



Fiber Based Ionic Liquid Sorbents

For more information, contact
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U.S. DEPARTMENT OF

ENERGY

National Energy
Technology Laboratory

The Need

- **Gas separation is important for a variety of industries, such as natural gas reforming and chemical manufacturing. Cheaper and more efficient gas separation is needed in these areas.**
- **Separation mechanisms are also needed to capture CO₂ from fossil fuel plants.**



The Need

- **Currently available carbon capture processes significantly reduce efficiency and increase electricity cost, but more efficient and economical processes for CO₂ capture are needed for these applications.**
- **Ionic liquids (IL), organic salts that are commonly liquid at room temperature, are promising materials for CO₂ capture and gas separation.**



The Problem

Better methods are needed to produce effective ionic liquid materials; specifically, to incorporate them into practical sorbent materials



The Technology Solution

Ionic Liquids: The Solvent of the Future

Properties of ionic liquids

Chemical stability

Low vapor pressure

Thermal stability

Tunable viscosity

High ionic conductivity

High polarity

Unique solubility properties

Low flammability

Possible ionic structures

Aprotic

*Solvents
Battery applications
Super capacitors
Lubricants*

Protic

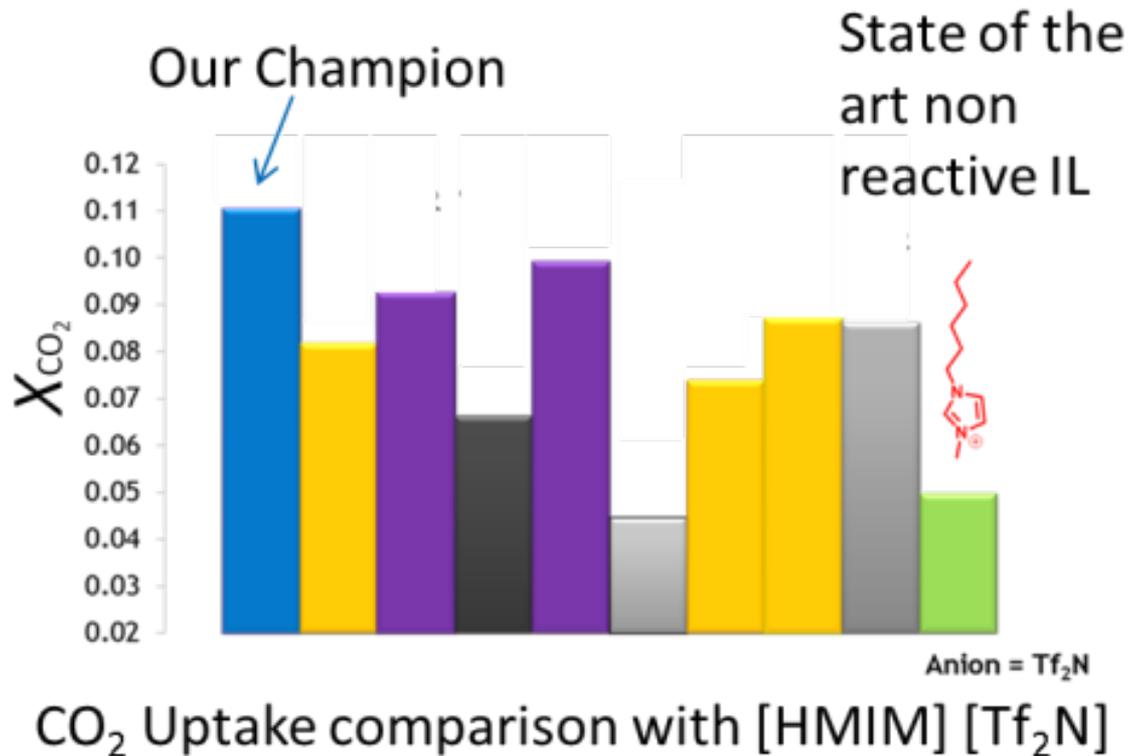
*Proton exchange
Catalysis*

Zwitterion

*Water filtration
Membranes
Anti-bacterial
Anti-fouling*

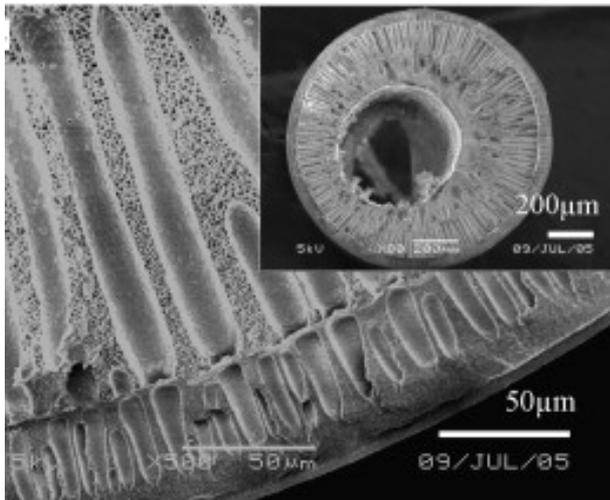
The Technology Solution

NETL has developed a new class of ionic liquids that offers promising properties for use in CO₂ capture processes and other gas separation.



The Technology Solution

NETL has also developed new methods for incorporating ionic liquids into substrates for gas capture.



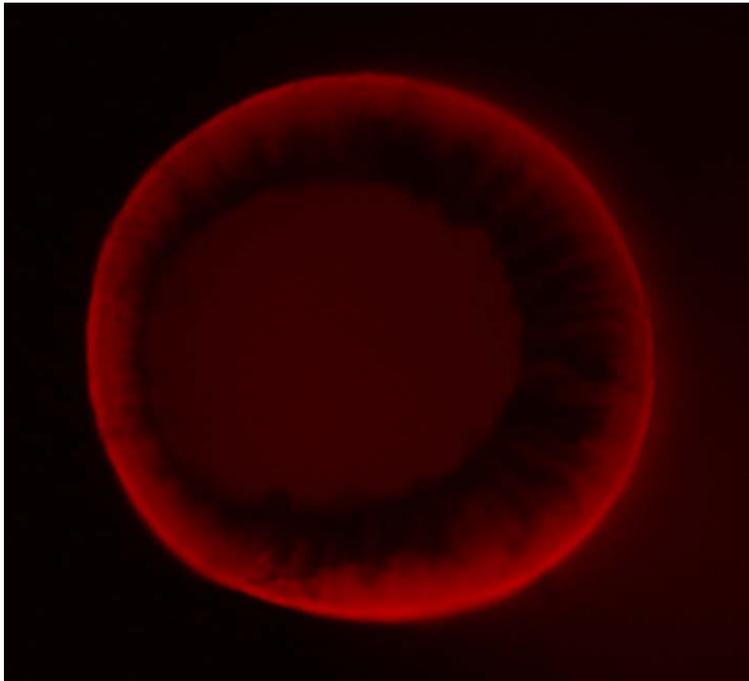
Dual layer hollow fibers



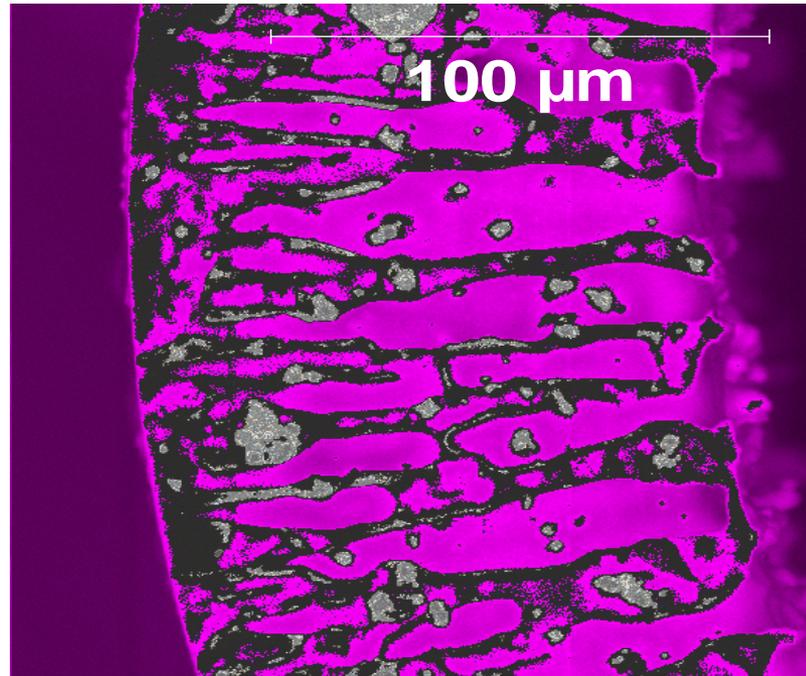
Hollow spheres as high performance sorbent materials

The Technology Solution

Other solutions being developed are:



Supported ionic liquid membranes

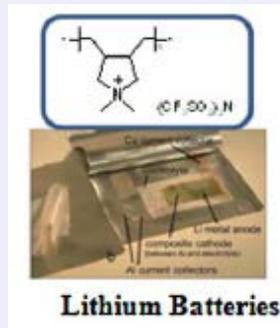


Mixed matrix membranes (MMMs)
with metal organic framework (MOF)
fillers

The Applications

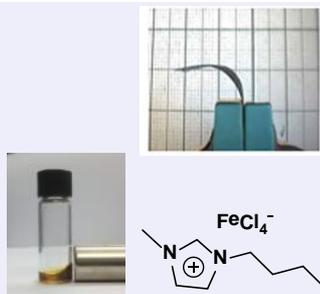
ELECTROLYTES

- fuel cells
- batteries
- supercapacitors
- metal finishing
- coating



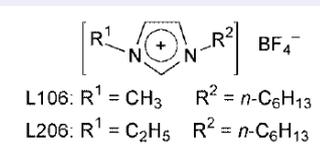
ELECTROELASTIC & MAGNETIC MATERIALS

- artificial muscles
- robotics
- magnetic ionic liquids



LUBRICANTS & ADDITIVES

- lubricants
- fuel additives
- plasticizer for rubber

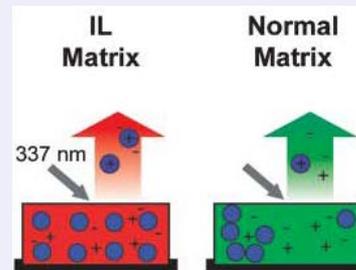


HEAT STORAGE

- thermal fluids

ANALYTICS

- MALDI-TOF-matrices
- GC-head-space-solvents
- protein-crystallization



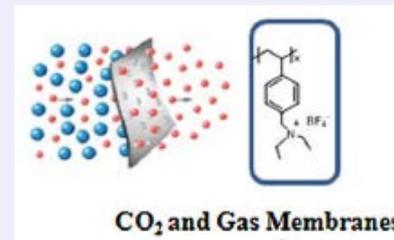
SOLVENTS

- organic reactions & catalysis
- nanoparticle synthesis
- polymerization



SEPARATION

- gas separation
- extractive distillation
 - extraction
 - membranes



Partnership Opportunity

These technologies are available for licensing and/or further collaborative research from the U.S. Department of Energy's National Energy Technology Laboratory.

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