SELECTED TOPICS IN ADVANCED ELECTRONICS

Edited by

Khalid A. S. Al-Khateeb

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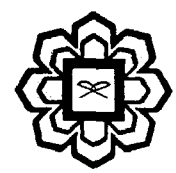

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CHAPTER 18

EPITAXIAL GROWTH OF THIN ZnS FILMS

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Synopsis

Zinc Sulphide (ZnS) is a group II-VI material, which is a versatile material with many interesting properties. In some respects it can be considered as a wide band-gap semiconductor of 3.6eV. As a crystalline material it exists in the cubic sphalerite diamond cubic structure or as a hexagonal wurtzite structure. Both structures exhibit electro optic properties, which can be utilized as light modulators in optical communications and display systems. There are three basic methods for the epitaxial deposition of ZnS films viz. thermal sublimation in ultrahigh vacuum (molecular beam epitaxy), vapour phase epitaxy and RF sputtering. Each of the methods is suitable for a certain application depending on the requirements. The ultimate aim is to produce films with good optical, structural, and electrical properties. The dimensions of the produced specimens are also important to warrant large scale production that facilitates its use for device fabrication.

1 Introduction

Zinc sulfide (ZnS) is an important functional material for electronics and optoelectronics. It has a wide band gap of 3.8 eV at room temperature. It is a key material for ultraviolet light emitting diodes, injection lasers, cathode ray tubes, flat panel displays, and IR windows [1].

Zinc Sulphide crystals exist in nature as a zinc blend mineral, which have black luster due to the presence of iron, popularly known as Black Jack. Occasionally, it founds it is found in some mine as a pure transparent crystals. It can also be grown artificially as thin films deposited on semiconductor substrates. As an amorphous powder, Zinc Sulphide was one of the first materials that were used in visual cathode ray tube displays due to the nature of the standard green colour of its cathodoluminescent light emission. This wavelength corresponds to the highest sensitivity of the human eye. It