

Physics Seminar

Michigan Technological University

Wednesday, December 5, 2007

2:00 pm

Room 127, Fisher Hall

ZnS based 1D nano-heterostructures: synthesis, properties and applications

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Abstract:

One dimensional structure, amongst all nanomaterials, perhaps holds the maximum promise for near future applications because of a number of reasons, such as the size confinement in two dimensions still leaves the other dimension practically macroscopic in order to be manipulated easily. Besides, it is also possible to prepare them using soft chemical as well as high temperature routes leading to nanostructures of varied dimensions, shapes and many useful compositions. ZnS is one of the first semiconductors discovered and probably one of the most important materials for electronics with a wide range of applications including electroluminescence, nonlinear optical devices, flat panel displays, sensors, lasers, and biologic applications. This talk will present ZnS as a case study to obtain a variety of one dimensional nanostructures. For applications like field emission, it is important to have high aspect ratio and sharp tips. The presentation will make an effort to establish these facts by comparable experimental findings, besides providing alternative mechanisms for field enhancement using tailored geometry of hierarchical nanostructures. For example, quantum confined ZnS belts can have field enhancement as high as that of carbon nanotubes. Similar enhancement can also be obtained aligning larger nanowires and even by obtaining hierarchical nanostructures of much smaller aspect ratio. Another reason for the large interest in the nanostructures of semiconducting materials is due to their luminescence properties. Cathodoluminescence is the phenomena of light emission upon electron bombardment. I will present some of the recent findings on the cathodoluminescence properties of the individual and the ensembles of these nanostructures.