

Nanoelectromechanical chip (NELMEC), an electromicrofluidic chip to diagnose epithelial and mesenchymal breast circulating tumor cells from leukocytes based on Silicon nanograss electrodes

Mohammad Abdolahad
University of Tehran, Iran


An integrated nano-electromechanical chip (NELMEC) has been developed for label free diagnosis of both epithelial and mesenchymal circulating tumor cells (ECTCs and MCTCs respectively) from white blood cells. This nanoelectrically activated microfluidic chip fabricated by silicon micromachining can trap large single cells (>12 μ m) at the opening of analysis microchannel arrays. The nature of captured cells would be detected by assistance of silicon nano grass (SiNG) electrodes patterned at the entrance of the channels. Observable difference between the membrane capacitance of ECTCs and MCTCs from WBCs (measured by SiNG electrodes) is the key indication in our diagnosis approach. NELMEC Chip not only solves the problem of size overlapping between CTCs and WBCs but also detects MCTCs without any markers and tagging processes as an important problem in previously reported CTC detection systems. Great

conductivity of gold coated SiNG nanocontacts as well as their safe penetration into the membrane of captured cells facilitates precise and direct signal extraction to distinguish the type of captured cells. The results achieved from epithelial (MCF-7) and mesenchymal (MDA-MB231) breast cancer cells circulated in unprocessed blood suggested the significant diagnostic ability of NELEMC.

Speaker Biography

Mohammad Abdolahad has received his PhD in Nanoelectronic Engineering from University of Tehran in 2013 and immediately joined to the university as Faculty Member in school of electrical and computer engineering. During recent four years, he published more than 25 papers and nine USA patents in the field of cancer detection by nanoelectronic devices. He introduced CNT-ECIS, SiNW-ECIS and NELMEC as new miniaturized systems for cancer diagnosis. He is now the Coordinator of nanobioelectronic devices lab in UT and Adjoint Professor of Theran University of Medical Sciences.

e: m.abdolahad@ut.ac.ir

 Notes: