**Nanoporous materials for energy and environmental related applications**

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Nanoporous polymers are new class of emerging materials, with pore diameters manifested in the nano meter range with high surface to volume ratio, a very ordered uniform nanoporous structure and extremely high thermal, chemical and mechanical stabilities.[1] The rational synthesis approach for the preparation of nanoporous materials via template and template free methods open up the incorporation of a wide variety of functional groups, different pore dimensionalities and pore lengths into the resultant final materials. These materials led to new advances in catalysis, catalysts supports, gas storage, adsorption or separations, sensing, and energy storage and conversion. Some of the most intensively studied applications of these nanoporous materials lies in solving of the energy and environmental related problems, including, simultaneous capture and conversion of CO2 from the power plant exhaust, sensing of toxic molecules, energy efficient separations, and electrochemical energy storage and conversion.

We have designed and developed several nanoporous materials incorporating various functional groups such as sterically confined N-heterocyclic carbine (NP-NHC),[2] pillar[5]arene (P5-CMPs),[3] sulfurized covalent triazine framework (S-CTF),[4] pyrazine units (3D-NG),[5] triazole and tri-s-tetrazine based mesoporous carbon nitride (MCN)[6-7] by using innovative reticular chemistry and nano hard templating approaches. The obtained nanoporous materials showed excellent textural parameters including high specific surface areas, large pore volumes and tunable pore diameters. Realized nanoporous materials demonstrated excellent potential in clean environment and sustainable energy sectors including simultaneous CO2 capture and conversion to value added cyclic carbonates, separation of propane and methane present in natural gas, highly efficient cathode for Li-S batteries and electrocatlyst for hydrogen evolution reaction (HER). It is worth to mention that the prepared nitrogen enriched MCN materials exhibited superior performance for sensing of toxins and photocatalytic hydrogen production with H2 evolution rate of 267 μmol h-1.[6]

**References**

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