A New Family of Nanoporous Nitride Materials for Energy and Environmental Applications

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Innovative approaches to translate basic nanomaterials research into real-world products are critical for our future. Nanotechnologies can deliver successful energy, environment and health solutions - such as converting carbon dioxide into clean fuel with only sunlight and water and developing innovative devices for energy storage and conversion. In this talk, I will present the development, capabilities, and current and future applications of multifunctional nanoporous materials. Especially, much focus will be given to the fabrication of new family of semiconducting nanostructures composed of carbon and nitrogen (carbon nitrides) with different pore diameters, nitrogen contents, and structures.[1-7] Especially, I will focus on the preparation of novel mesoporous C3N5, C3N6, C3N7 and C3N8 materials and their structural elucidation using different spectroscopic techniques. I will also demonstrate how the chemical composition, structure, porosity and the functionalization of these unique materials can be tuned, as well as the fabrication of CN with single molecular precursors with C, N, S elements and with mono and bimetallic sulphides. In the last part of the talk, I will present on the energy storage and photocatalytic performance of these unique nanoporous carbon nitrides and their hybrids on water splitting and CO2 capture and conversion. Much focus will be given on the bulk production of the functionalized carbon nanostructures and their commercialization including the demonstration of the pilot plant for CO2 capture.

References

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