DESIGNING, FABRICATING AND CHARACTERIZING A MICROFLUIDIC CAPACITOR

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APPROVAL AND DECLARATION SHEET

This project report titled Designing, Fabricating and Characterizing A Microfluidic Capacitor was prepared and submitted by Raymond Anthony A/L Anthonysamy (Matrix Number: 031010426) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Microelectronic Engineering) in Universiti Malaysia Perlis (UniMAP).

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Abstrak

Hari ini, melambangkan suatu anjakan teknologi baru, yakni Microelctromechanical Systems atau MEMS. Teknologi ini telah menjadi suatu titik permulaan bagi pelbagai bidang. Peranti cecair mikro merupakan salah satu daripada pencapaian bidan ini dan terbukti keberkesanannya berbanding dengan peranti makro. Saiznya yang kecil, keperluan sampel yang kecil, kos fabrikasi yang murah serta kebolehanya untuk menjalankan pelbagai fungsi menyumbang kepada permintaan yang tinggi.

Keperluan ini telah mencetuskan kelahiran kapasitor cecair mikro. Projek ini merangkumi tiga aspek yakni, merekabentuk, fabrikasi dan menganalisis sifat-sifat electrikal kapasitor cecair mikro. Lapisan penebat dalam kapasitor konvensional digantikan dengan cecair. Konduktor yang digunakan merupakan elektrod sesikat. Peranti ini difarbrikasi menggunakan teknik fabrikasi CMOS.

Applikasi peranti ini termasuklah printer ink-jet, penganalisis darah, cip DNA dan proteomic, system makmal di atas cip dan system analisis mikro.

Abstract

Today, being the dawn of a new technology wave, Micro electromechanical Systems or MEMS have promised a new beginning to a wide spectrum of fields. Microfluidics marked another milestone in this area as highly effective devices with their many advantages over macro devices. Its compact size, smaller volumes of samples and cheaper fabrication cost, low power consumption, multifunctionality and parallelism of analysis have contributed to the increased need for such devices.

This sparked the birth of Microfluidic capacitor. This project, integrates three areas; designing, fabricating and electrically characterizing a Microfluidic capacitor. The main insulator channel is replaced with a liquid instead of the usual solid state material. The conductive material will be interdigitated electrodes of aluminium origin. The device is fabricated using standard semiconductor processing techniques. Since the insulator is substituted with fluid, thus the name Microfluidic capacitor.

The application of this device would be in portable blood analyzers, DNA and proteomic chips, lab-on-a-chip system, micro total analysis system, DNA sequencing, smart sensors in food packaging and other newer applications.

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LIST OF SYMBOLS

mm	milimeters
µm	micrometers
nl	nanoliters
pl	picolitres
Ǻ	angstrom
Rpm	revolutions per minute
^{o}C	degrees Celsius
Ω/cm	Ohm per centimetres
sccm	Standard Cubic Centimetres per Minute
Si	Silicon