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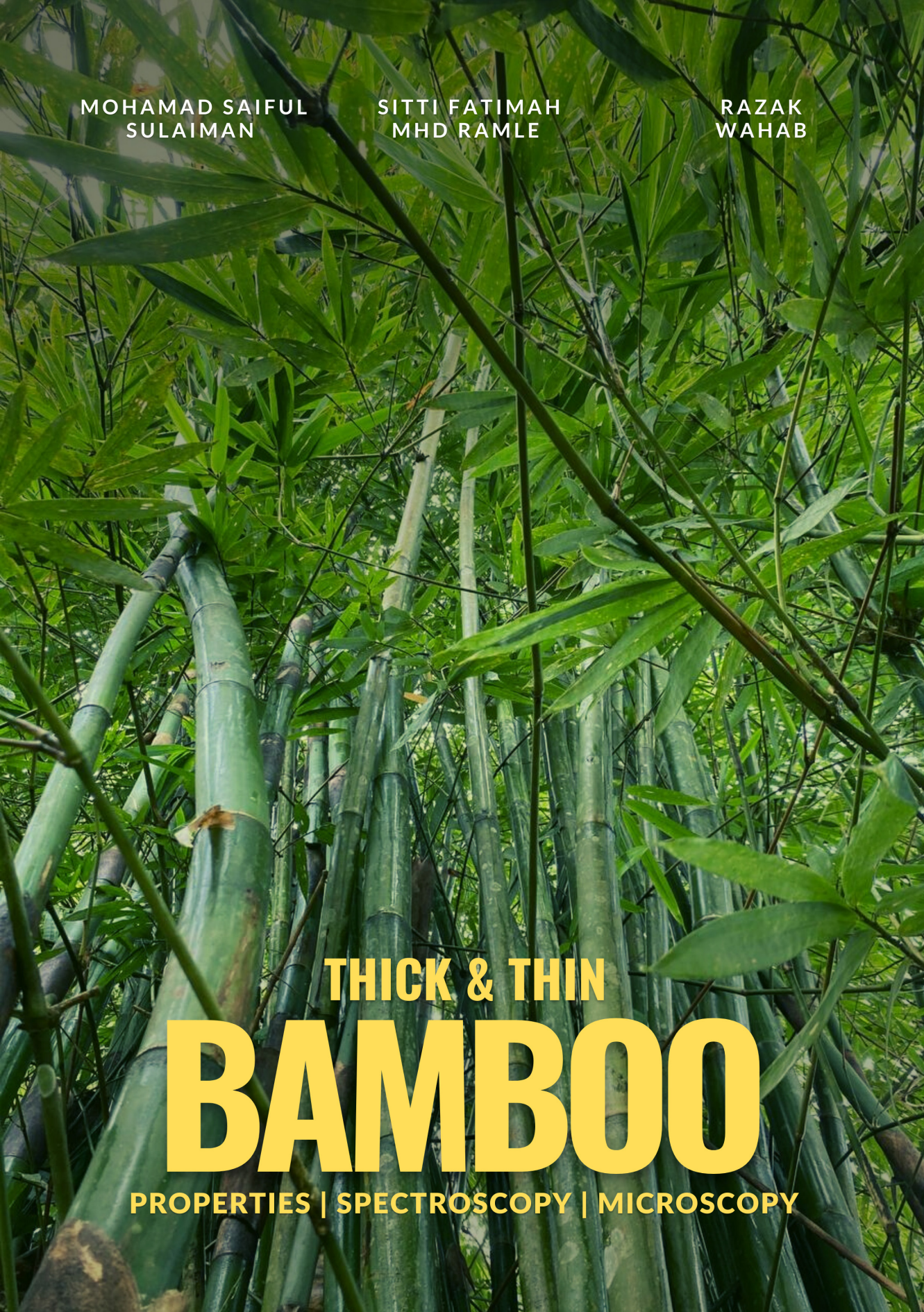

THICK & THIN BAMBOO

PROPERTIES | SPECTROSCOPY | MICROSCOPY

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Mohamad Saiful Sulaiman
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TABLE OF CONTENT

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PREFACE

Praise to Allah with His bounty and permission, we were given this opportunity and have successfully completed a book in the form of scientific knowledge entitled “Thick and Thin Bamboo: Properties, Spectroscopy, & Microscopy”. This book has been successfully produced with the best quality belonging to the thesis research finding titled “Characterisation and Anatomical Properties of *Schizostachyum brachycladum* Kurz and *Bambusa vulgaris* Schrad. Grown In Kelantan, Malaysia”.

In Shaa Allah, the good writing style in the elaboration of facts and good discussion is able to attract readers from all backgrounds of whether among students, researchers, academicians, industry, or government. The information contained in this book is very appropriate and useful to be used as reference and guidance, especially for those who are directly involved in the wood manufacturing industry in this country or globally. Perhaps with a little effort in sharing the experience and knowledge available, it can be used as a guide to people who are interested in wood and non-wood composite as structural, panels, automotive, and many more.

Needless to say, I would like to thank Universiti Malaysia Kelantan, especially the Faculty of Earth Science, for the research facilities and Fundamental Research Grant Study (FGRS: R/FRGS/A08.00/00801A/001/2013/00110) and for the support throughout the research duration. We are also grateful to University of Technology Sarawak for the research grants (UCTS/RESEARCH/2/2018/03) given. Last but not least, it is my pleasure to thank others who have contributed either directly or indirectly by giving their support and guidance.

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LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ATR	Attenuated Total Reflexion
FTIR	Fourier Transform Infrared Spectroscopy
H_2SO_4	Sulphuric Acid
ISO	International Standard of Organization
LM	Light Microscopy
MC	Moisture Content
MOE	*Modulus of Elasticity*
MOR	Modulus of Rupture
$NaClO_2$	Sodium Chlorite
NaOH	Sodium Hydroxide
SEM	Scanning Electron Microscopy
TEM	Transmission Electron Microscopy
TS	Thickness Swelling
UTM	Universal Testing Machine
UTS	University of Technology Sarawak
WA	Water Absorption

LIST OF SYMBOLS

%	Percentage
=	Equal To
±	Plus Minus
≤	Less than equal
≥	Greater than equal
°C	Degree Celsius
µm	Micrometre
cm	Centimetre
cm^{-1}	One Per Centimetre
g	Gram
Kg/m^3	Kilogram per metre cube
L	Litre
M	Mole
ml	Millilitre
mm	Millimetre
nm	Nanometre
X	Multiple/ times

CHAPTER 1

Global Bamboo and Species

Introduction

There are over 1250 species and 75 genera of bamboos scattered around the world Shanmughavel et al., (2001), covering approximately 31.5 million hectares of land across 21 countries, predominantly in northern Asia such China and India. In Peninsular Malaysia, various species of bamboos comprise almost 7% of lowland and highland forests, which translates to 421,722 hectares of forest area in Peninsular Malaysia. Till now, there are 59 species of bamboo in Malaysia consisted of 25 cultivated and 34 indigenous species (Bahari & Krause, 2016).

Bamboo is renowned as one of the most crucial nontimber resources after timber and rattan. It is recorded as one of the fastest growing woody plants as it can be annually renewed with effective management, resulting to its high productivity and application in various industries. Nowadays, bamboo is acknowledged as a vital resource in the world market, mainly in its application in end-product manufacturing, such as plywood, vegetable containers, parqueting, and even paper pulps (Asari, & Suratman, 2010). In Malaysia, bamboo is widely used as essential materials for a bamboo basket, joss-sticks, handicraft products, toothpicks, chopsticks, bamboo blinds, joss papers, and