



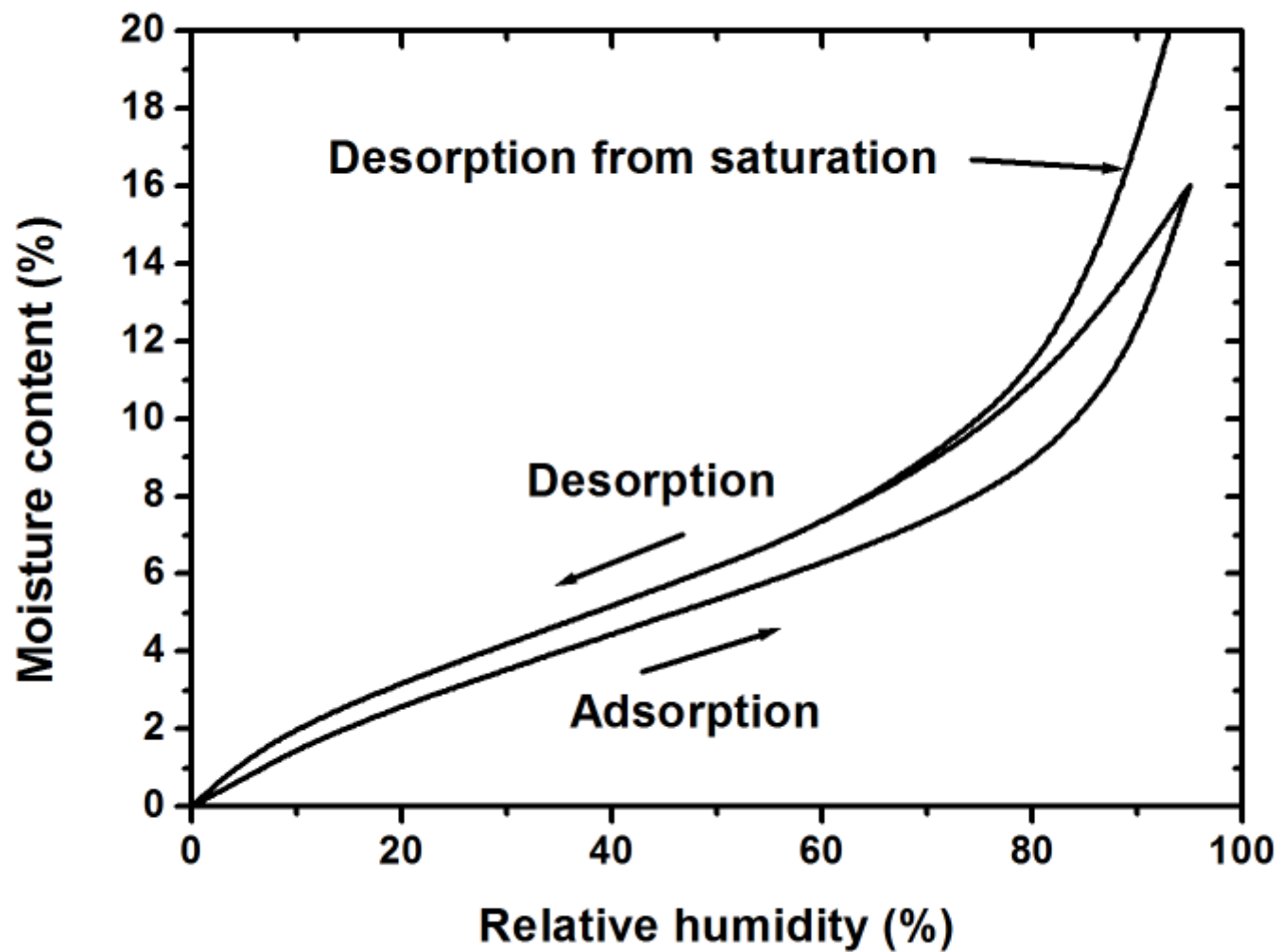
Establishing timber as a preferred material for construction

# **Water Vapour Sorption Behaviour of Lignocellulosic Materials**

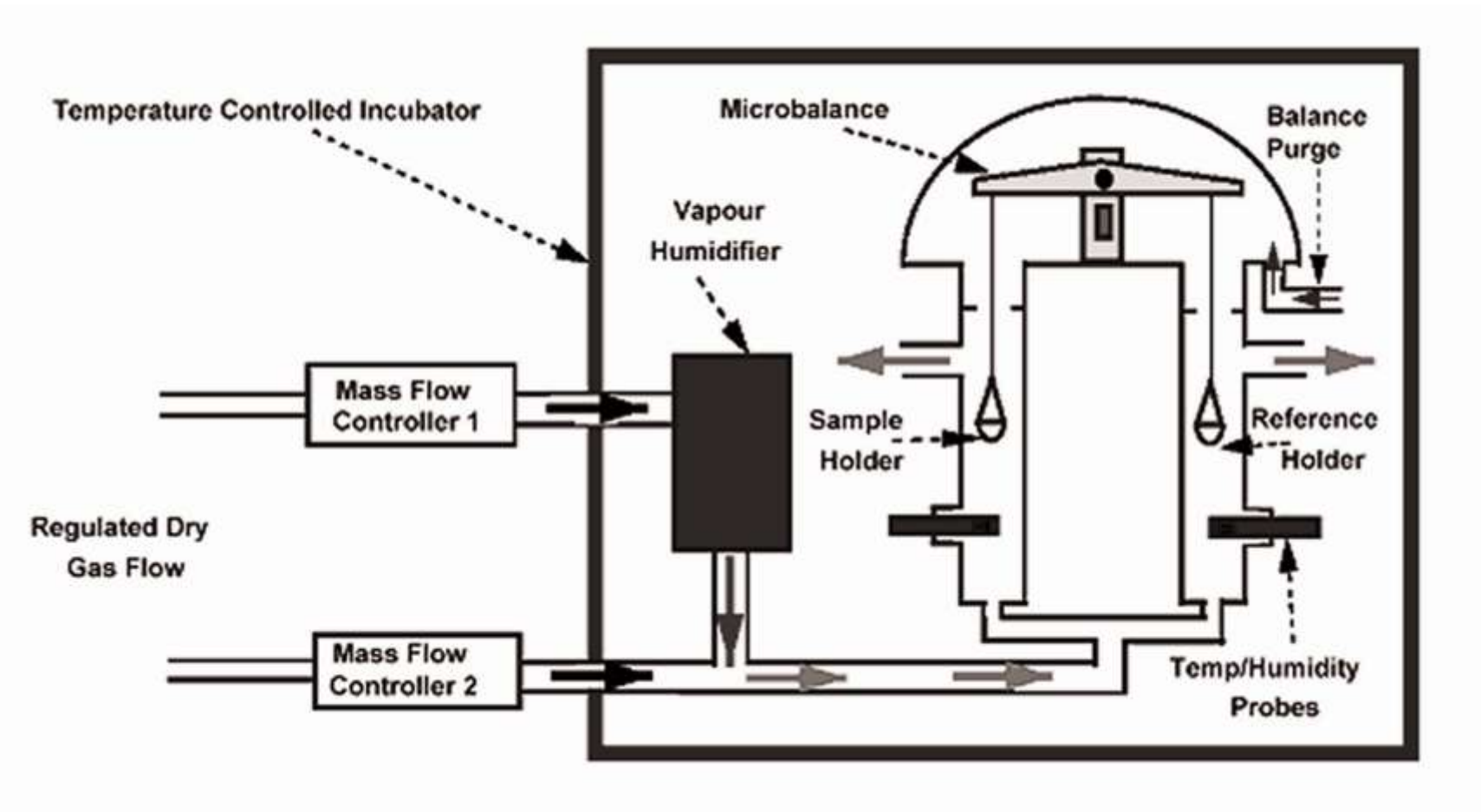
**Professor Callum Hill**  
**Centre for Timber Engineering**  
**Edinburgh Napier University**

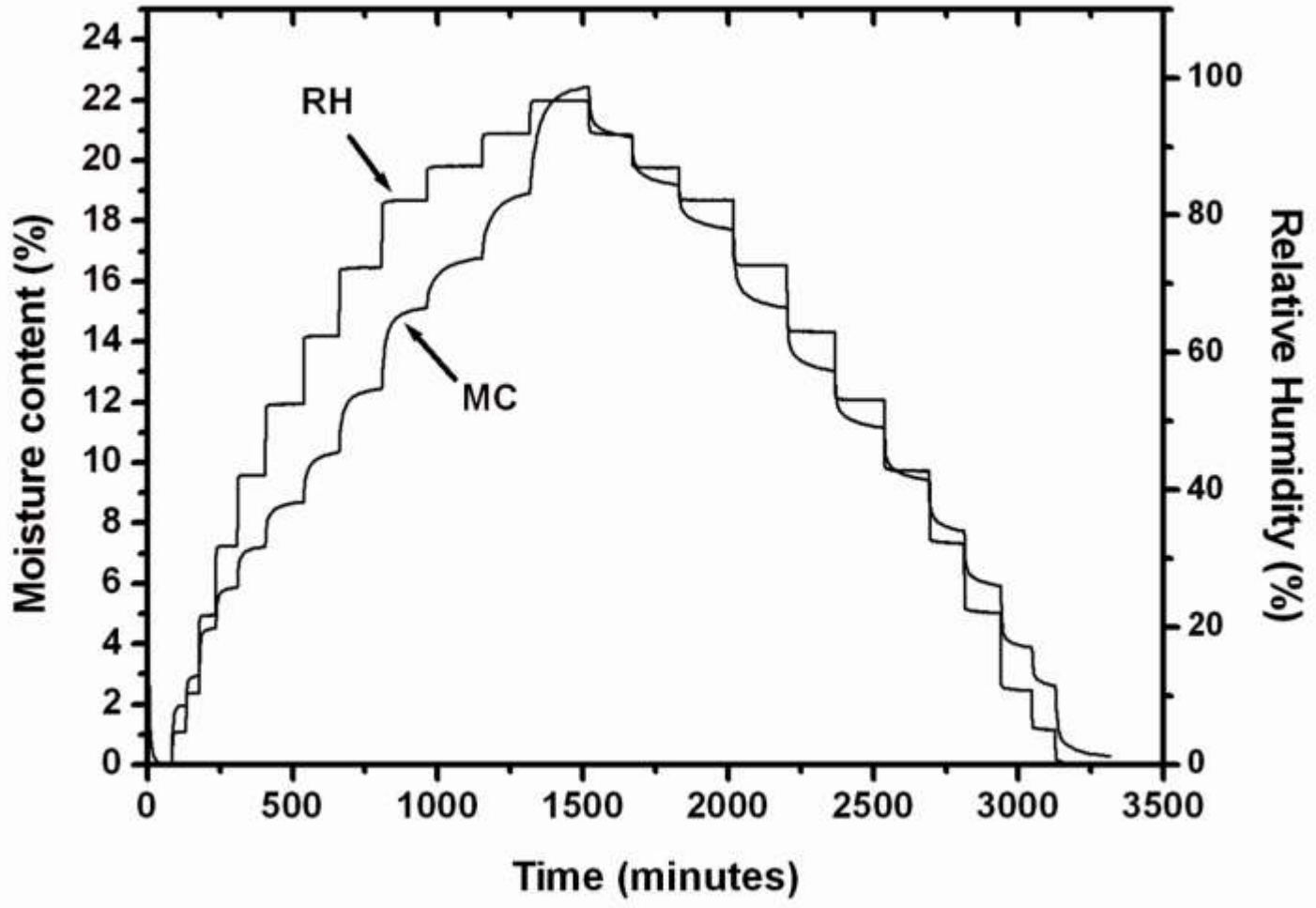
- INTRODUCTION TO THE SORPTION ISOTHERM
- DESCRIPTION OF DYNAMIC VAPOUR SORPTION
- ISOTHERMS OF FIBRES
- WHAT IS HYSTERESIS?
- SORPTION KINETICS
- ACTIVATION ENERGY OF SORPTION
- MODEL

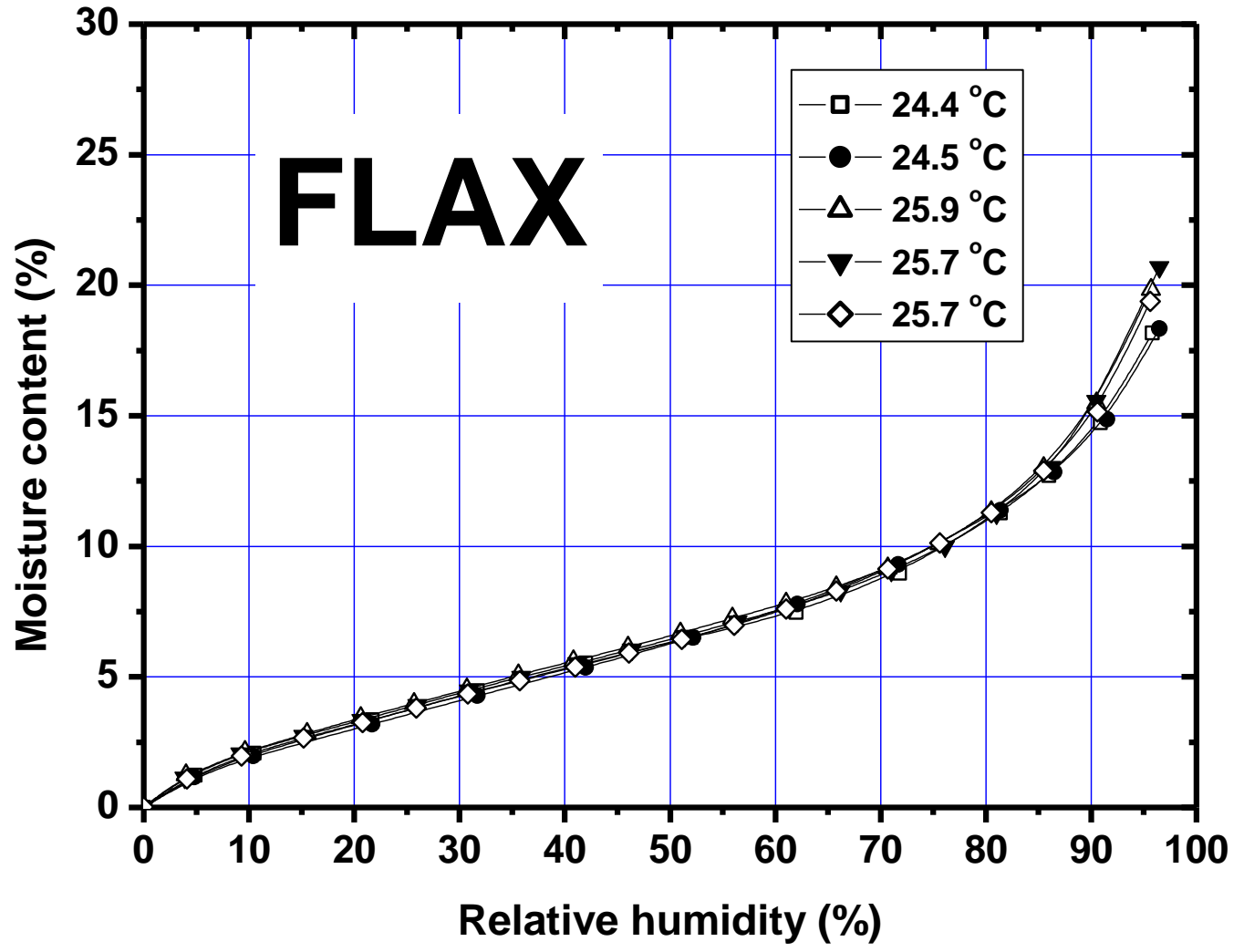
# THE SORPTION ISOTHERM



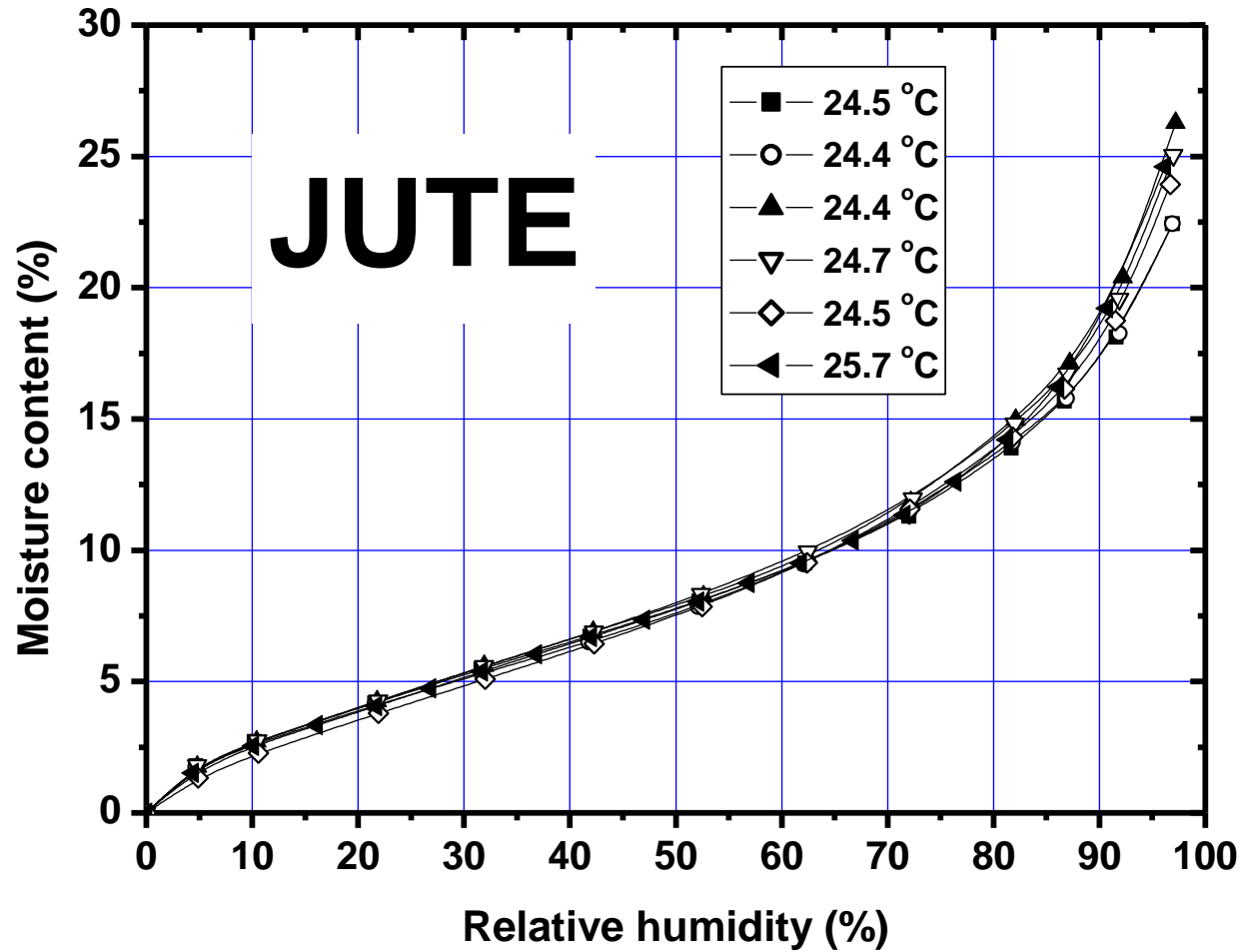
# **DYNAMIC VAPOUR SORPTION**

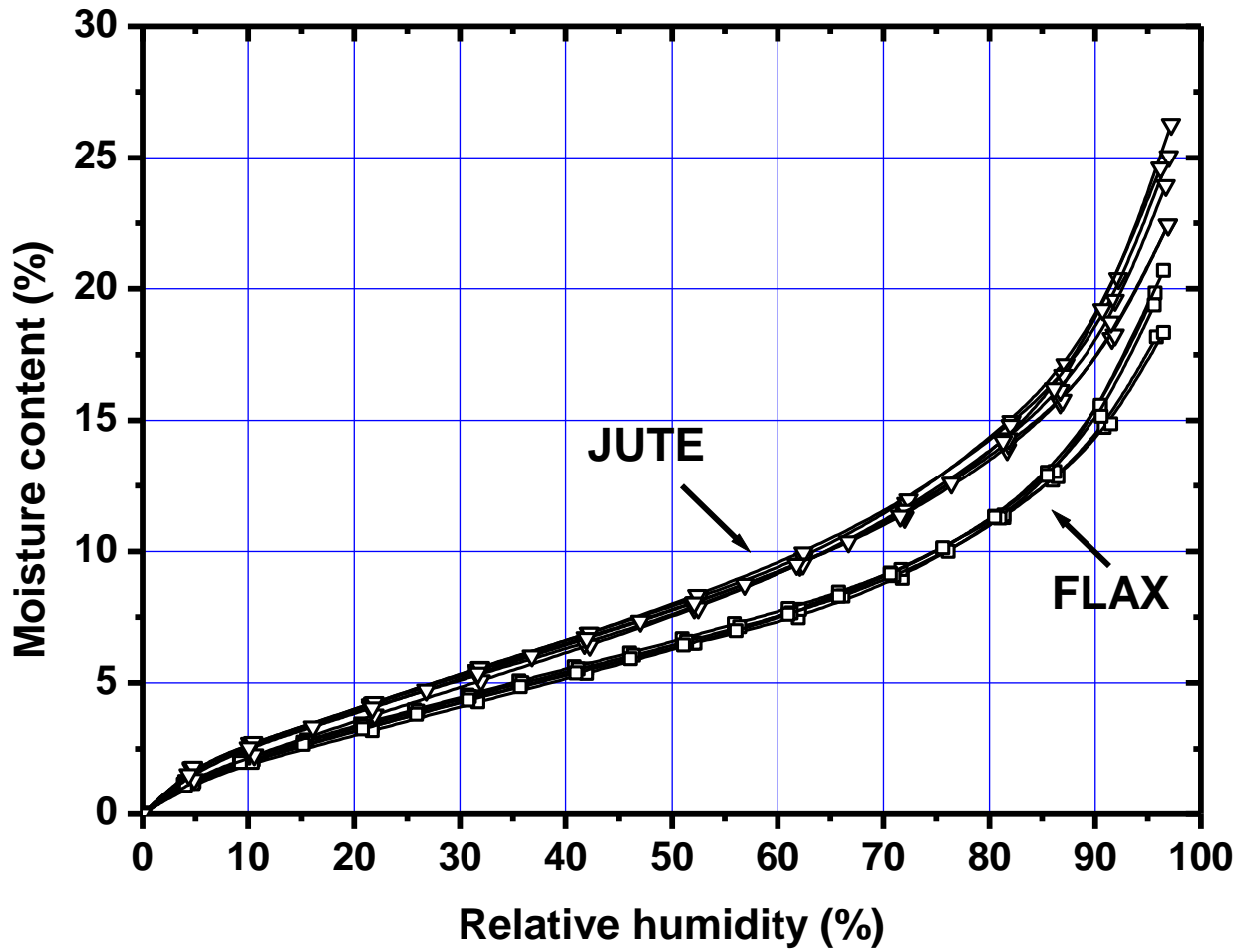


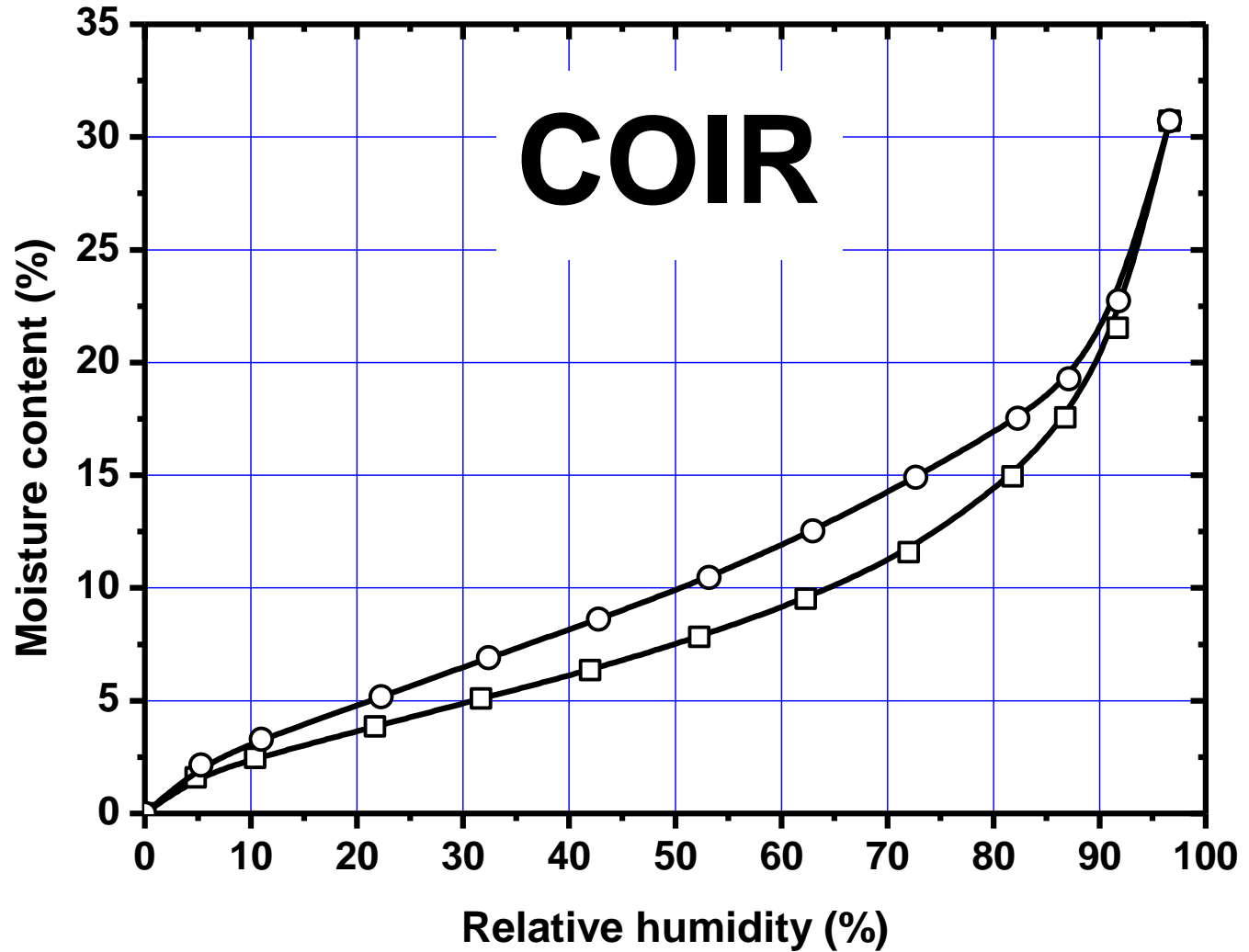


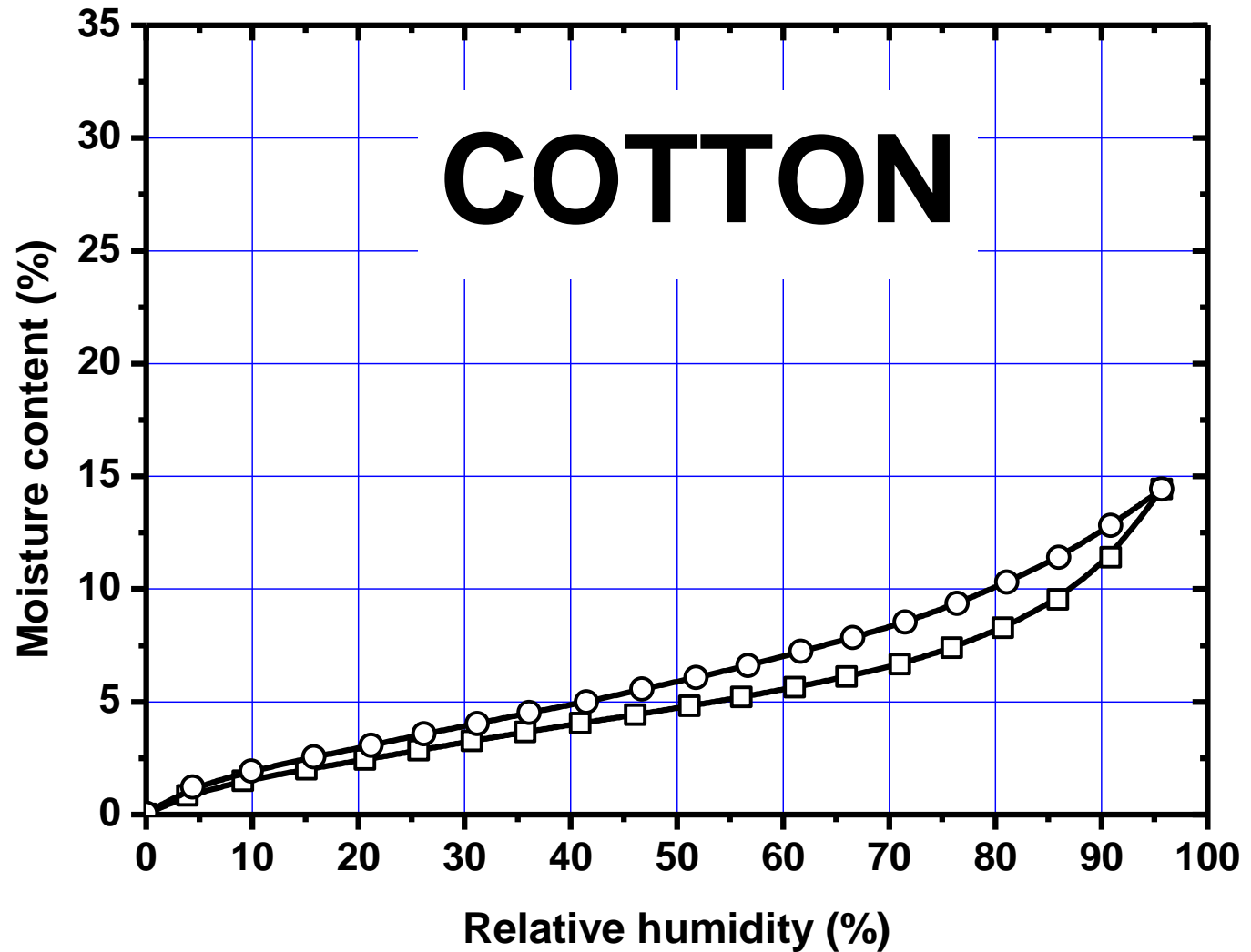


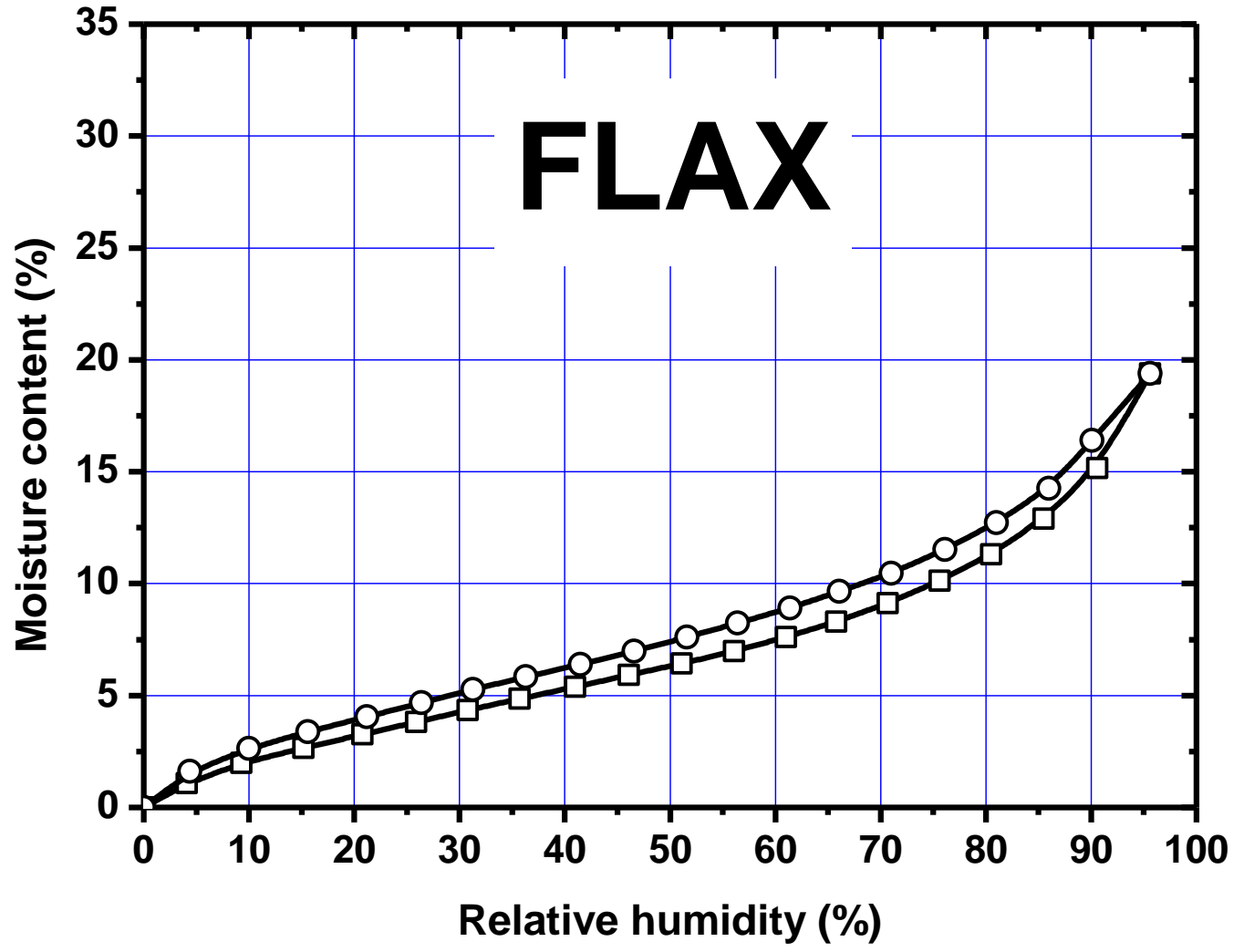


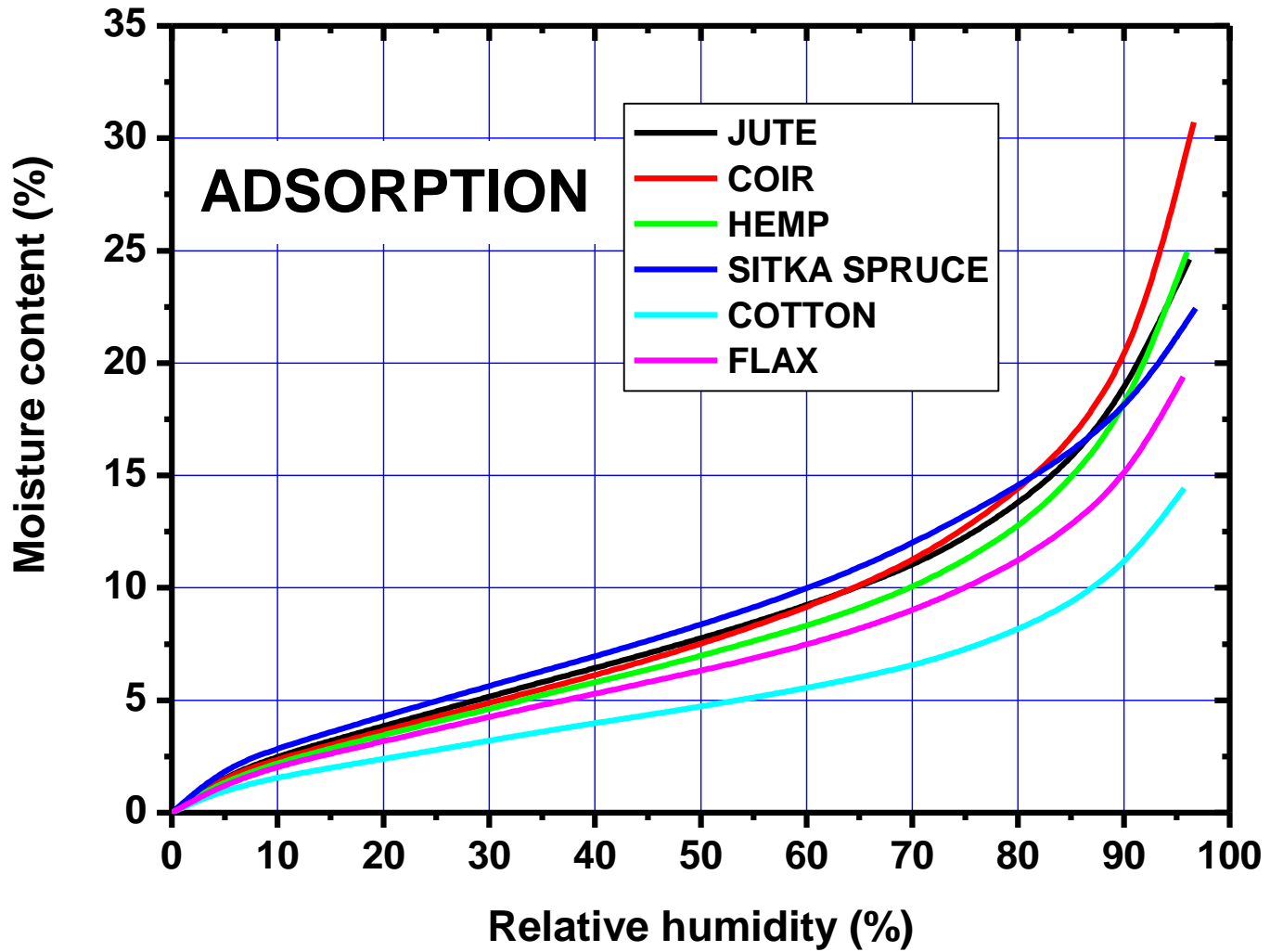


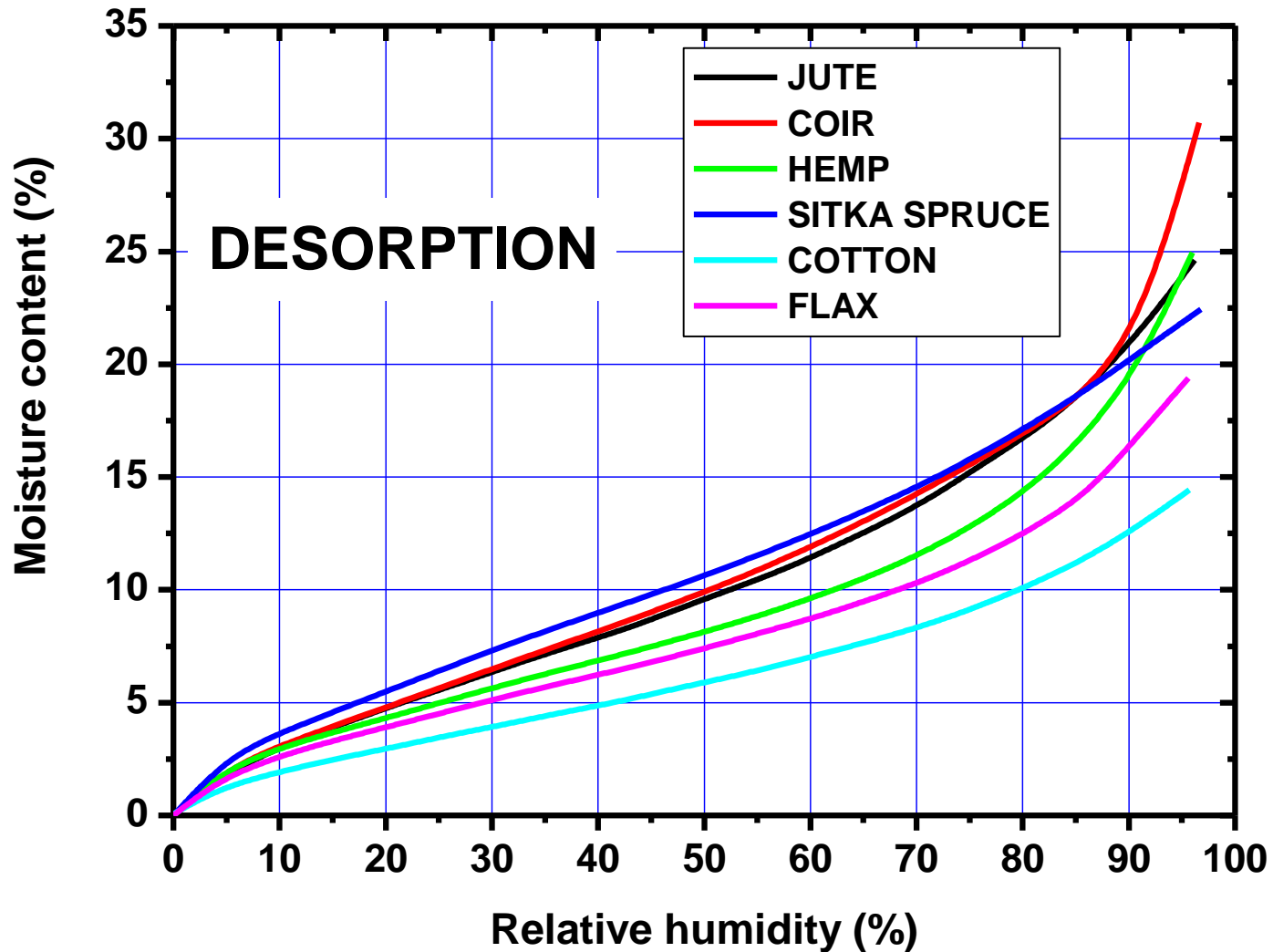






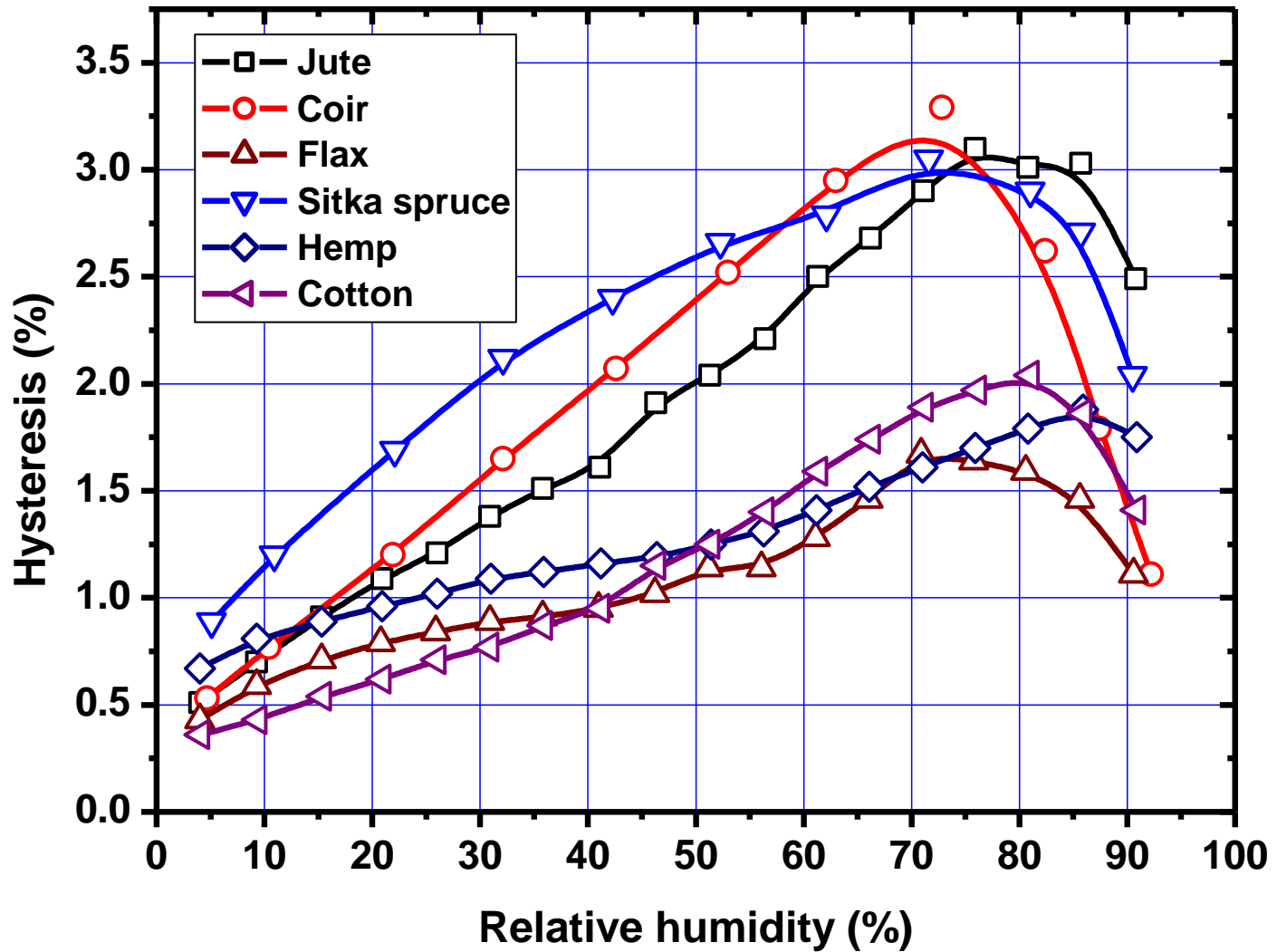


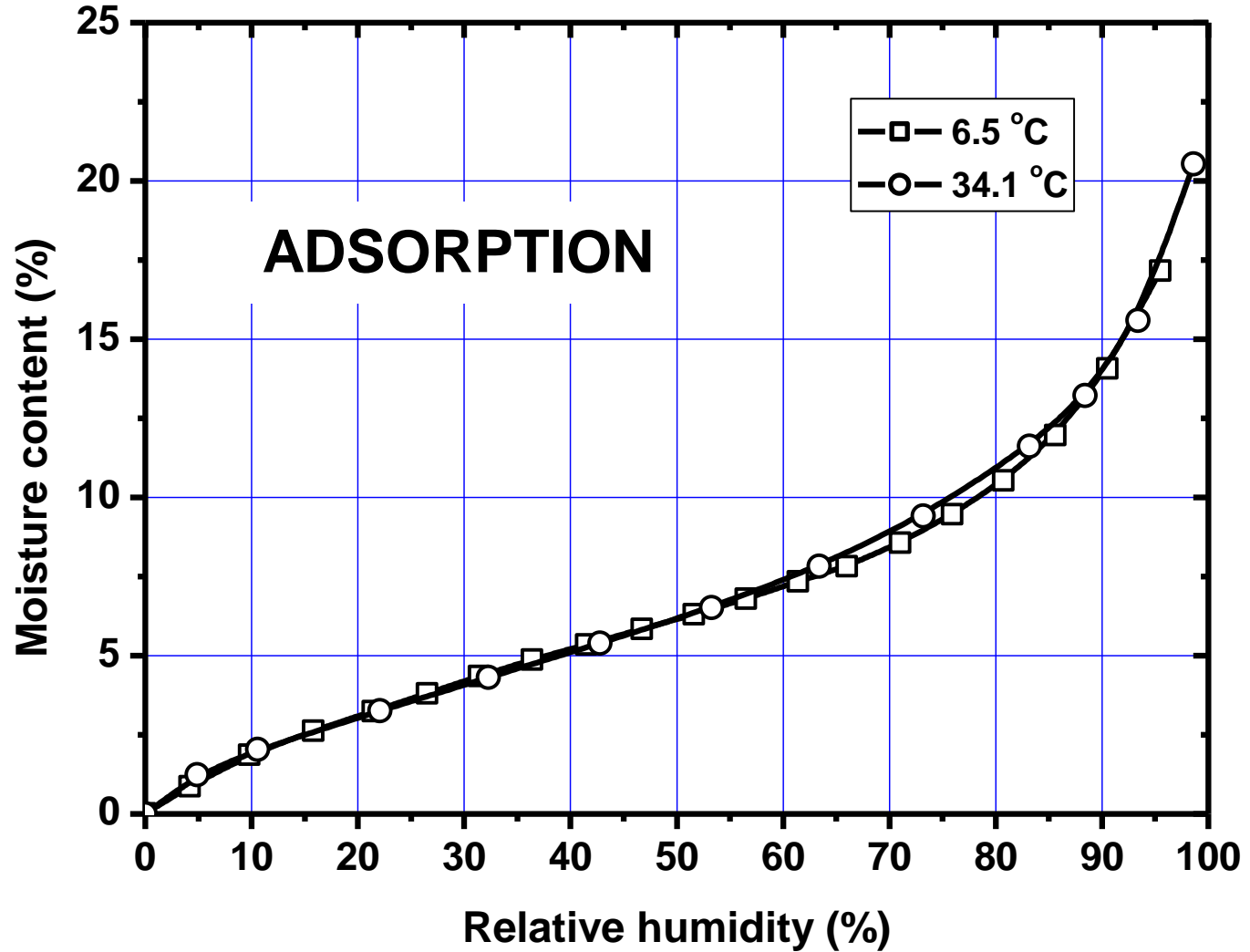


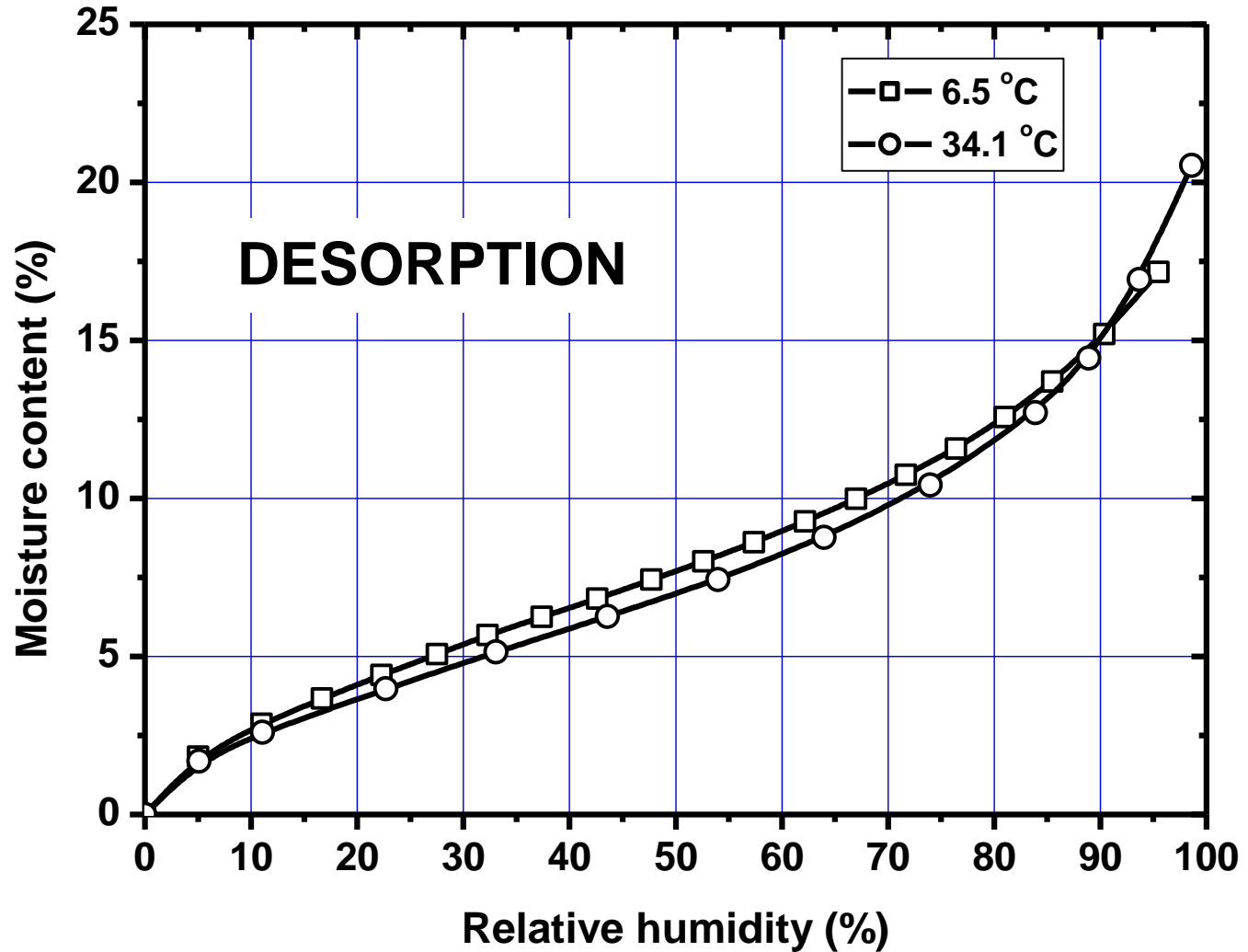


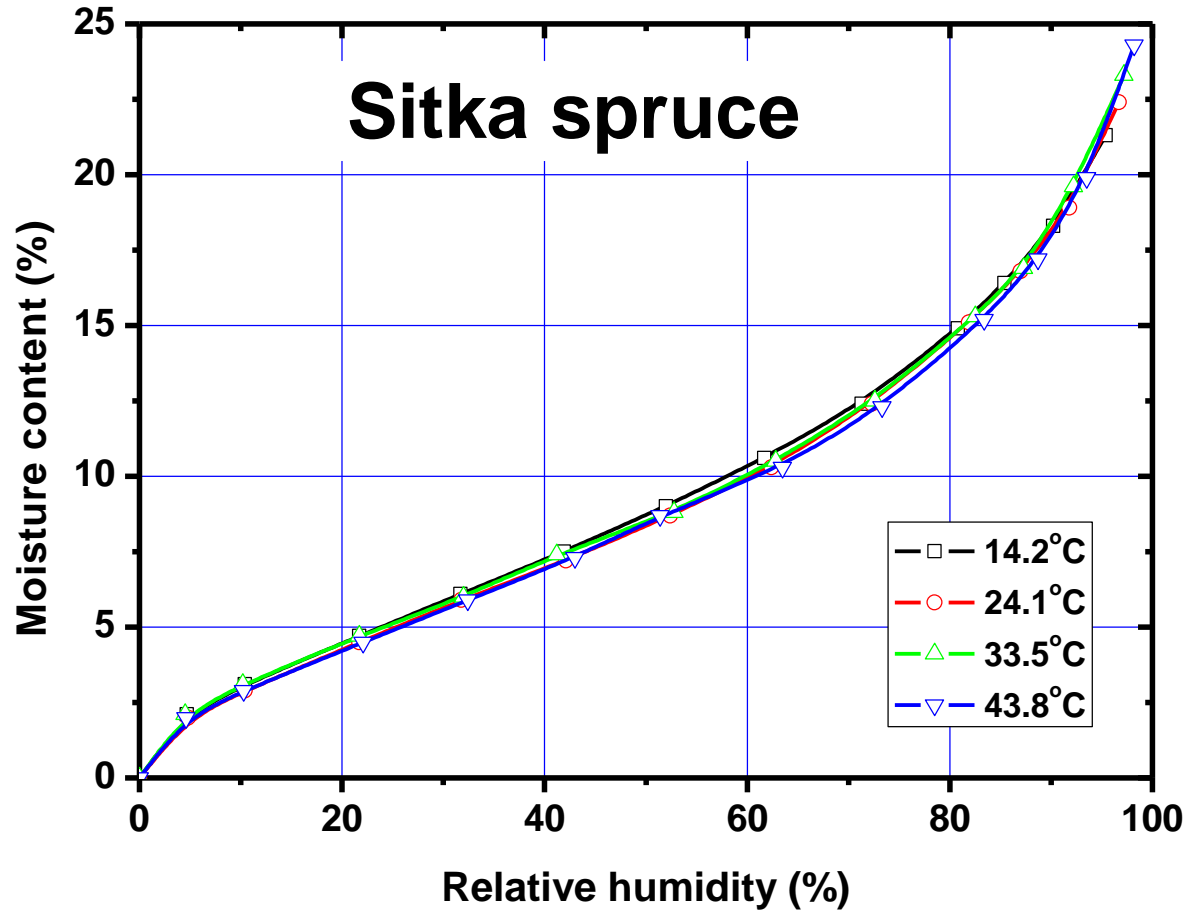
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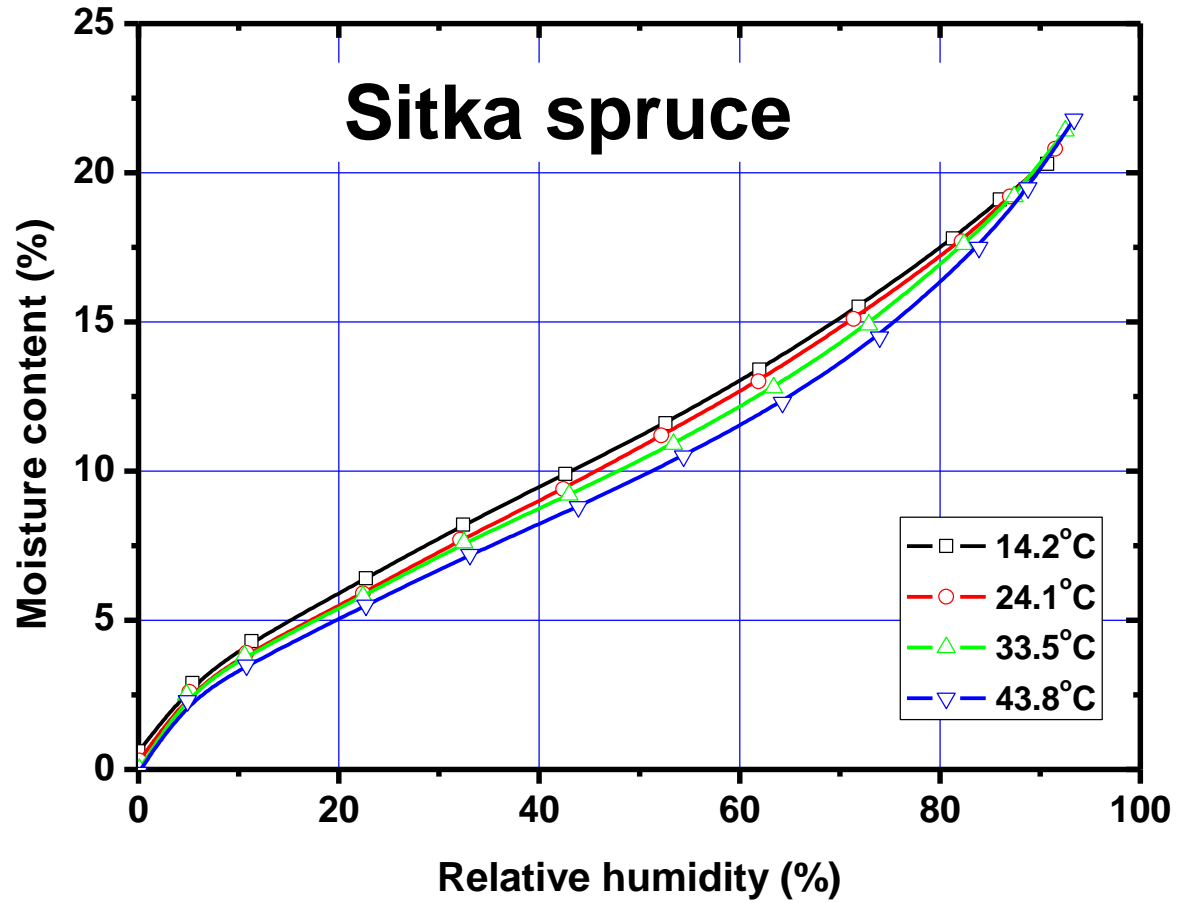


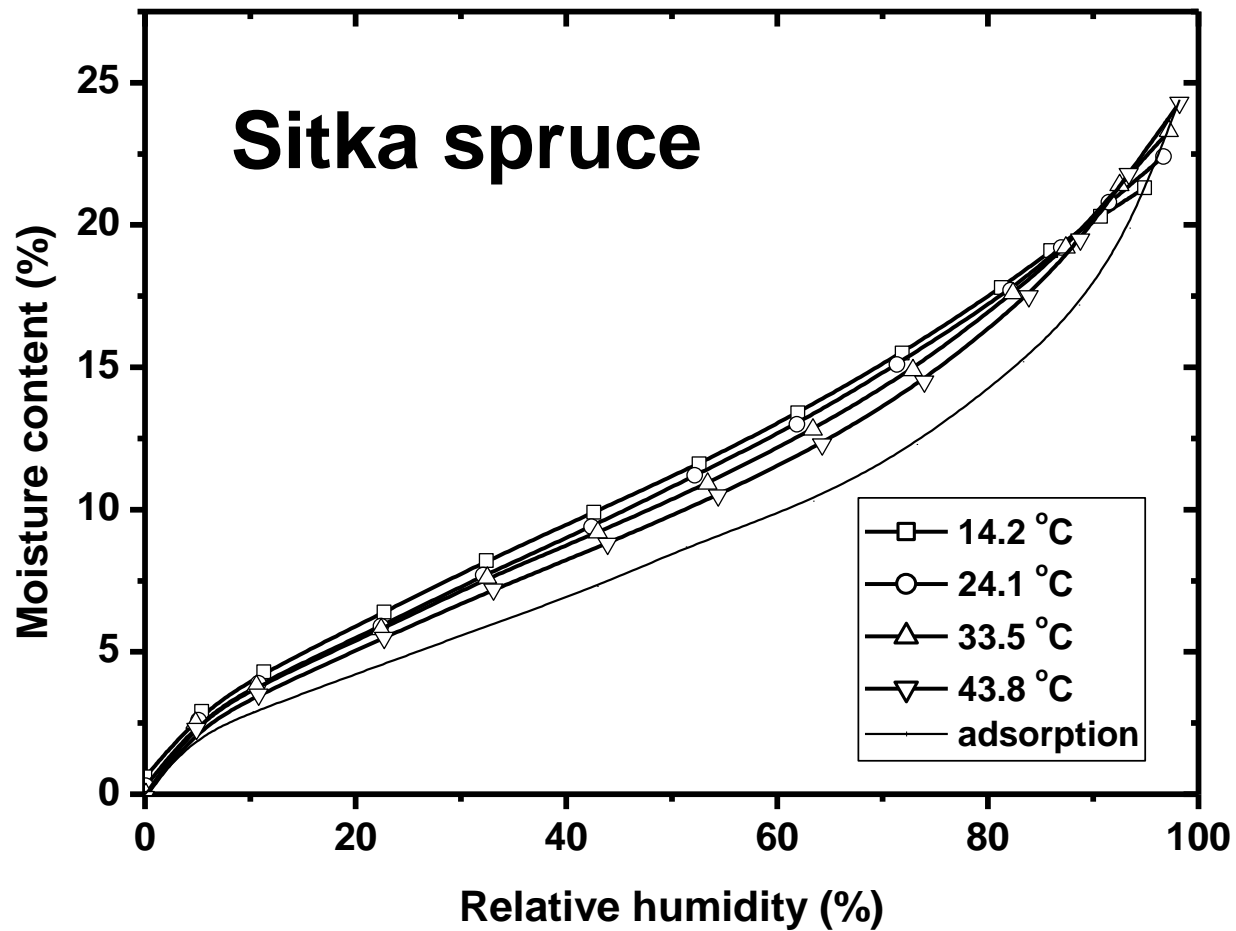




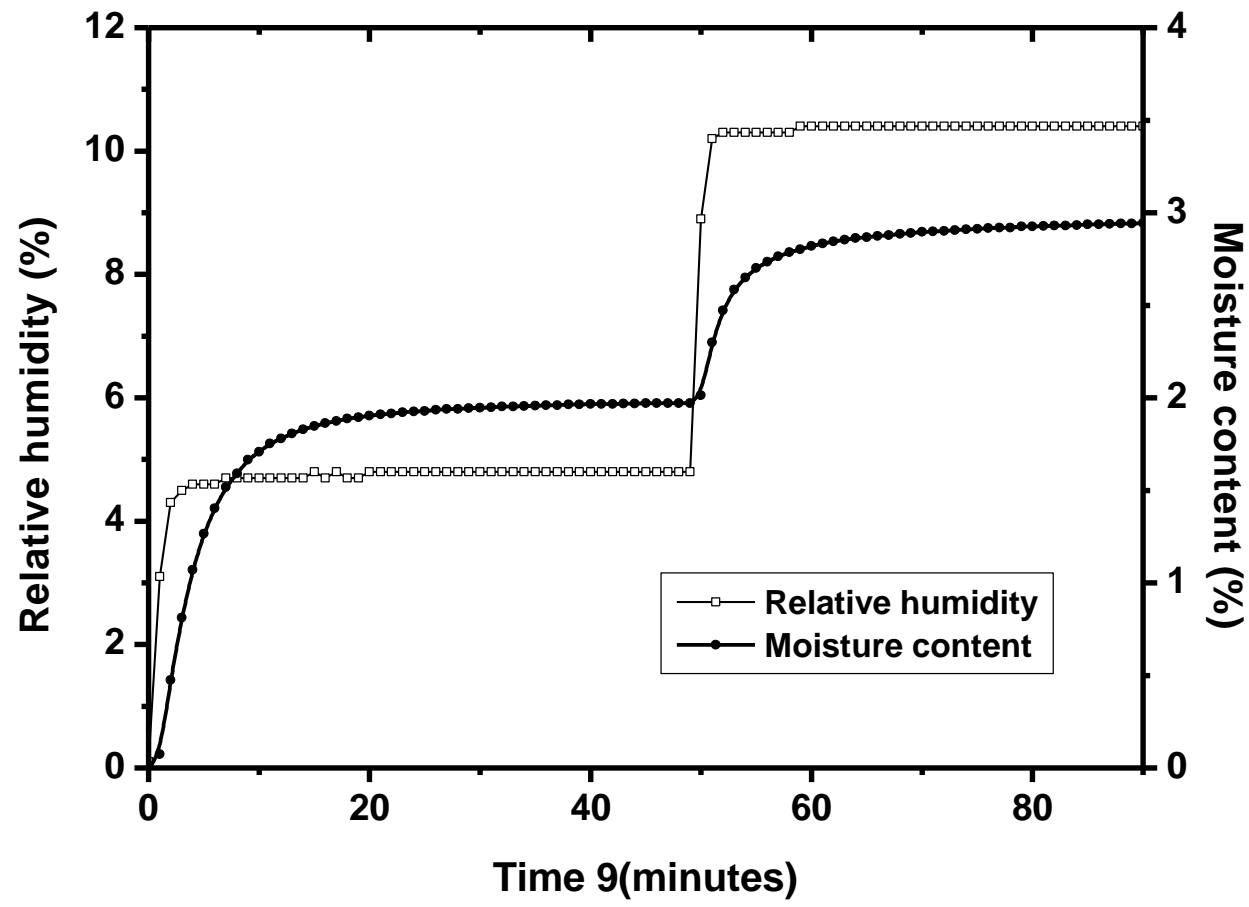






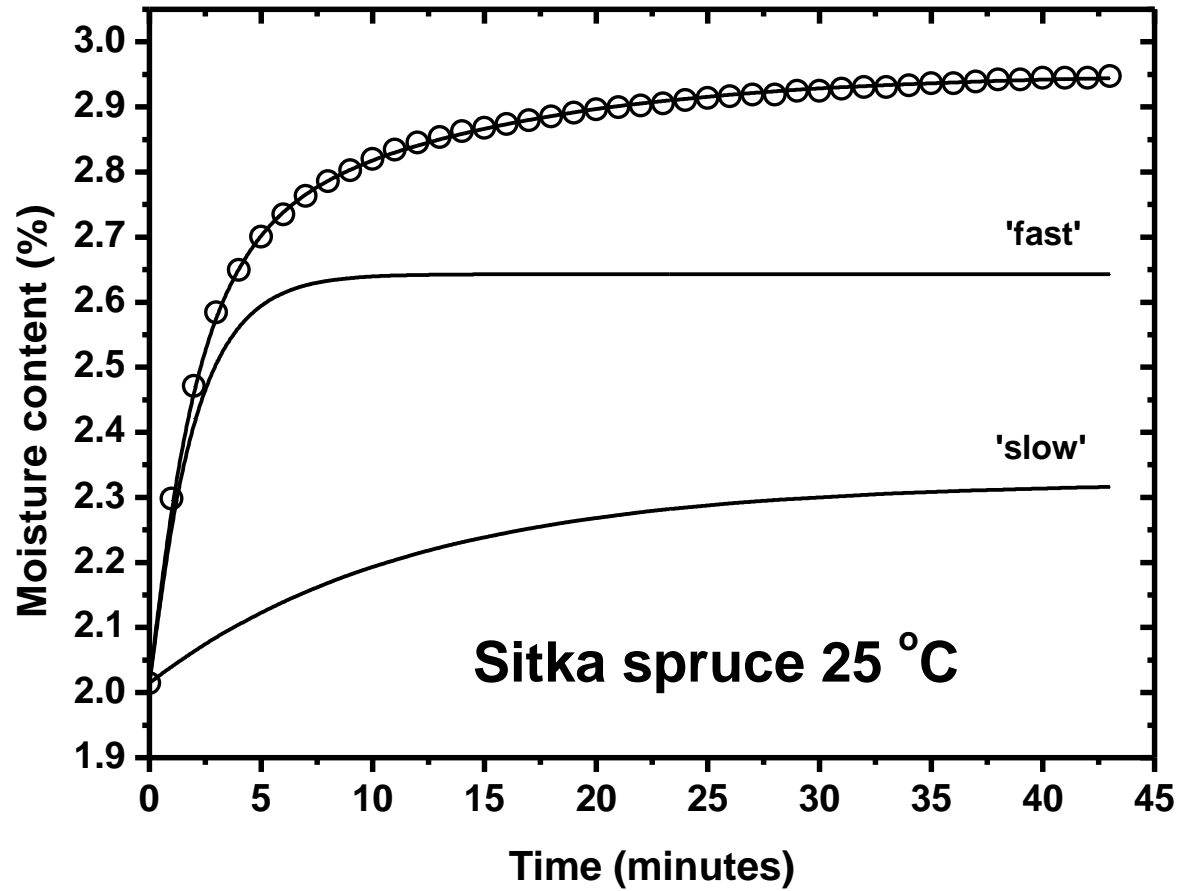


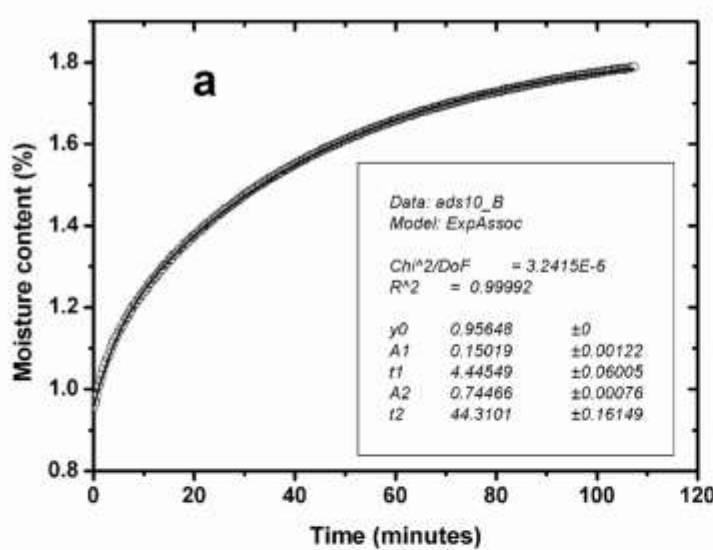
# KINETICS



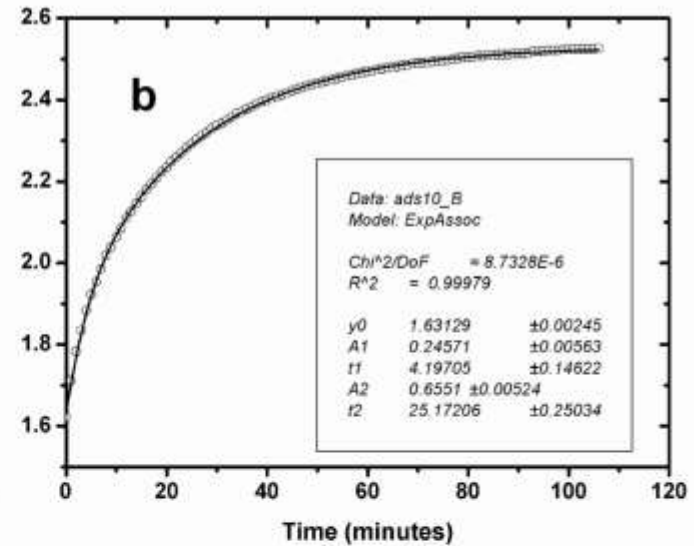


$$MC = MC_0 + MC_1(1 - e^{-t/t_1}) + MC_2(1 - e^{-t/t_2})$$

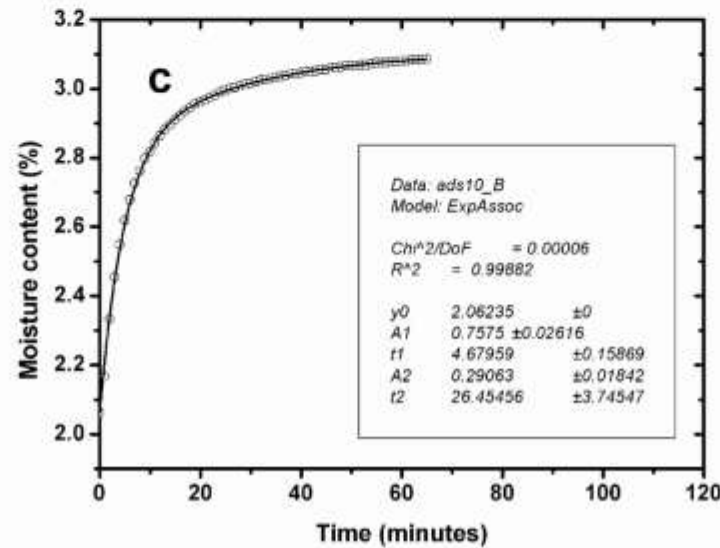




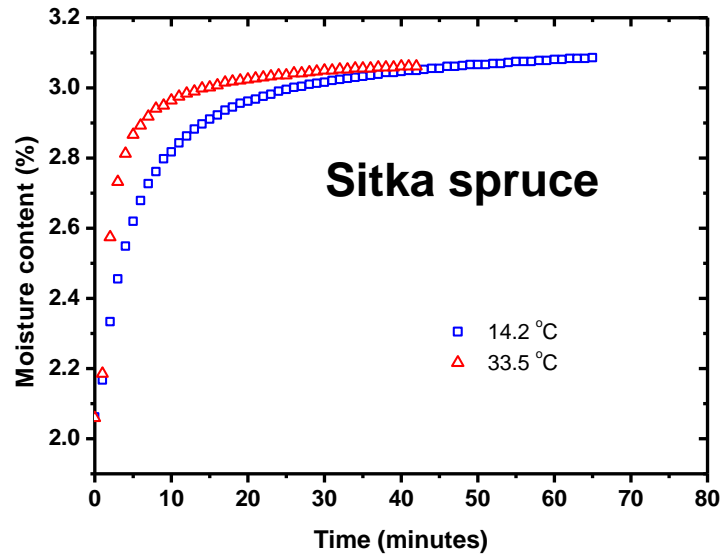
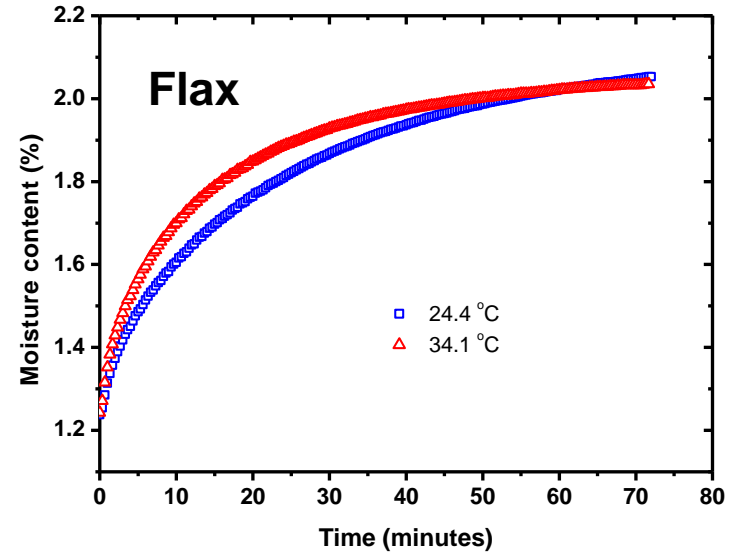
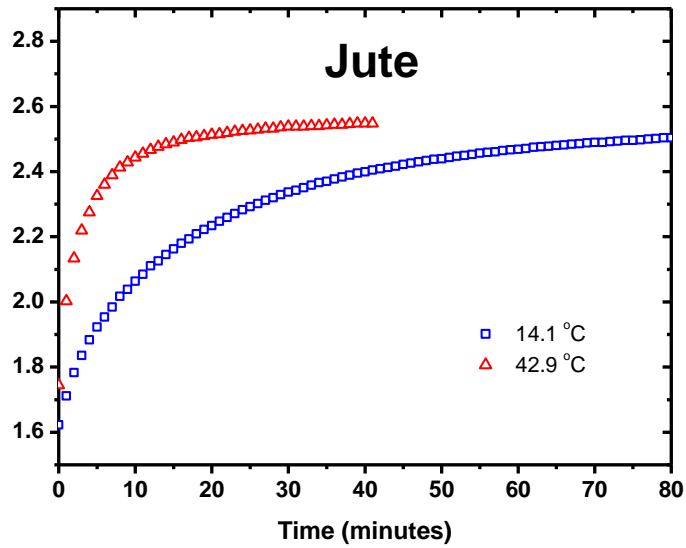
Jute



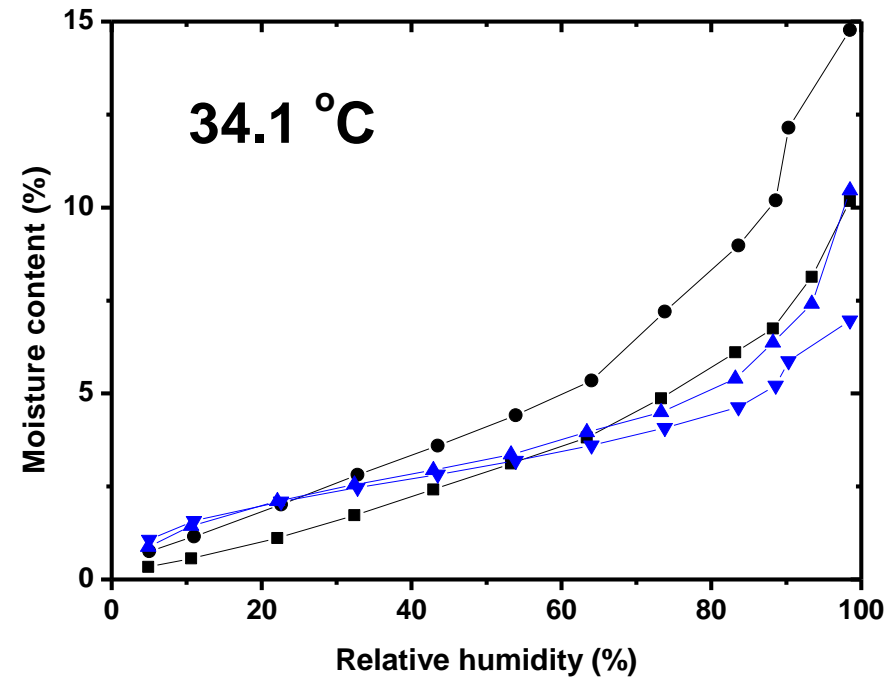
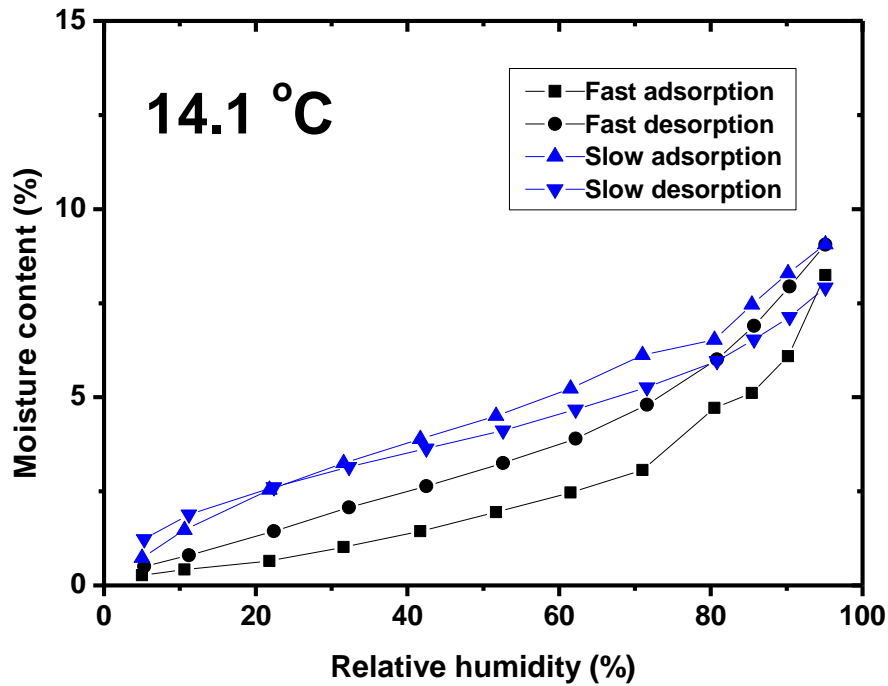
Flax

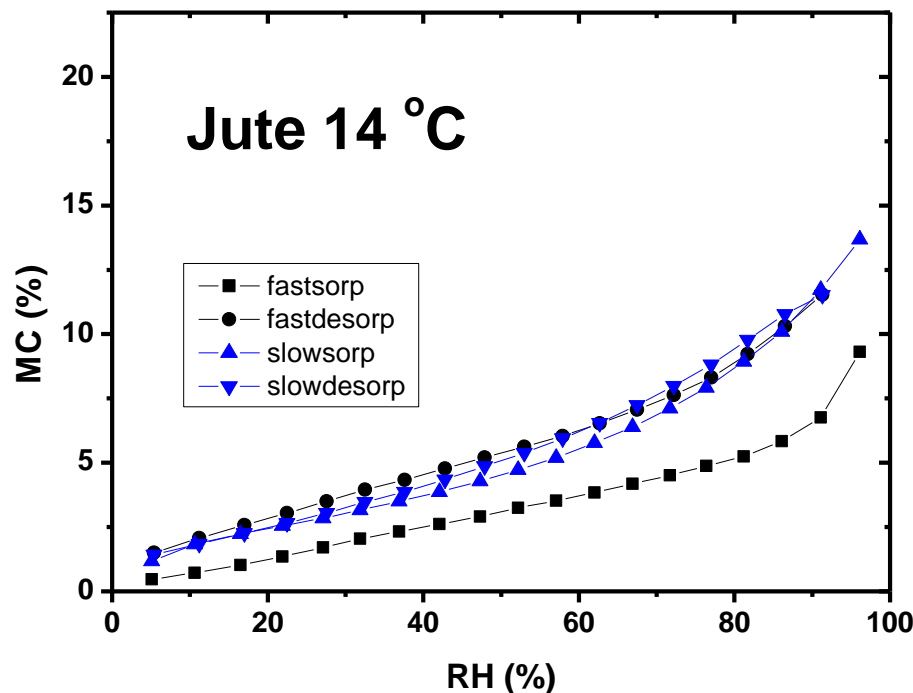
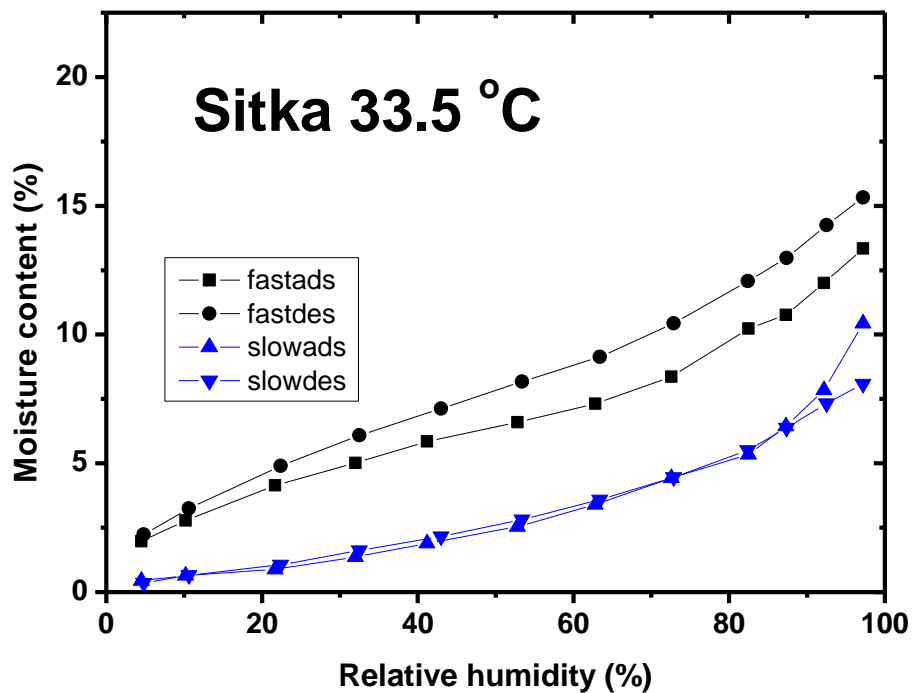


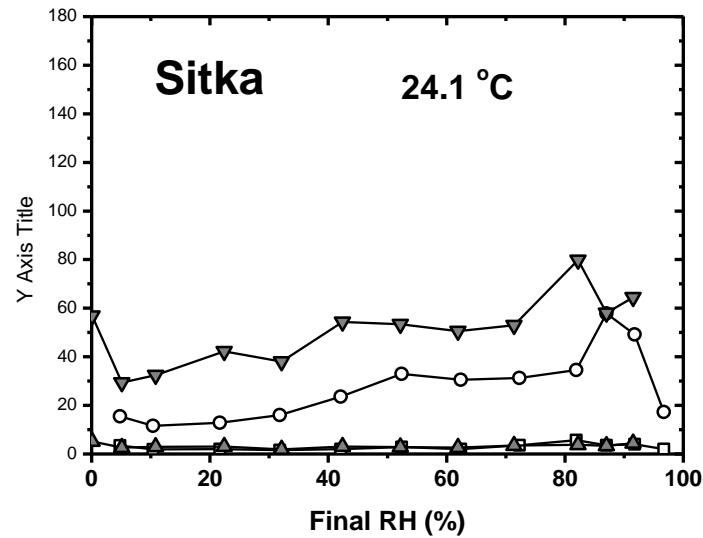
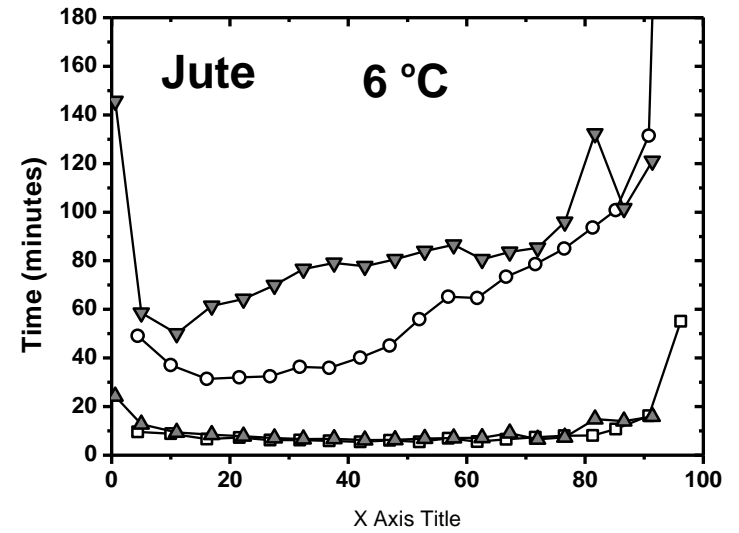
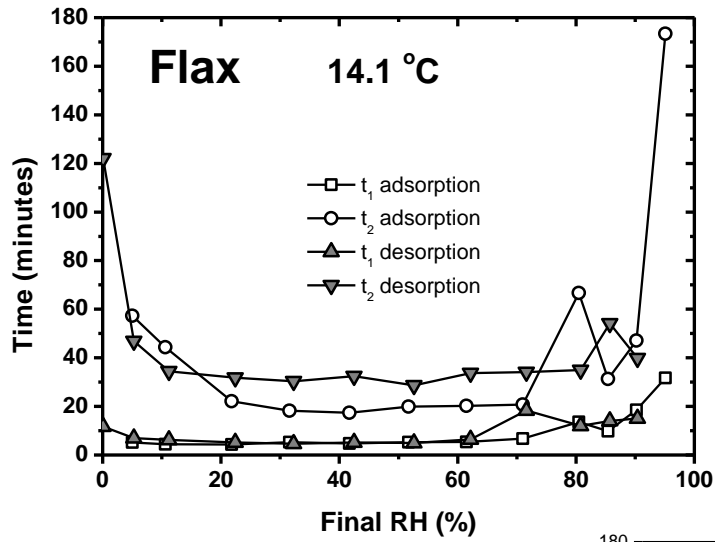
Sitka spruce



# HYSTERESIS

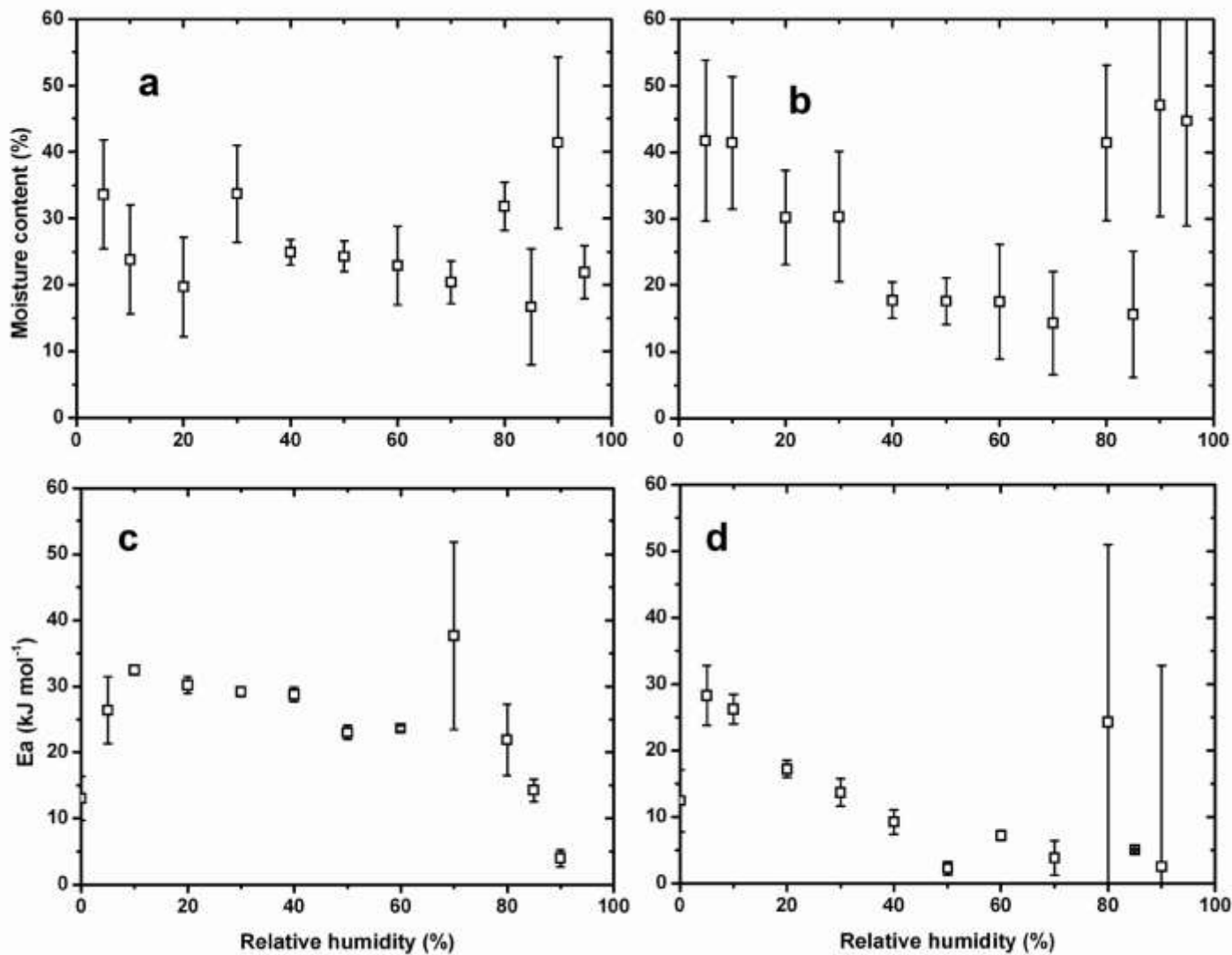


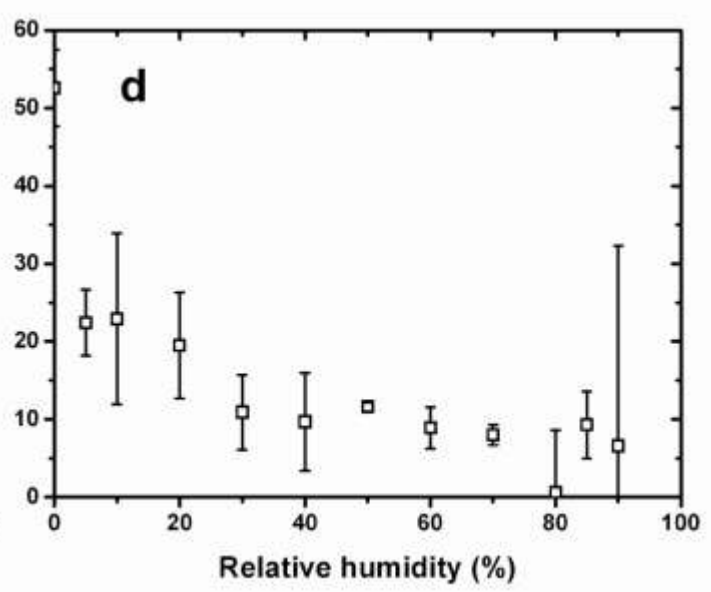
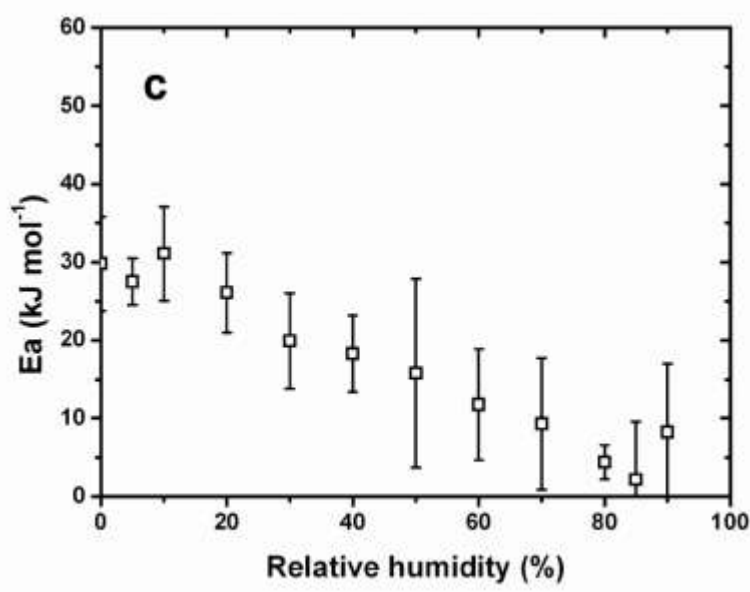
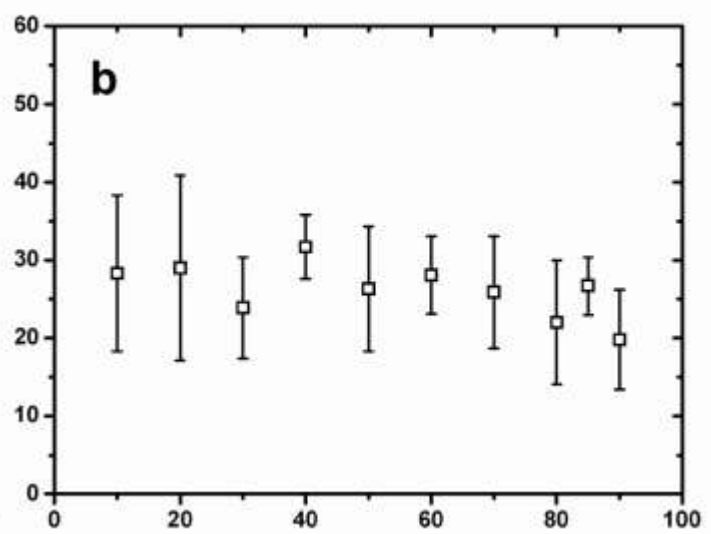
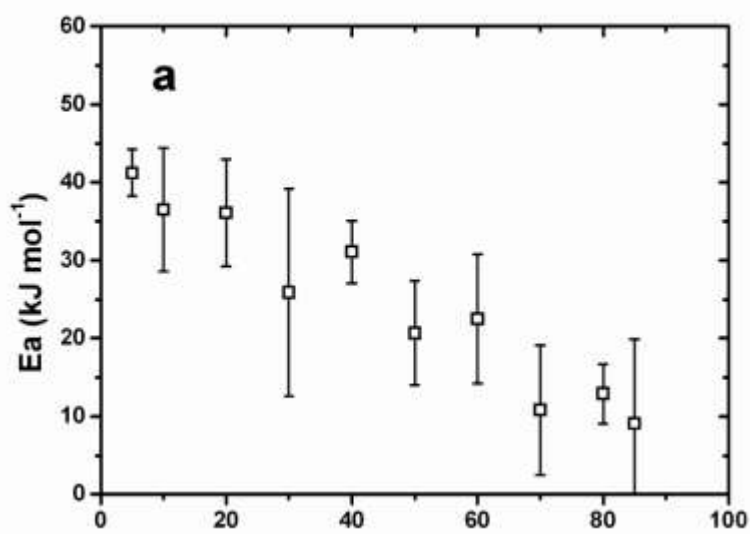




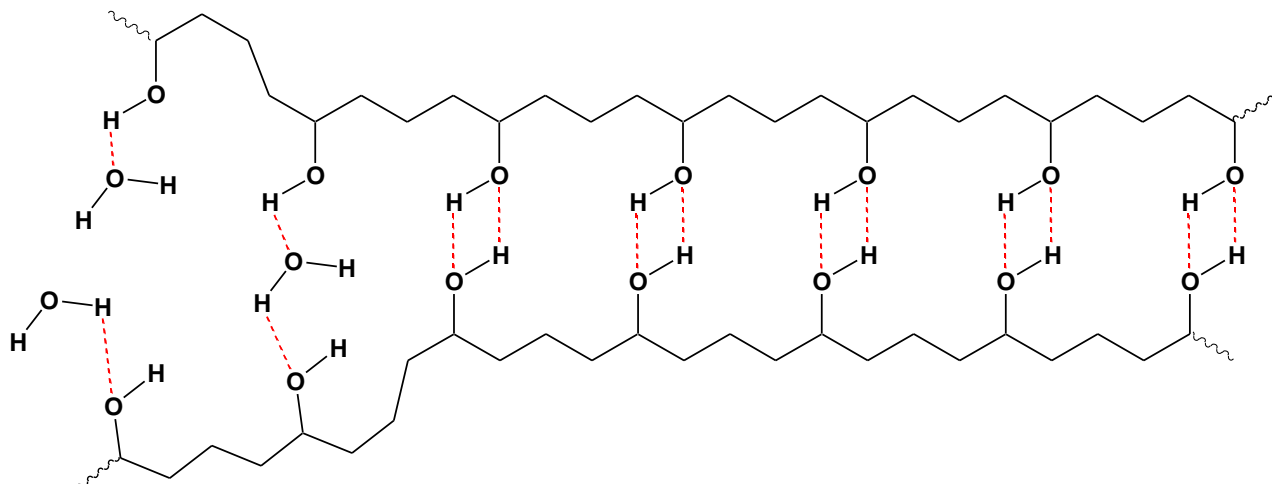
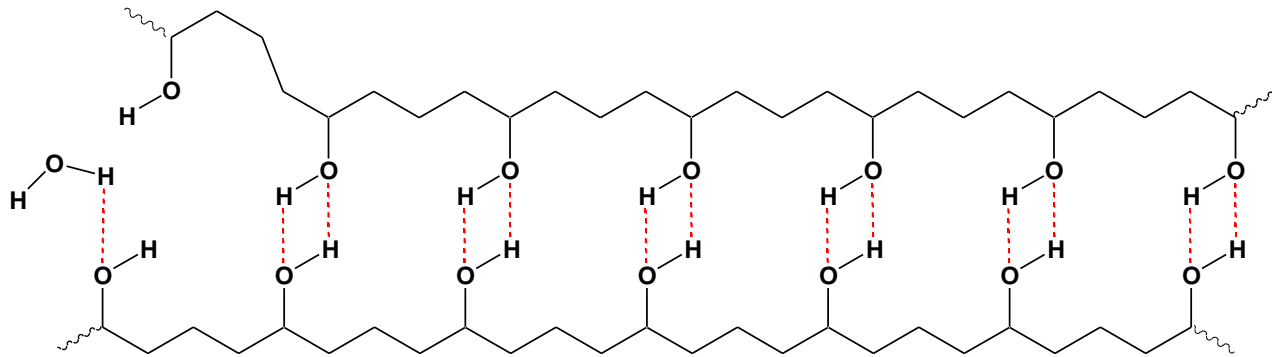
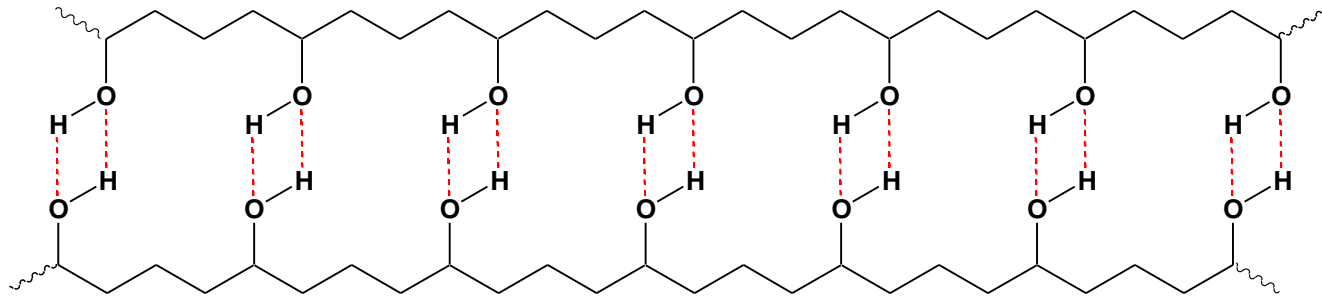


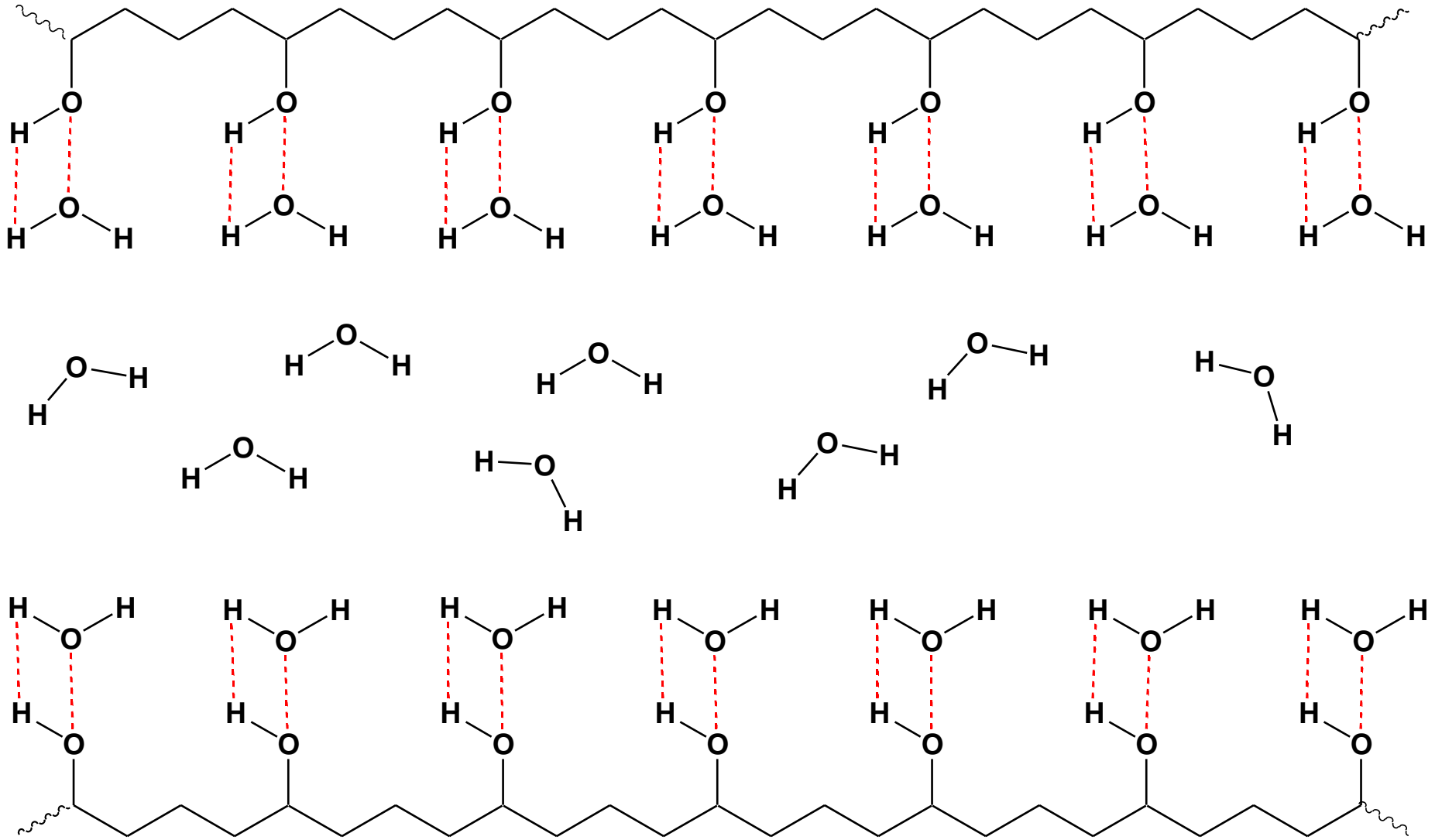
# ACTIVATION ENERGY





- SORPTION ON A GLASSY SOLID BELOW THE GLASS TRANSITION TEMPERATURE
- OPENING UP OF NANOCAPILLARIES
- HYDROGEN BONDING BREAKING OR FORMATION IS RATE LIMITING STEP AT LOWER CELL WALL MOISTURE CONTENTS (ZIPPER MODEL)





The Centre for Timber Engineering is based at Napier University in Edinburgh. It aims to provide a support base to establish timber as a preferred material for construction through:

- Undergraduate and Postgraduate Programmes
- Continuing Professional Development Courses
- Applied and Strategic Research
- Expert Advice, Consultancy and Knowledge Transfer



<http://cte.napier.ac.uk>