



SUSTAINABLE **ENERGY** pathways to a **GREENER FUTURE**

Editors
Mimi Haryani Hassim
Asiah Nusaibah Masri

SUSTAINABLE ENERGY

pathways to a

GREENER FUTURE

In a world racing toward sustainable development, this book offers an insightful journey through the frontiers of energy and materials innovation. Tackling critical issues from biofuel simulation to GHG emission tracking and nuclear fuel optimization, each chapter delivers practical, research-based solutions for real-world sustainability challenges. Designed to spark action and foster understanding, this volume equips students, researchers, and industry professionals with the knowledge to drive green transitions in engineering. With a compelling blend of theory, technology, and application, the book serves as both a resource and a catalyst empowering the reader to contribute to a cleaner, smarter, and more resilient energy future.



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**Mimi Haryani Hassim
Asiah Nusaibah Masri**

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CONTENTS

<i>Contributors</i>		<i>vii</i>
<i>Preface</i>		<i>ix</i>
CHAPTER 1	INTRODUCTION TO SUSTAINABLE ENERGY	1
	<i>Mimi Haryani Hassim and Asiah Nusaibah Masri</i>	
CHAPTER 2	SUSTAINABLE BIOFUEL PRODUCTION FROM LIGNOCELLULOSIC BIOMASS	17
	<i>Sharifah Nurain Hussain, Lew Zhi Yiang, Tengku Zulaikha Malim-Busu, and Amnani Shamjuddin</i>	
CHAPTER 3	SUSTAINABLE TECHNOLOGIES FOR EMISSION REDUCTION	39
	<i>Mohammed S. Ba Bakr, Mimi Haryani Hassim, Asiah Nusaibah Masri, and Amalina Hamran</i>	
CHAPTER 4	SUSTAINABLE NUCLEAR POWER THROUGH PARTICLE SWARM OPTIMISATION	53
	<i>Choo Kai Jie, Muhammad Arif Sazali, and Mark Dennis Usang</i>	

CHAPTER 5	CFD-BASED INSIGHTS INTO SUSTAINABLE GAS PIPELINE OPERATIONS	65
	<i>Muhammad Nurhaleem Mohd. Yusoff, Zulkifli Abdul Majid, Norhana Mohamed Rashid, and Mohd Dinie Muhaimin Samsudin</i>	
CHAPTER 6	PREDICTING ACRYLIC FIRE EMISSIONS FOR CLEANER ENERGY APPLICATIONS	97
	<i>Khairunnisa Zakaria, Miss Hasimawaty Mat Kiah, and Bintu Grema Mustafa</i>	
INDEX		127

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PREFACE

This book was written with the vision of contributing practical, research-driven insights into the evolving field of sustainable energy and green materials engineering. Our goal is to bridge the gap between laboratory innovation and industrial application, empowering readers to navigate energy sustainability with clarity and purpose.

Amid growing environmental concerns and global energy challenges, this book explores cutting-edge advancements from biomass-based biofuel simulation and carbon tracking technologies to clean nuclear fuel designs and renewable energy integration. We aim to highlight both foundational principles and breakthrough applications, providing a well-rounded resource for those seeking to make an impact in academia, policy, or practice.

The book is intended for undergraduate and postgraduate students, researchers, engineers, and decision-makers involved in energy, environment, and sustainability. Its relevance spans chemical engineering, materials science, and environmental studies.

Our motivation came from witnessing both the urgency and opportunity surrounding global energy transformation. This work was made possible through the dedication of our contributors and the support of Universiti Teknologi Malaysia.

The book is structured into six chapters, each focusing on a distinct aspect of sustainable energy or materials innovation. To maximise benefit, we recommend reading Chapter 1 for an overarching framework before diving into topic-specific chapters.

The editorial team brings expertise in sustainable process systems, green engineering, and energy innovation, with the hope that this book ignites meaningful progress. It is anticipated that the knowledge

presented here will inspire further research collaborations and practical solutions. Ultimately, this book is positioned as a catalyst for informed action toward a more resilient and sustainable global energy future.

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