Crystals and Nanostructures: a Unique Class of Tunable Inorganic-Organic Frameworks

Jing Li, Xiaoying Huang, *Department of Chemistry and Chemical Biology, Rutgers University, Piscataway, NJ 08854, USA*. E-mail: jingli@rutchem.rutgers.edu

An exciting and promising area of materials research that concerns chemistry and physics of inorganic-organic hybrid materials is rapidly emerging. Hybrid materials that combine the superior electronic, magnetic, optical properties and thermal stability of inorganic frameworks with the structural diversity, flexibility, high processability, and light-weight of organic molecules may reveal new phenomena and new properties, and enhance/strengthen the existing functionality and performance. Thus, they are of both fundamental and technological importance. We have recently developed a unique class of crystalline hybrid nanostructured materials with systematically tunable structures and multifunctional properties. The framework structures of these materials are composed of, at our choice, II-VI semiconductor nanometer sized motifs (inorganic component) and suitable organic spacers (organic component). They possess numerous improved properties over conventional II-VI semiconductor bulk materials, including broad band-gap tunability, high absorption coefficients, and large carrier diffusion lengths, all highly desirable for optoelectronic applications such as photovoltaics and solid state lighting. More significantly, they exhibit extremely strong quantum size effect and their nano properties can be systematically tuned by changing the structure and dimensionality of the inorganic motifs.

Keywords: inorganic-organic hybrid material, II-VI semiconductor, nanostructure