Department of Chemical and Environmental Engineering

UC RIVERSIDE UNIVERSITY OF CALIFORNIA | Bourns College of Engineering

# CEE Seminar Series

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**JUELICH, GERMANY**


FRI **FEB 22, 2013**

**9:30 - 10:30** AM

**BOURNS** A265

## SILICON-BASED BIO-/CHEMICAL SENSING @INB, FH AACHEN

Silicon-based field-effect sensors are currently being the basic structural element in a new generation of bio-/chemical microsensors. They provide several advantages: small size/weight, fast response time, possibility of on-chip integration of arrays, high robustness, low-cost fabrication. Their application fields reach from medicine, process control, biotechnology, environmental monitoring, food and drug industries up to defence and security requirements. Among the multitude of concepts, bioelectronics devices as well as functional hybrid nano-biosystems based on nano-structured surfaces or interfaces are two promising strategies to increase the sensitivity and selectivity of biological systems connected to semiconductor circuitries. This talk is mainly focusing on recent developments in our lab creating "nano-inspired" surfaces yielding a new class of field-effect based functional hybrid nano-biosystems with molecular-scale proximity between the recognition and transduction element:

- Nano-crystalline diamond has been recognized as a promising alternative transducer material for bio-/chemical sensing. It is especially attractive due to its outstanding electrochemical properties, superior chemical inertness and biocompatibility.
- Since the introduction into the "sensor arena" in 90's, functionalized Au nanoparticles and carbon nano-tubes have been increasingly used to enhance electrochemical and photometric sensor applications. Different key experiments in order to exemplify their use with functionalized hybrid field-effect nano-biosystems will be presented.
- Coupling of bio-computing systems with electronic chips is highly promising because of the complexity of biological materials and their unique properties of selectivity of bio-catalyzed reactions and specificity of bio-recognition processes; logic gates defined by enzyme-catalyzed reactions can serve as starting point for complex biocomputing networks.

Additionally, experiments taking advantage of thin-film calorimetric gas sensors for the quantitative determination of hydrogen peroxide gas concentrations in aseptic food processing will be discussed.