Title (Calibri 12pt): A rapid and simple lab on a chip system based on single-channel bisulfite conversion for DNA methylation analysis

Authors (Calibri 11pt): Jaeyun Yoon[1,2], Mi Kyoung Park[1], Tae Yoon Lee[1], Yong-Jin Yoon[2],*, Yong Shin[1],*

Author Affiliations (Calibri 10pt):
[1]Institute of Microelectronics, A*STAR (Agency for Science, Technology and Research), 11 Science Park Road, Singapore Science Park II, Singapore117685
[2]School of Mechanical & Aerospace Engineering, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639789

Abstract (Calibri 10pt): Miniaturized Lab on a Chip (LOC) systems have been developed for genetic and epigenetic analyses in clinical applications because of advantages such as reduced sample size and reagent consumption, rapid processing speed, simplicity, and enhanced sensitivity. Despite tremendous efforts made towards developing LOC systems for use in the clinical setting, the development of LOC systems to analyze DNA methylation, which is an emerging epigenetic marker causing the abnormal silencing of genes including tumor suppressor genes, is still challenging because of the gold standard methods involving a bisulfite conversion step. Existing bisulfite-conversion based techniques are not suitable for clinical use due to their long processing-time, labor-intensiveness, and the purification steps involved. Here, we present a Lab-on-a-Chip system for DNA Methylation Analysis based on Bisulfite conversion (LoMA-B), which couples a sample pre-processing module for on-chip bisulfite conversion and a label-free, real-time detection module for rapid analysis of DNA methylation status using an isothermal DNA amplification /detection technique. The methylation status of the *RAR*β gene in human genomic DNA extracted from MCF-7 cells was rapidly analyzed by the LoMA-B system within 80 min compared to conventional MS-PCR (3 to 24 h). Furthermore, the LoMA-B system is highly sensitive and can detect as little as 1% methylated DNA in a methylated/ unmethylated cell mixture. Therefore, the LoMA-B system is an efficient diagnostic tool for the simple, fast, and quantitative evaluation of DNA methylation patterns for clinical applications.

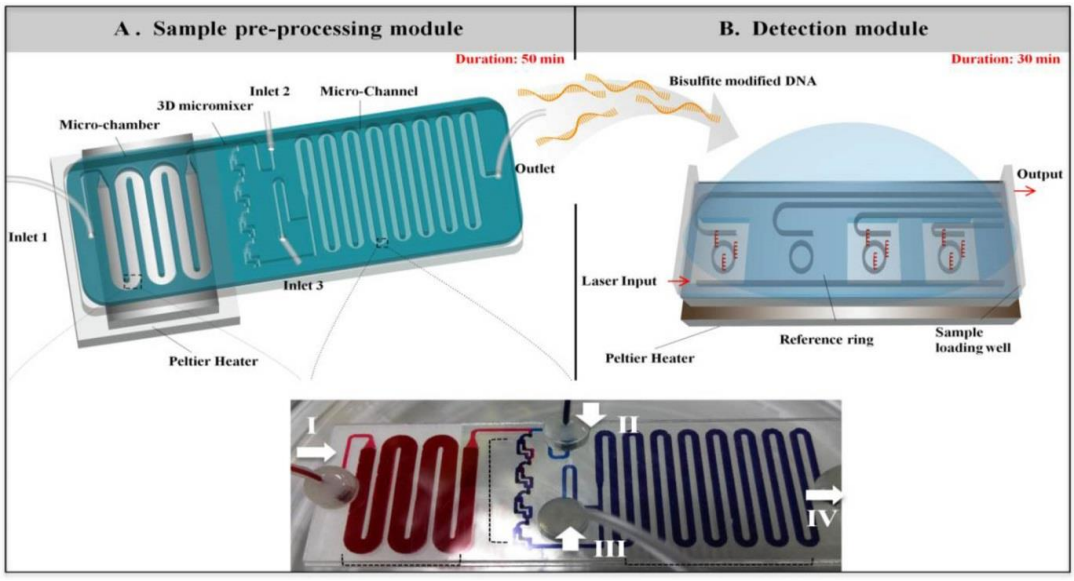

Figure Caption (Calibri 10pt): Figure 1. OOOOO