PHOTOLUMINESCENCE STUDY OF ZINC OXIDE (ZnO) NANOSTRUCTURED BY SOL-GEL IMMERSED METHOD

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TABLE OF CONTENTS

ABSTRACT

Nanostructured Zinc oxide (ZnO) were grown on silicon (Si) substrates through sol-gel immersed method and spin-coating technique with presence of gold as catalyst. ZnO then were annealed at temperature of 400°C, 500°C and 600°C and it found that annealing temperature had improved the crystalline structure of ZnO. The ZnO nanostructures were characterized using photoluminescence (PL) spectrofluorometer and X-ray diffraction (XRD) for morphology and optical properties study.

Keyword: Zinc Oxide (ZnO) nanostructure, room temperature, Photoluminescence (PL), X-ray Diffraction (XRD), Sol-Gel Immersed Method

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

Zinc oxide is a unique material that exhibits semiconducting and piezoelectric dual properties. [1] ZnO has a long history of usage for pigments and protective coatings on metals. The electrical, optoelectronic [1] and photochemical properties of undoped ZnO has resulted in use for solar cells, transparent electrodes and blue/UV light emitting devices. [2]

Compared with other semiconductor materials, Zinc oxide (ZnO) has a wide band gap II–VI semiconductor ($E_g \sim 3.37$ eV) and has been extensively investigated as an ideal candidate for optoelectronic devices such as light-emitting diodes and lasers. Especially, its large exciton binding energy (~ 60 meV) allows efficient excitonic emission even at room temperature, thus brings promise for low-threshold and high-efficiency photonic devices.[3] It also finds applications ranging from transparent electrodes in solar cells [3], gas sensors [3][4], varistors [4], spintronic devices , to surface acoustic wave devices .[4] ZnO also has more resistant to radiation, and is multifunctional with uses in the areas as a piezoelectric, ferroelectric and ferromagnetic. ZnO-based semiconductor and nanowire devices are also promising for the integration on a single chip. So far, the various