bridging the gaps
Sustainable Urban Spaces

Little Green Things

Nanotechnology and Sustainability Sandpit

UCL

Pseudo-Living Material Modification

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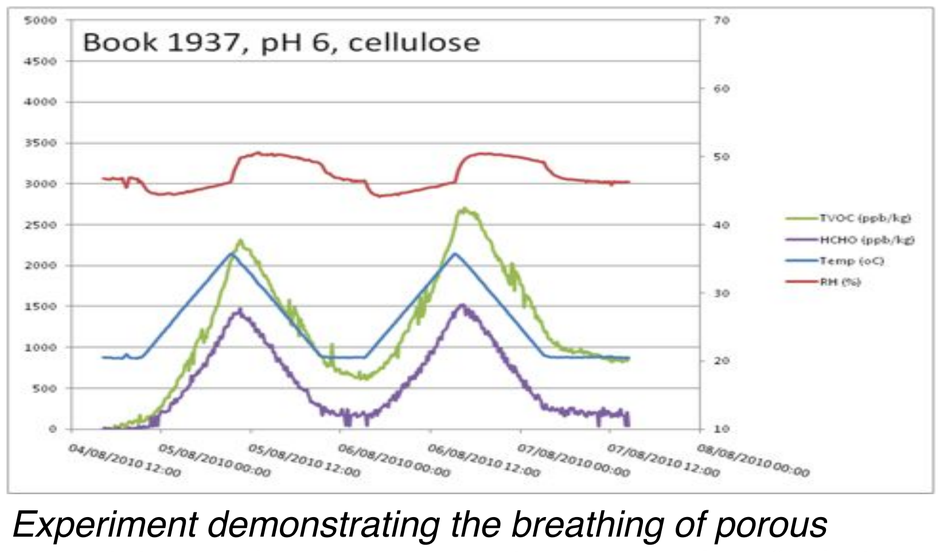
Project objectives

- To explore the possibility of modifying existing material properties (chemical or physical) through introduction of a new phase. The principal property of this phase would be to organically move through nano and micro-sized pores.
- To model these processes using advanced computational modelling, such as computational fluid dynamics, exploring the interactions between fluids and pore walls.
- To characterise the process using nano-scale characterisation techniques.
- To introduce new functionalities into old materials thus sustainably prolonging their lifetime.

Measurement of emission and reabsorption of volatile compounds in porous materials (closed books).



Experiment demonstrating the breathing of porous materials: as the temperature increases, they "exhale" formaldehyde and other volatile compounds, as it decreases, they "inhale" the same compounds. Image by Dr Irina Spulber.

The research

Several research strands evolved, involving mainly desk-top, but also experimental research:

- The requirements for modelling of the movement of gases through micro- and nano-sized pores were established and the literature was reviewed.
- Measurements of emission and reabsorption of gases from a typical porous 3D material (a closed book) were performed and academic publication was drafted based on these experiments.
- The possibilities of examination of material surfaces using nano-robots were examined and literature reviewed.

Project outcomes

•Experimental research shows that porous objects emit and reabsorb volatile organic compounds depending on the temperature, the process being similar to breathing.
•Computational fluid dynamics modelling can be used to explore the process theoretically, however, complex measurements are necessary to establish the necessary computational parameters.
•An AHRC/EPSRC Science & Heritage Programme proposal was submitted to explore the use of swarms of nano-robots for examination of material surfaces
•An AHRC/EPSRC Science & Heritage Programme proposal was submitted to understand the complex interactions between materials and their environment
•A Bridging the Gaps application of Escalator Funds was submitted on the topic of "Modelling Porous Materials as Chemical Reactors".
The Bridging the Gaps project enabled the participants to fully explore synergies and resulted in two successful bids for projects, which would otherwise not be possible.