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Our research efforts target alternate solutions to some current issues in the fields of mesh-adjustable molecular sieves, adsorbent coolant (green air-conditioning), selective gas adsorption studies - storage of hydrogen and methane (next generation fuels), sequestration of carbon dioxide (lowering greenhouse effect), sensors, chiral catalysis, and metal-oxides/sulfides/selenides nanoparticles.

Recent important discoveries include -

(1) **the nanoporous (pore size: 0.5-2 nm) metal organic frameworks:** their selective gas (nitrogen vs carbon dioxide or methane) and liquid (water vs alcohol or acetonitrile) adsorption studies are very encouraging.

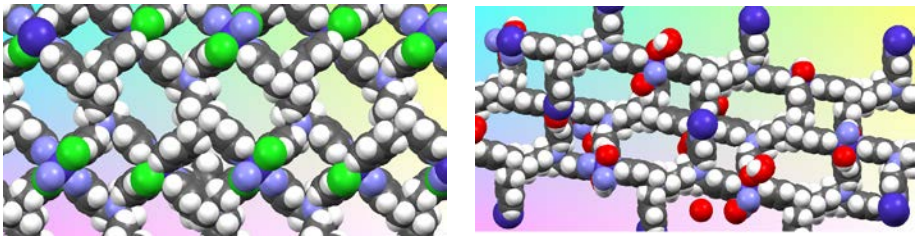

Fig. Examples of Nanoporous Metal Organic Frameworks.

(2) **nano-sized crystalline ZnO or CdO:** these are prepared at mild conditions (400 °C and 250 °C, respectively) via the direct thermal decomposition technique from the water soluble coordination polymer precursors without any no solvent like oleic acid or any surfactant. Thus, this route is cost-effective for producing large quantities for their multi-use in electronics, catalysis, photodegradation of dyes, etc.

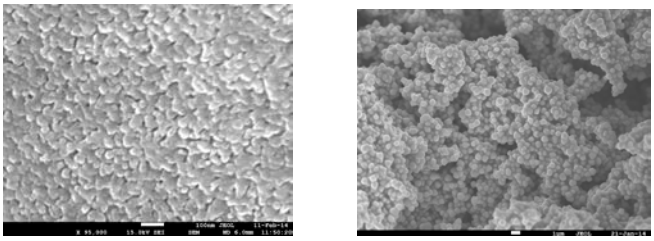

Fig. SEM images of ZnO produced at 400 °C (left) and CdO produced at 250 °C (right).

(3) **an amino-acid based chiral and neutral Cu(II) complex as a receptor for anions:** it shows distinct receptor behaviour in dimethylsulfoxide or methanol towards anions, such as F^-, Cl^-, Br^-, I^- or OAc^-, where F^- and OAc^- have the most colorimetric change. The importance of this work comes from the fact that anions such as F^-, Cl^-, OAc^- or phosphates and their derivatives play important roles in chemical (natural and industrial) and biological processes.

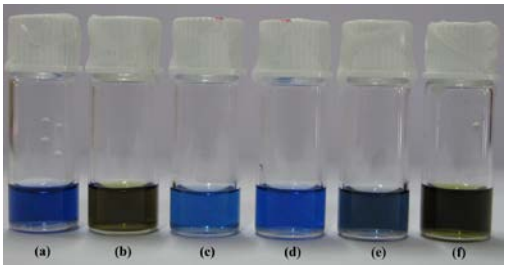

Fig. Chromogenic response of solutions of **1a** in DMSO upon interaction with various anions: (a) Free host **1a** (3mM); (b) **1a** + 1 eq. KF (c) **1a** + 1 eq. KCl (d) **1a** + 1 eq. KBr; (e) **1a** + 1 eq. KI and (f) **1a** + 1 eq. NaOAc.