# ELECTRICAL PROPERTIES OF LEAD TITANATE THIN FILM PREPARED BY SOL-GEL METHOD USING SPIN COATING TECHNIQUE

AZIZAH BT AMI

FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
MALAYSIA

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**ABSTRACT**

Lead titanate $PbTiO_3$ thin films were prepared by sol gel deposition method using spin coating technique. The surface morphologies were investigated using Scanning Electron Microscope (SEM). The microstructure's uniformity decreased as the spinning time and speed increased.The resistivity and conductivity were obtained by referring the voltage-current (I-V) measurement. The resistivity was in the range of $10^{6\ to}\ 10^{9}\ \Omega$.m and the conductivity ranged from $10^{-7}$ to $10^{-8}\ Sm^{-1}$. The dielectric obtained from the was less than 50 for frequency less than 100 kHz

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# CHAPTER 1

# INTRODUCTION

## 1.0 Introduction

Lead titanate $PbTiO_3$ which exhibits perovskite structure belongs to the most important piezoelectric and ferroelectric families [1]. It has many important technological applications because of its interesting dielectric, pyroelectric and piezoelectric properties [2]. Such applications are capacitors, non-volatile memory, piezoelectrics for ultrasound imaging and actuators, electro-optic materials for data storage applications, thermistors, switches known as transchargers or transpolarizers, oscillators and filters and also light deflectors, modulators and displays [3].

There are many types of deposition method that can be used such as sol-gel process, pulse laser deposition (PLD), chemical vapor deposition (CVD), and magnetron sputtering and jet print deposition to fabricate PT thin film. Compared to the other deposition technique, sol-gel method has received the considerable attention. This is a relatively new method for the fabrication of ferroelectric thin films. It shows positive sign towards meeting the stringent quality requirements for device applications. In the sol-gel process, a non-aqueous solution of metal-organic (alkoxide) precursors is prepared with the cations in the desired stoichiometry, and controllably hydrolyzed with a solvent/water solution. A thin adherent film of the hydrolyzed alkoxide solution (or "sol") is applied to a substrate by either dip-coating or spin-coating. The dried "gel" film is then subjected to a heat treatment process [4]. Advantages of the sol-gel process for thin films include excellent homogeneity due to atomic-scale mixing of the alkoxide solution prior to hydrolysis. It also has excellent control of composition and ease of compositional variations. Furthermore the films can be fabricated at relatively low temperatures