3. Perform experiments and interpret results of physical and chemical cellulosic properties determination. (LO1,LO2,LO3-CTPS3,LO4-CS3;LO5-TS3;LO9-LS2; C3;P4; A4)</p>
Pre-Requisite Courses	No course recommendations
Topics	<p>1. Lignocellulosic materials 1.1) 1.1 Introduction 1.2) 1.2 Biological nature of lignocellulosic materials</p> <p>2. Lignocellulosic material and water relationship 2.1) 2.1 The physics of water 2.2) 2.2 Relative humidity 2.3) 2.3 Hydrogen bonding and water adsorption 2.4) 2.4 Moisture content 2.5) 2.5 Equilibrium moisture content</p> <p>3. Relative density of lignocellulosic materials 3.1) 3.1 Relative density of wall material 3.2) 3.2 Gross relative density 3.3) 3.3 Standard method of determination, theoretical and experimental 3.4) 3.4 Factors affecting density and relative density 3.5) 3.5 Porosity</p> <p>4. Dimensional instability of lignocellulosic materials 4.1) 4.2 Hydroscopic shrinkage and swelling 4.2) 4.2 Volumetric shrinkage and swelling 4.3) 4.3 Anisotropy shrinkage and swelling 4.4) 4.4 Drying mechanism</p>

5. Permeability of lignocellulosic materials

- 5.1) 5.1 Basic structure of wood, non-wood and agriculture fibers
- 5.2) 5.2 Darcy' law
- 5.3) 5.3 Standard measurement
- 5.4) 5.4 Flow model

6. Thermal conductivity

- 6.1) 6.1 Fourier's law
- 6.2) 6.2 Empirical equation for thermal conductivity
- 6.3) 6.3 Factors affecting thermal conductivity
- 6.4) 6.4 Electrical properties

7. Weathering

- 7.1) 7.1 The effect of environments on weathering
- 7.2) 7.2 Graveyard test

8. Decay resistance

- 8.1) 8.1 Types of decay
- 8.2) 8.2 Plant pathology

9. Chemical resistance

- 9.1) 9.1 Introduction
- 9.2) 9.2 Chemical composition
- 9.3) 9.3 Natural durability

10. Chemical properties of lignocellulosic

- 10.1) 10.1 Chemical composition of lignocellulosic
- 10.2) 10.2 Chemical reaction of lignocellulosic materials
- 10.3) 10.3 Sugar chemistry
- 10.4) 10.4 Cellulose
- 10.5) 10.5 Hemicellulose
- 10.6) 10.6 Lignin
- 10.7) 10.7 Extractives

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	1 assignments for individual assignment which carries 5% marks each	5%	CLO1 , CLO2
	Lab Exercise	9 lab works that carries 20% marks	20%	CLO3
	Quiz	5 quizzes that carries 1% mark each	5%	CLO1 , CLO2 , CLO3
	Test	Two tests that carries 15% marks each	30%	CLO1 , CLO2 , CLO3

Reading List	Reference Book Resources	<ul style="list-style-type: none"> • Anonymous 1999, <i>Wood Handbook - Wood as an Engineering Material.</i> , U.S. Forest Products Laboratory Madison, Wisconsin, USA • Siau, J.F 1984, <i>Transport Processes in Wood</i>, Springer-Verlag • Stamm, A.J. 1964, <i>Wood and Cellulose Sciences.</i> , Ronald Press • Skaar, C 1972, <i>Water in Wood</i>, Syracuse University Press • Kollman, F.F.P. and Côté, W.A., Jr. 1968, <i>Principles of Wood Science and Technology Vol. I - Solid Wood</i>, Springer-Verlag New York, Inc., USA New York • Sjostrom,E 1981, <i>Wood Chemistry: Fundamentals and Applications.</i> , Academic Press New York
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	