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Tunable Inorganic-Organic Hybrid Nanostructures by Crystal Engineering. Xiaoying Huang, Wooseok Ki, Jing Li, Dept. of Chemistry and Chemical Biology, Rutgers Univ., Piscataway, NJ 08854, USA.

Research in inorganic-organic hybrid materials is a rapidly developing area of materials science. Hybrid materials can combine the superior electronic, magnetic, and optical properties and thermal stability of inorganic frameworks with the structural diversity, flexibility, high processability, and light-weight of organic molecules. These materials can enhance and strengthen the functionality and performance and, thus, have both fundamental and technological importance. We have recently developed a unique class of crystalline inorganic-organic hybrid nanostructured materials with systematically tunable structures and properties. The structures of these materials are comprised of 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 exciton binding energies, all very desirable for optoelectronic applications such as photovoltaics , solid state lighting and UV emitting devices. More significantly, they exhibit extremely strong quantum size effect and their nano-properties are independent on particle sizes, and can be systematically tuned by changing the structure and dimensionality of the inorganic motifs.