

DESIGNING NANOSTRUCTURES FOR NEW FUNCTIONAL MATERIALS

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High demands on materials performance, particularly for functional applications in miniaturized systems, have brought revolutionary changes in materials synthesis, processing and fabrication concepts. Recent advances have demonstrated that materials with nanometer scale structures can be successfully designed at the atomic and molecular levels by many methods to exhibit unique properties. Improved and unexpected properties of these materials impact a wide spectrum of phenomena including superconductivity, magnetism, quantum electronics, non-linear optics, cluster stability, and nucleation and growth. Concurrent with innovative processing and fabrication, new characterization tools, such as scanning tunneling microscopy, atomic force microscopy and magnetic force microscopy, have not only revolutionized our understanding of interatomic interactions and structures of atomic and molecular self organization, but have provided new opportunities in designing systems with specific functions, through interdisciplinary integrations. Selected observations of recent studies in this emerging field will be presented with recommendations for future research.