

**UNIVERSITI TEKNOLOGI MARA**

**HEAT DISTRIBUTION SIMULATION OF  
A PHASE CHANGE MEMORY WITH  
SEPARATED HEATER  
STRUCTURE**

**MOHD SHARIMAN BIN A. AZIZ**

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## ABSTRACT

Phase change memory (PCM) is a type of the non-volatile memory. A PCM structure with the heater layer was more efficient in heating up the PCM material. Typically, the heater needs to maintain in a fairly high temperature because enough power were enquired in ensuring the melting temperature to be reached. Therefore, the Silicon Carbide (SiC) was proposed as the heater layer. SiC's advantages was low thermal expansion, high thermal conductivity, excellent thermal shock resistance and wide band gap material. The objective of this study were to determine the optimum temperature for the changes in the memory layer using SiC as the heater layer by simulation method, to investigate the ability of SiC as a heater layer in separate-heater PCM structure to change the phase change material properties from amorphous to crystalline state by simulation method and to determine the power consumption for the phase change memory (PCM) and investigated multilevel storage of the phase change memory (PCM) by calculating the resistance changes of the memory layer. The PCM with a separated hater structure was design by using COMSOL Mutiphysic Software to control the power and to achieve multilevel storage. Joule heating elements in COMSOL Mutiphysic Software were applied. Simulation with different structure, properties, thickness, channel and the different heater material of SiC were done in this study. Finding from this study, SiC were most suitable material for heater layer compared with other material (CNT and TiSi3) . The optimum temperature of this design was 450K and the power consumption was 0.9V with 100ns pulse width.

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