

Development of Novel Activated Carbon for Heat pump applications

Ahmed Abdalla (PhD Candidate)

Supervisors: Z.Tamainot-Telto and S.G. Shire

July 2022 / Mission innovation Workshop



Contents

Introduction

Research
methodology

Research
status

Conclusion



Introduction- Research Rational

Activated carbon used in Adsorption system is not manufactured specifically for that application

Having a model to guide the selection and manufacturing of AC leads to:

- A reduction in the amount of experimental studies required.
- A significant increase in COP of 30 %



Introduction- Research Objectives

- To relate isotherm shape with material specification
- To manufacture samples of Activated Carbon from raw materials
- To test manufactured and commercially obtained samples

Contents

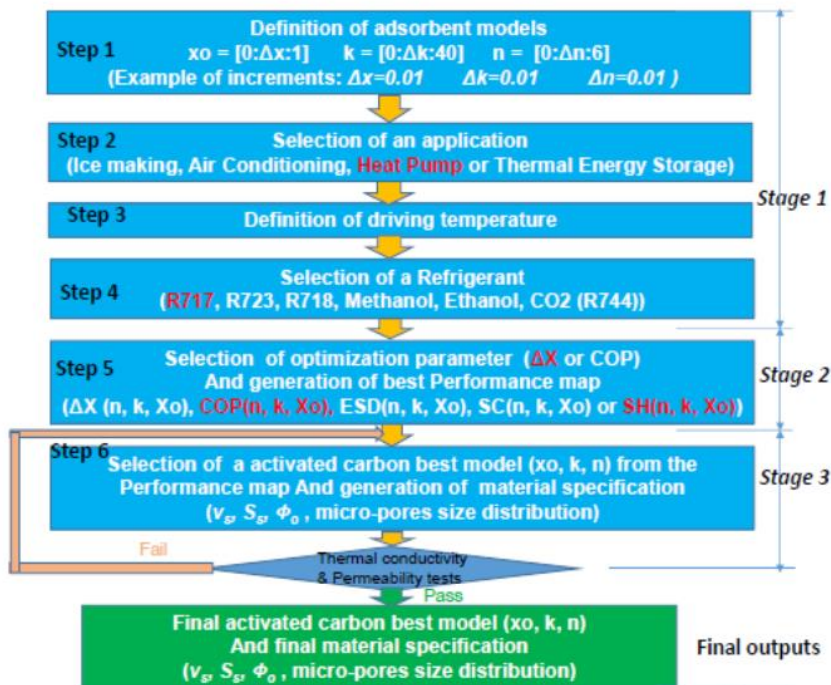
Introduction

Research
methodology

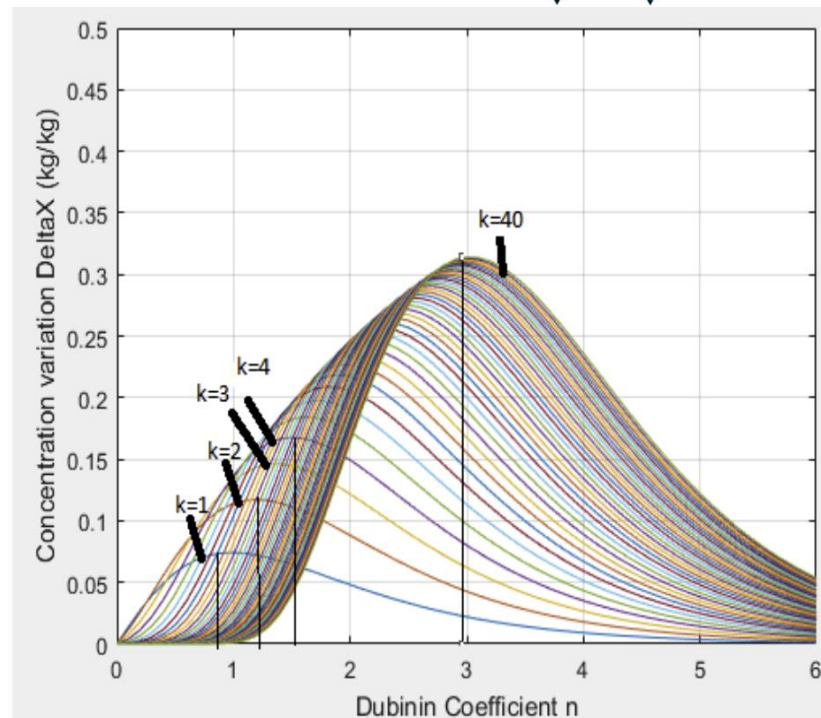
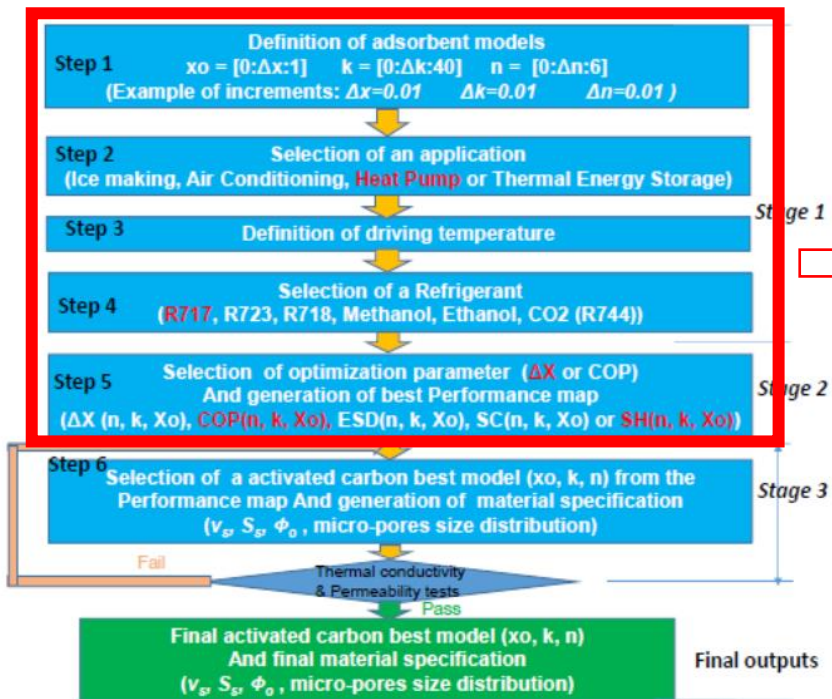
Research
status

Conclusion

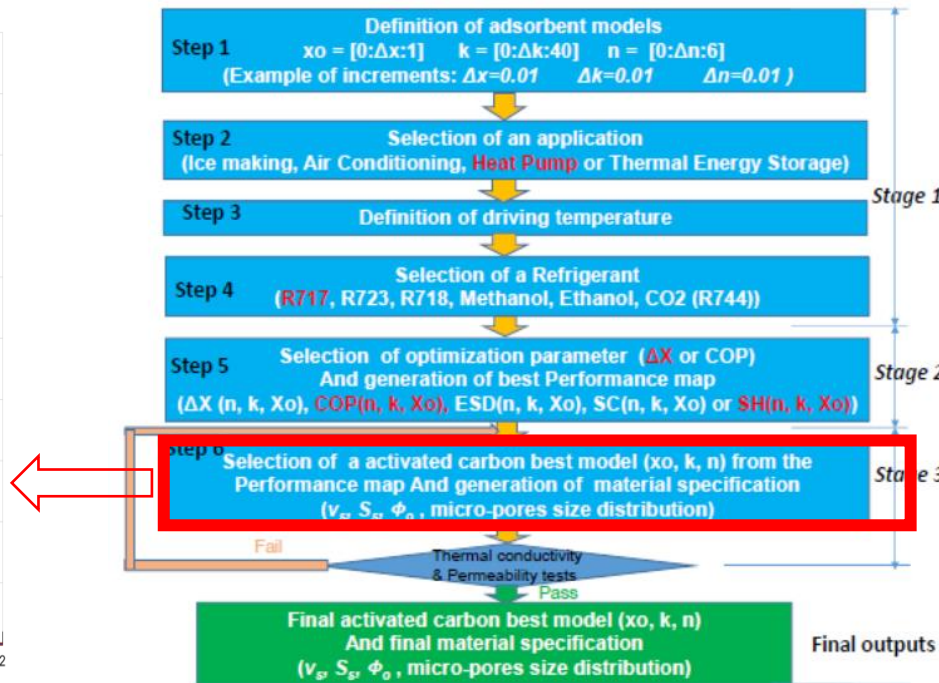
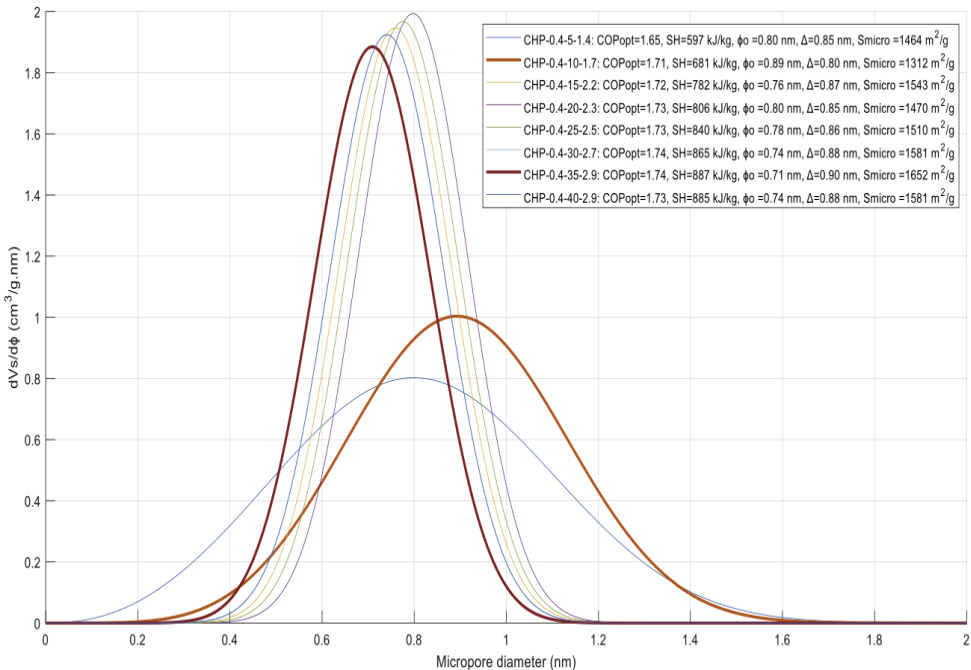
Research Methodology



Research Methodology



Research Methodology



Contents

Introduction

Research
methodology

Research
status

Conclusion

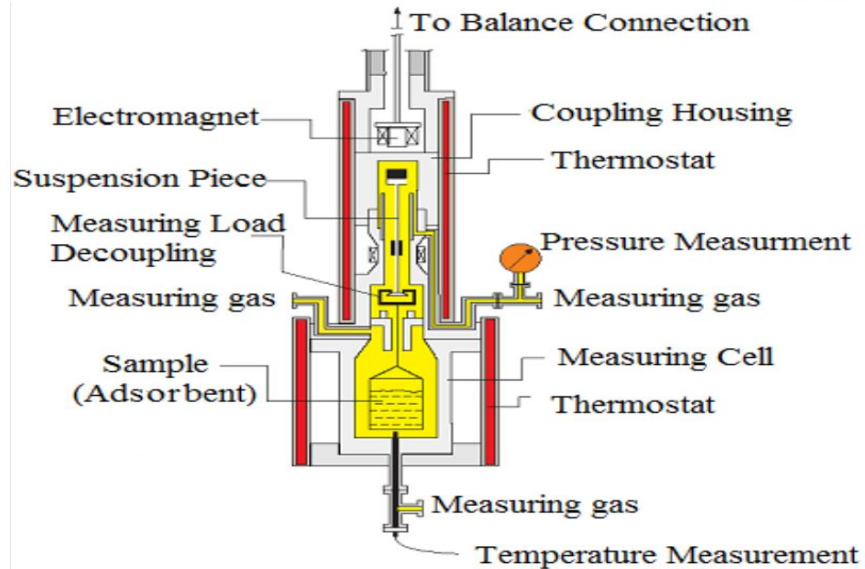


Research Status Overview

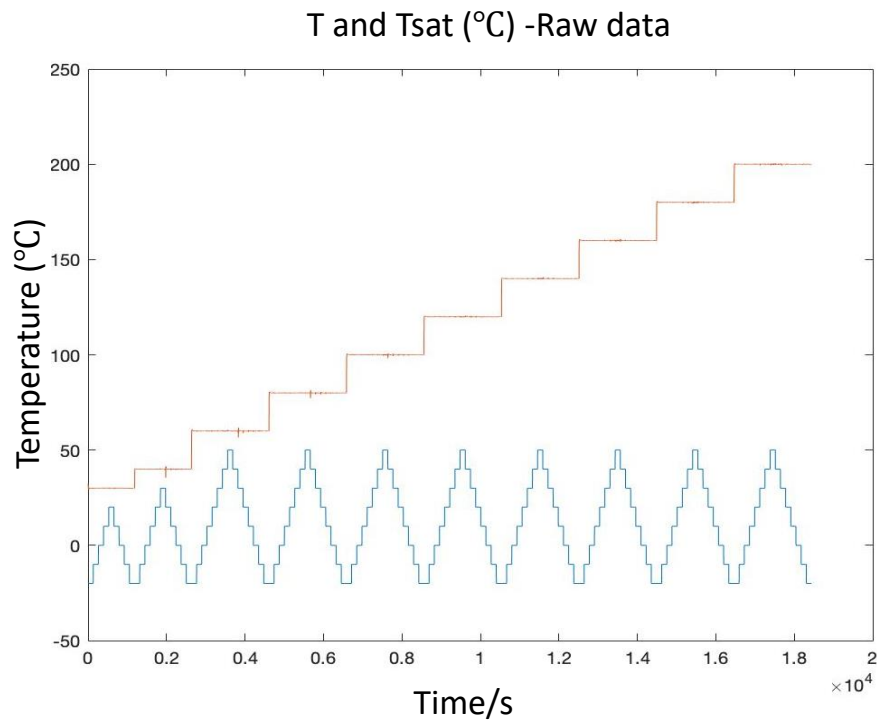
- Rubotherm experiments mainly to obtain adsorption isotherm
- ASAP 2020 Porosimeter experiments mainly to obtain micropore size distribution and BET/ Dubinin surface area
- Looked into possible models that can be applied to analyse adsorbent isotherms.

Research status-Rubotherm

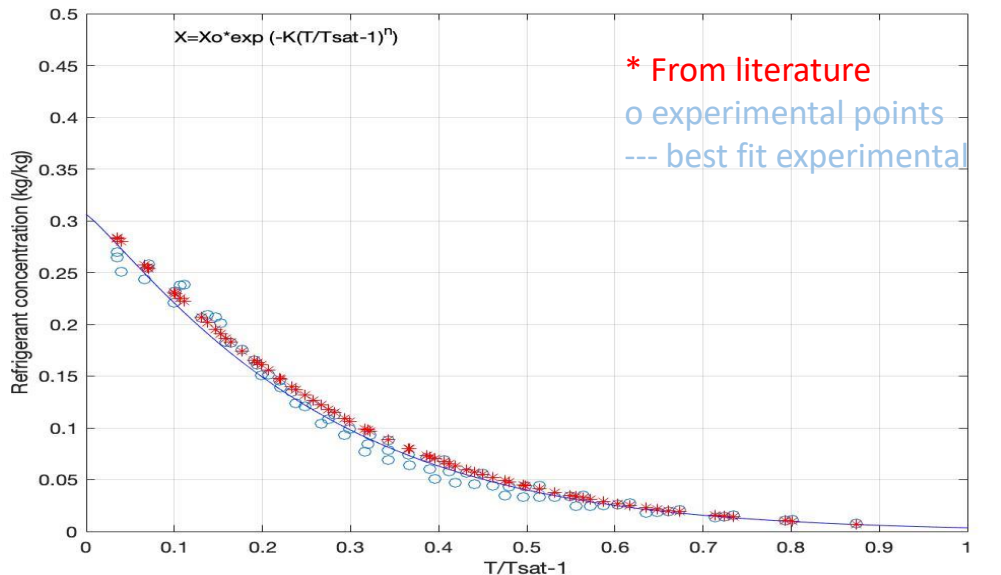
- Analyzed Carbon 208 C on Rubotherm
- Results had to be analyzed further



Research status- Rubotherm Results



Research status- Rubotherm Results cont.

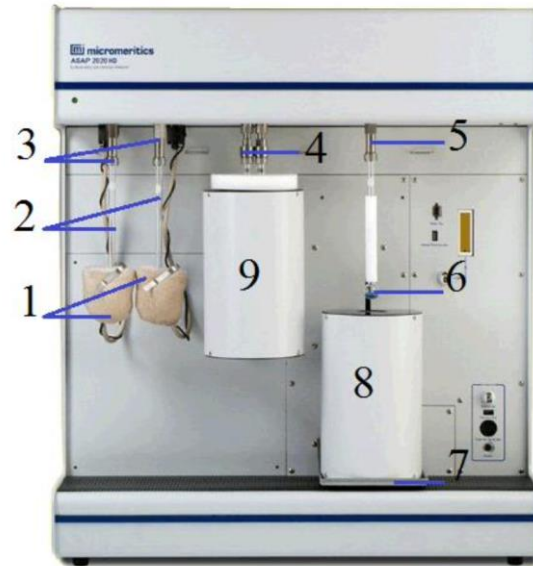


x	k	n	mse	MSE from lit.[*]
0.3063	-4.4577	1.1320	0.0000	0.0060

*Tamainot-Telto, Z., Metcalf, S., Critoph, R., Zhong, Y. and Thorpe, R., 2009. Carbon-ammonia pairs for adsorption refrigeration applications: ice making, air conditioning and heat pumping. *International Journal of Refrigeration*, 32(6), pp.1212-1229.

Research status- Porosimeter

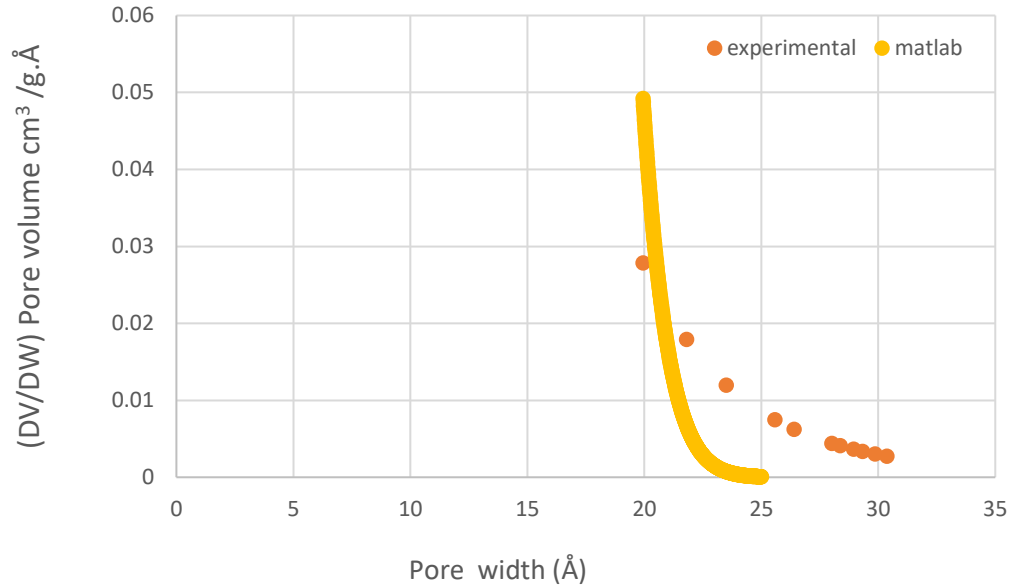
- Analyzed Carbon 208 C on ASAP 2020
- Machine has inbuilt functions to analyze nitrogen isotherm



- WARWICK**
THE UNIVERSITY OF WARWICK
1. Electric heating blanket
 2. Sample holder
 3. Degas port
 4. Cold traps
 5. Sample port
 6. Sample holder
 7. container elevator
 8. Nitrogen Container
 9. Cold trap container

Research status- Porosimeter results

DA method PSD of Carbon 208C



Contents

Introduction

Research
methodology

Research
status

Conclusion



Conclusion



- Developing AC for a specific application leads to a significant improvement in the COP
- Characterization of samples using porosimeter and Rubotherm
- Testing and analyzing samples will be the main force pushing the research further

Thanks for Listening !!

Email Address: Ahmed.Abdalla@warwick.ac.uk