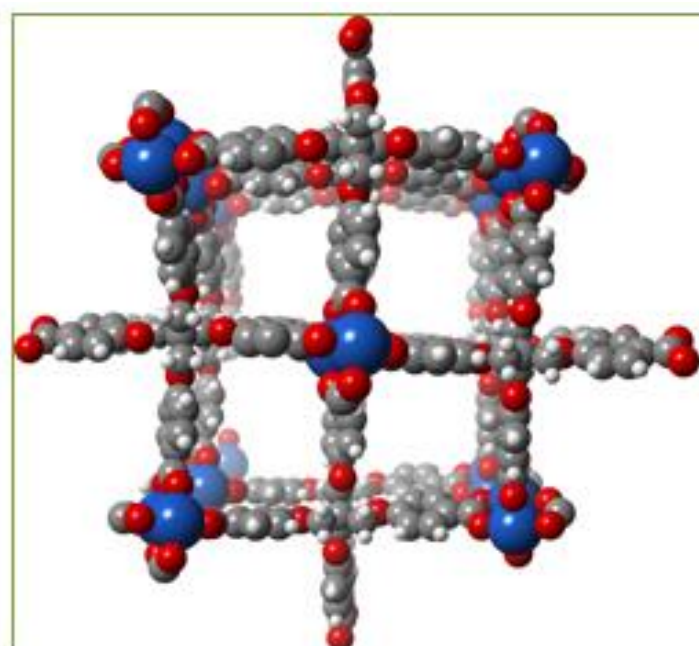


Metal-Organic-Frameworks for Energy Applications

An infographic by: Xiaoting Guo and Joseph Capani Jr.

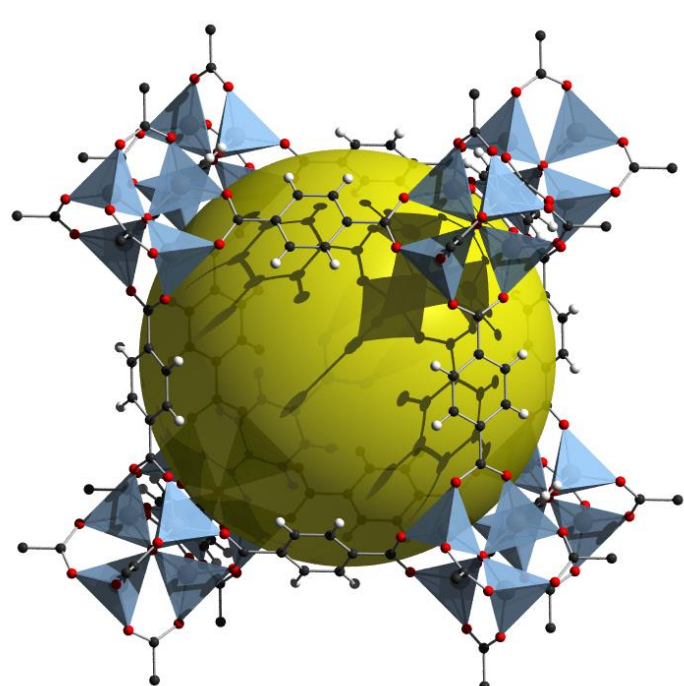
What is a Metal-Organic-Framework?



"Metal-Organic frameworks, made of metal ions and organic particles" by Don Siegel, CC

- Metal-Organic-Frameworks (MOFs) are porous lattices of metal ions bound to organic ligands extending in one, two, or three dimensions
- MOFs have stable cavities with properties that can be finely tuned using different metals and ligands
- The unique properties of MOFs may be useful in a variety of applications

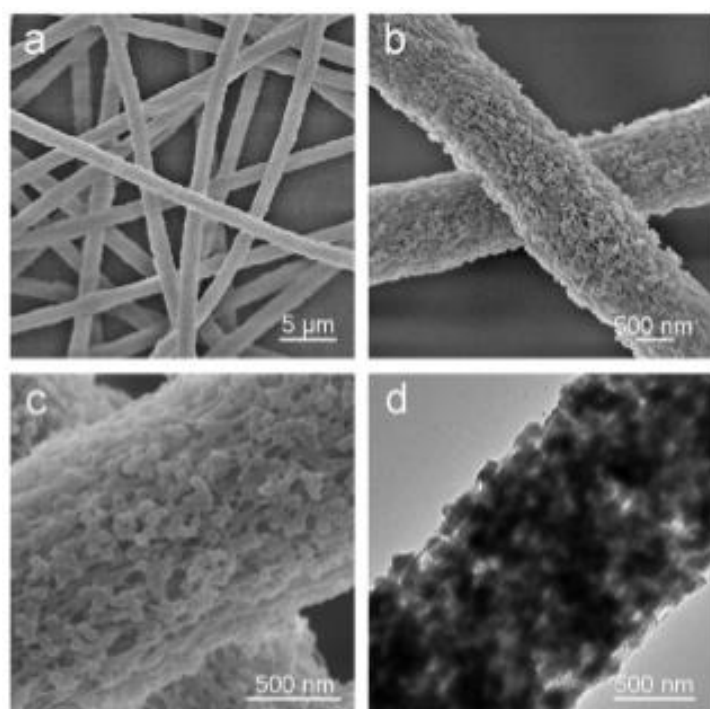
MOFs: Gas Storage



"Example of MOF-5" by Tony Boehle, Public Domain

- MOF cavities can be used to store hydrogen gas as a fuel source
- This image depicts hydrogen gas stored in an MOF cavity
- Hydrogen gas is an efficient, clean burning fuel that has the potential to replace gas and coal
- MOFs with larger surface areas tend to be better H₂ absorbers

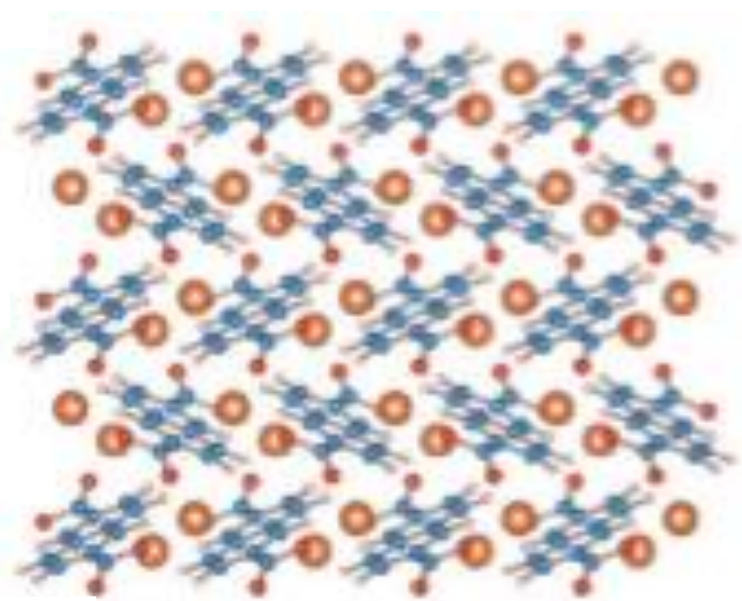
MOFs: Supercapacitors



"FESEM and TEM images of the FAN/ZIF-8 composite nanofibers" by Li-Feng Chen, CC

- Supercapacitors are promising energy storage devices for next-generation electronics
- Supercapacitors have longer lifetimes, higher power density, and faster charge rates
- Carbon nanofibers may be treated with metals to form MOF fibers with supercapacitor capabilities
- These images depict treated carbon nanofibers at the molecular level

MOFs: Rechargeable Batteries



"The structure of Li-doped pi-stacking naphthalene rings" by Nobuhiro Ogihara, CC

- Lithium-ion batteries have potential as large-scale energy storage devices for many applications
- Currently, the voltage of Li-ion batteries is limited because batteries must be connected in series, increasing resistance
- Lithium-ion MOFs provide higher voltage per unit, lower resistance, and higher energy density
- This image depicts the structure of a Li-naphthalene battery MOF

Conclusion

Metal-Organic-Frameworks are promising structures for use in a variety of energy applications. The tunable properties of MOFs allow for unique approaches to the challenges of energy storage.

Works Cited:

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