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**THE ELECTRICAL PROPERTIES OF ZINC OXIDE-GRAPHENE THIN  
FILM IN PHASE CHANGE MEMORY**

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## **ABSTRACT**

ZnO and Graphene, both have high thermal conductivity which are suitable to become a heater layer in Phase Change Memory. The function of the heater layer is to heat the phase change material little by little. This experiment investigates the electrical properties of ZnO-Graphene thin film that has been deposited on substrate by using spin coating technique. The samples were annealed at different temperature. The surface morphology, electrical properties and thickness of the ZnO-Graphene thin film was characterized by using Field Emission Scanning Electron Microscope (FESEM), I-V measurement and Surface Profiler. The thickness of the thin film decrease as the temperature increase. The I-V measurement results shows that the current flow on the sample that was annealed at 250°C is the highest compared to the samples that were annealed at 100°C, 150°C and 250°C.

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## CHAPTER 1

### INTRODUCTION

#### 1.1 BACKGROUND OF STUDY

Novel information storage develop continuously from compact disk to flash memory and the latest one, phase change memory. Phase change memory is a nonvolatile memory. It store data in crystalline and amorphous phases that can reversibly change by applying an external voltage. In phase change memory, there is phase change material. Phase change material is chalcogenides which has power optical and electrical contrast, rapid crystallization and high crystallization temperature. Information is kept in phase change material and read by measuring the resistance of Phase Change Memory cell. Amorphous phase change to crystalline phase is called as 'set' state while crystalline phase change to amorphous phase is called 'reset' state(Raoux, Xiong, Wuttig, & Pop, 2014).

Zinc Oxide (ZnO) is a inorganic powder that is not soluble in water(Documentation, 2010). Zinc oxide has been applied in many fields like medical, manufacturing, sensor, solar cells, cosmetics and others. Zinc Oxide is a semiconductor material from group II-VI(Kolodziejczak-Radzimska & Jesionowski, 2014). It is very suitable to become a heater layer because it has high band gap energy, high conductivity and high boiling point(Covered, Oxide, Information, & Applications, 2011).

Graphene is from carbon's group. It is two dimensional lattices. Its shapes is hexagonal. It has been discovered on 2004 by two physicists, Andre Geim and Konstantin Novoselov from University of Manchester. Graphene is the thinnest material. It is also the