

CCS IN ACTION - CRANFIELD BIENNIAL, 21-22 April 2015

## EPSRC project update: Organic mixed matrix membrane technologies (ORGMMENT) for post-combustion CO<sub>2</sub> capture



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# Organic mixed matrix membrane technologies (ORGMMENT) for post-combustion CO<sub>2</sub> capture

EP/M001342/1

Start: 31 Dec. 2014. End: 30 Dec. 2018. Value: £826,848

## Postdoctoral research associates



Dr. Rupesh Bhavsar



Started Feb. 2015



Dr. Tamoghna (Tom) Mitra



Started March 2015

# Organic mixed matrix membrane technologies (ORGMMENT) for post-combustion CO<sub>2</sub> capture

## **Mixed matrix membrane:**

Synergistic combination of processable polymer with filler that improves performance.



# Organic mixed matrix membrane technologies (ORGMMENT) for post-combustion CO<sub>2</sub> capture

## Mixed matrix membrane:

Synergistic combination of processable polymer with filler that improves performance.

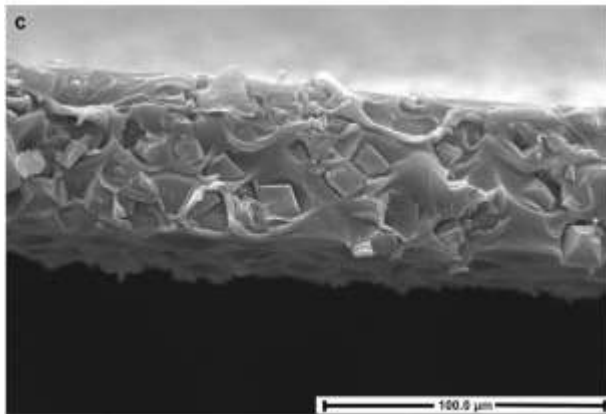
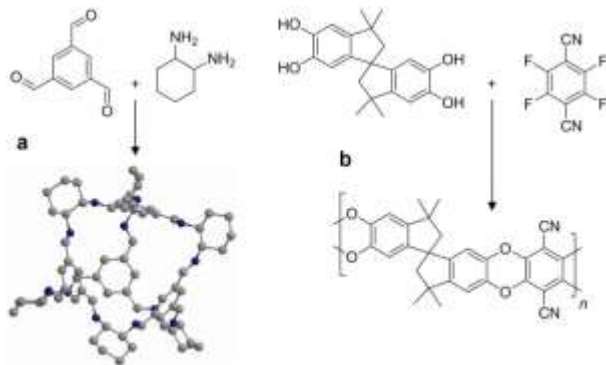
**Problem:** lack of compatibility between most fillers (often crystalline inorganic or metal-organic) and membrane polymers (often amorphous and organic).



# Organic mixed matrix membrane technologies (ORGMMENT) for post-combustion CO<sub>2</sub> capture

## Organic fillers:

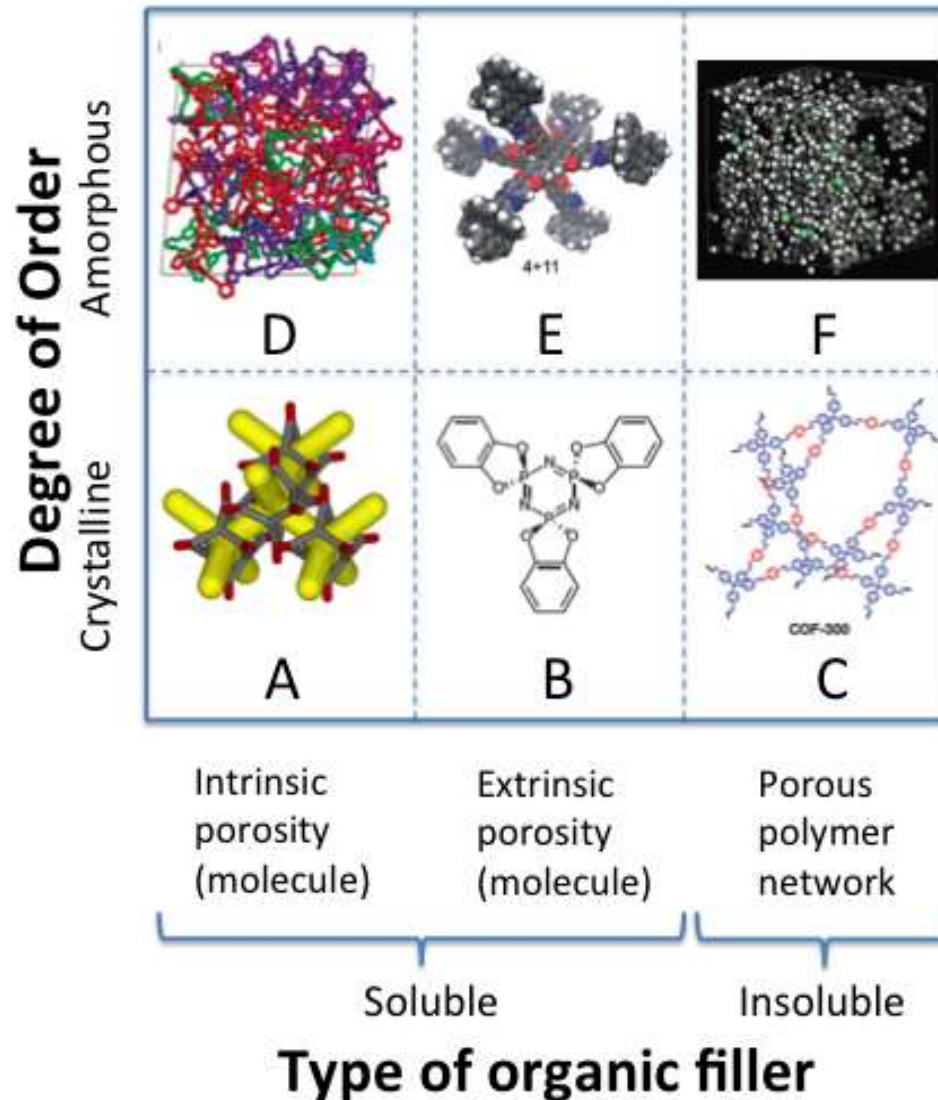
- (i) Better compatibility with organic polymers;
- (ii) Tailored physical properties through organic synthesis.



Technical Parallel Session 1  
*Novel Capture Technologies*  
Novel membranes for carbon capture

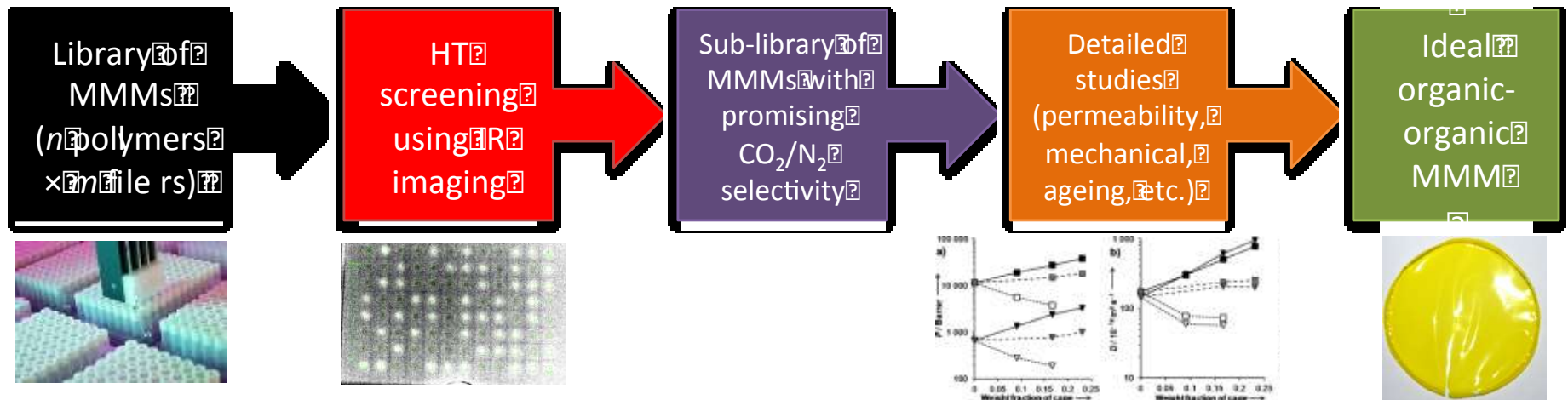
A. Bushell *et al.*,  
*Angew. Chem. Int. Ed.*,  
2013, **52**, 1253.

# Organic mixed matrix membrane technologies (ORGMEMT) for post-combustion CO<sub>2</sub> capture



# Organic mixed matrix membrane technologies (ORGMEMT) for post-combustion CO<sub>2</sub> capture

Many membrane polymers.  
Many potential organic fillers.  
So utilise **high throughput** methods.



# Organic mixed matrix membrane technologies (ORGMMENT) for post-combustion CO<sub>2</sub> capture

Selection of organic fillers for initial searches prioritised on the basis of:

Cost

Stability

Solubility

Dispersibility

Compatibility with membrane polymer

Gas selectivity

Polymorphism



The University of Manchester



# Graphene-based membranes

EP/K016946/1

Start: 1 July 2013. End: 30 June 2018. Value: £2,839,350



**Molecular separations**

Bioalcohol recovery  
CO<sub>2</sub> capture

**Barriers**

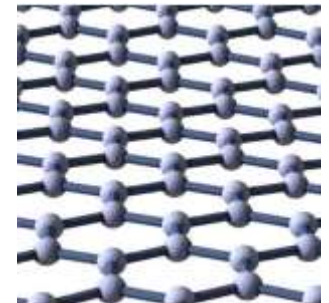
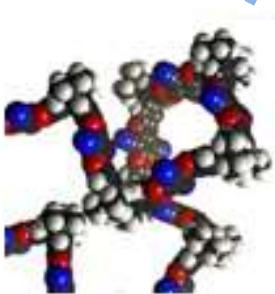
Chemical agents  
Food packaging

**Ionic conductors**

Fuel cell  
Chlorine cell

**Sensors**

Health  
Agriculture



Polymers of  
Intrinsic  
microporosity  
(PIMs)

Graphene  
oxide  
dispersions

Graphene  
dispersions

CVD  
graphene

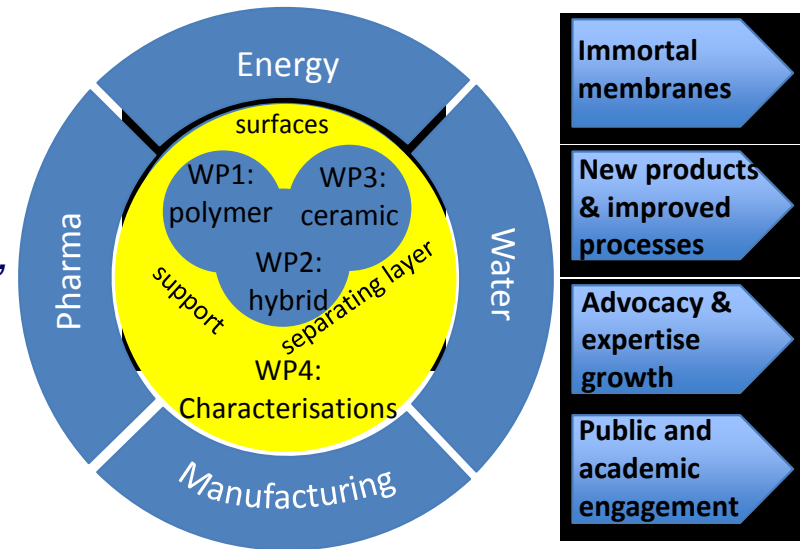
# From membrane material synthesis to fabrication and function (SynFabFun)

EP/M01486X/1

Start: 1 April 2015. End: 31 March 2020. Value: £4,508,218



*Our vision is to create membranes which do not suffer from ageing or fouling, and for which separation functionality is therefore maintained over time.*



Ian Metcalfe      Andrew Livingston Kang Li      Davide Mattia Darrell Patterson      Neil McKeown      Peter Budd

