Condensation and Evaporation of Hexane in Nanoporous Alumina Membranes

Hermann Böttcher[1] Victor Doebele[2] Pierre-Etienne Wolf[2]
Panayotis Sphatis[2] Fabien Souris[2]

[1]University of Constance

[2]Institut Néel, Centre national de la recherche scientifique

02/10/2018

Overview

Context

Grand scheme

- Condensation and evaporation of fluids in confinement

Context

Grand scheme

- Condensation and evaporation of fluids in confinement
- Dependency on
  - pore diameter
  - temperature (relative to the critical temperature)

Context

Grand scheme

- Condensation and evaporation of fluids in confinement
- Dependency on
  - pore diameter
  - temperature (relative to the critical temperature)

Plan

- Anodized alumina membranes (AAM)
- Test setup using Hexane $\rightarrow$ working at room temperature permits much faster executable experiments
- Transfer to **helium** experiment

Goals

Goals

- Improving and **systemizing** the evaluation of the recorded isotherm data
- Performing isotherm measurements on many membranes for **statistics**

Goals

- Improving and **systemizing** the evaluation of the recorded isotherm data
- Performing isotherm measurements on many membranes for **statistics**
- Comparing the pore diameters extracted from the volumetric measurements those from scanning electron microscopy (SEM) images

Goals

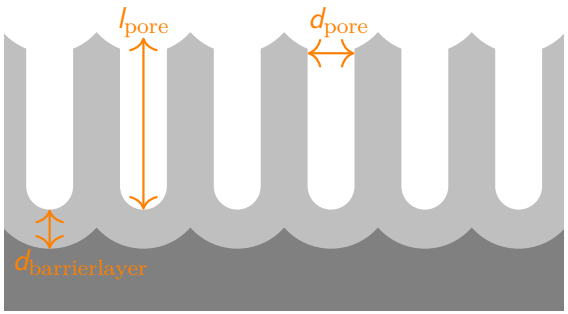
- Improving and **systemizing** the evaluation of the recorded isotherm data
- Performing isotherm measurements on many membranes for **statistics**
- Comparing the pore diameters extracted from the volumetric measurements those from scanning electron microscopy (SEM) images
- Improving the fabrication process to reduce the dispersion

Goals

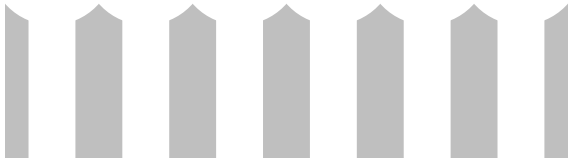
- Improving and **systemizing** the evaluation of the recorded isotherm data
- Performing isotherm measurements on many membranes for **statistics**
- Comparing the pore diameters extracted from the volumetric measurements those from scanning electron microscopy (SEM) images
- Improving the fabrication process to reduce the dispersion
- Testing the efficiency of the ALD process as a means to reduce the pore diameters

Membrane production

Two step anodizing
in oxalic acid ($C_2H_2O_4$)
at 0 °C



Immersion in
27.2 g $CuCl_2$
copper chloride



Experimental setup

Data evaluation

Inverse funnelling

Atomic layer deposition