Preface

Scope

Studies on new physical properties and applications of nanomaterials and nanostructures are possible only when nanocrystalline materials are made available with desired size, morphology, crystal and microstructure and chemical composition. Nanocrystalline materials exhibit physical and chemical properties different from either the individual molecules or the extended solid. This class of materials is attracting considerable attention during the past two decades. Nanocrystalline materials are novel materials, which are not only scientifically interesting but also have great potential for various applications. It is realized that a sound knowledge on nanostructured materials regarding the structural, optical, and other properties is essentially required to meet the demands of production of various devices with the necessary reproducibility and stability of their characteristics. To understand the basic physics involved in the phenomenon, it is necessary to have more number of experimental data for the quantitative assessment of different physical parameters.

Presentation

Nanostructured materials are those with at least one dimension falling in nanometer scale, and include nanoparticles, nanorods and nanowires and also have thin films, and bulk materials made of building blocks in the nanoscale regime. The study of nanocrystalline materials has made tremendous advances over the past few years. Many
workers have explored different synthesis process and growth of nanocrystalline PbS films at different ambient conditions, using and altering the deposition parameters. Proper optimization of growth conditions and parameters is utmost necessary for production of good quality films for various applications. Keeping in view of these aspects an experimental study on synthesis and characterization of nanocrystalline PbS by chemical bath deposition (CBD) technique was undertaken. In the present study attempts are made to make correlation between the structural and other properties of the nanocrystalline PbS on the deposition parameters. It is expected that such study will add new knowledge to the existing database and facilitate deposition of desired nanocrystalline PbS films by optimizing the different conditions. The key results presented in this thesis are divided into six chapters. Chapter I contain various information regarding synthesis and characterization of nanomaterials, previous works on nanocrystalline IV-VI semiconductor, particularly PbS, thin films. Experimental details of preparation and characterization of nanocrystalline PbS by CBD technique and also the experimental details of swift heavy ion (SHI) irradiation have been discussed in Chapter II. Structural analysis and optical properties of nanocrystalline PbS are given in Chapter III and IV respectively. Effect of SHI irradiation on nanocrystalline PbS is given in Chapter V. The Chapter VI concludes with a comparison of properties of nanocrystalline PbS and PbS
films of larger crystallite sizes. Related references of books and research papers are included at the end of each chapter. The list of publications on our works is given at the end.

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