

Nano-Technologies for Bio-Chemical Sensing

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Abstract:

Nanotechnologies along with standard silicon micro-fabrication technologies have enabled novel nano-dimensional materials, structures and eventually devices which find numerous applications in the field of medical diagnostics, drug delivery, electronics, energy production, detecting food adulterants, water pollutants, etc. With the increasing awareness, healthcare is particularly in focus that includes early diagnosis, drugs discovery, point-of-care solutions, etc. For these bio-medical applications, specific and sensitive detection of various biological and chemical species becomes crucial.

Among the various nano-materials realized, CNT, Nano-Gap and Nanowire based bio-chemical sensors are most exploited for the purpose. Nano-Gap sensors works on two principles; either on the 'change of the conductivity' of the sensing layers between the nano-electrodes when exposed to analytes or based on 'Electro-magnetic enhancement' using micro Raman spectroscopy. Nanowire sensors work on the principle of 'Field Effect Transistor' (FET) where charges associated with the chemical molecule or the biological specie is attached on the nanowire surface and acts as chemical or bio-gate; the devices are hence termed as CHEM-FET or BIO-FET. MEMS based gas sensors as breathe analyzer are also being explored for various diagnostic applications.

The process technologies used to realize such devices and their applications will be discussed.

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