

# Multiscale modelling of MMMs

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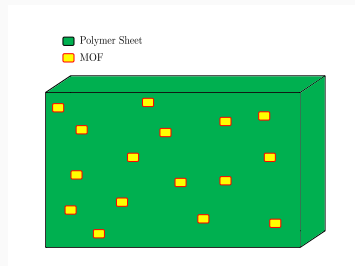
Team David HasselMOF:

Beth Boulton, Chris Budd, Chris Guiver, Cameron Smith

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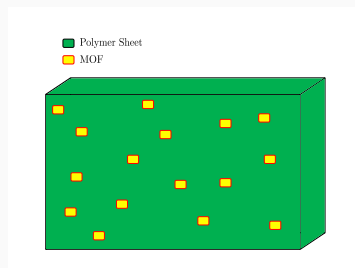
ITT6

# What is a mixed matrix membrane?



Schematic for a MMM

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Schematic for a MMM

Different scales:

Polymer sheet depth  $\sim cm$

MOF size  $\sim 100\mu m$

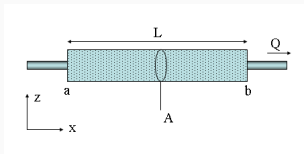
Polymer sheet pores  $nm \sim mm$

MOF pores  $\sim nm$

**Question:** How to characterise the flow through the MMM?

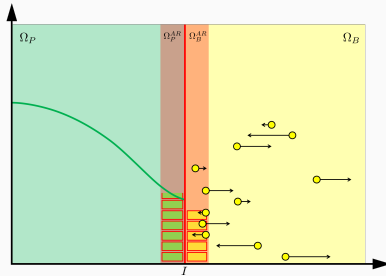
# Approach 1: Darcy flows

- Start in **one or two dimensions**
- Randomly allocate MOFs using **Poisson process in  $\mathbb{R}, \mathbb{R}^2$**
- MOF permeability  $\mu_1$  and polymer sheet permeability  $\mu_2$
- How do we find these?
- Control the density of MOFs
- Continuum method in the polymer sheet: **Darcy flow?**



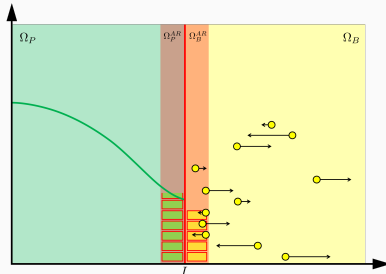
Darcy flow experiment

## Approach 2: Hybrid modelling



Sample hybrid method

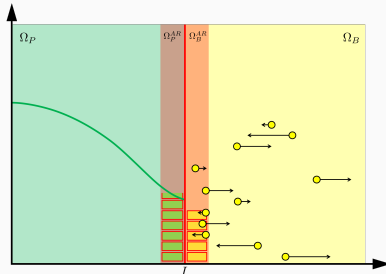
## Approach 2: Hybrid modelling



Sample hybrid method

**Question:** Can we use hybrid techniques to characterise MMM flow?

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Sample hybrid method

**Question:** Can we use hybrid techniques to characterise MMM flow?

**Question:** How does this method compare to the Darcy law flow?