Kemijski inštitut
Ljubljana
Slovenija

National
Institute of Chemistry
Slovenia

# Vljudno vabljeni

na svečano podelitev naziva častni član Kemijskega inštituta

**prof. dr. Josephu Wangu,**

ki bo imel ob tej priložnosti inštitutsko predavanje z naslovom:

## Nanomaterials for Monitoring and Controlling Biomolecular Interactions

v petek, 15. junija 2007 ob 13.00 uri v

Veliki predavalnici Kemijskega inštituta,

Hajdrihova 19, Ljubljana.

V želji, da se na dogodku srečamo, vas lepo pozdravljamo!

Doc. dr. Peter Venturini

Direktor



# Nanomaterials for Monitoring and Controlling Biomolecular Interactions

Joseph Wang is the Director of the Center for Bioelectronics and Biosensors (Biodesign Institute), and a Full Professor Chemical Engineering, and Chemistry and Biochemistry at Arizona State University (ASU) since 2004. He also serves as the Chief Editor of 'Electroanalysis' since 1988. He obtained his higher education at the Israel Institute of Technology and being awarded his D. Sc. in 1978. From 1978 to 1980 he served as a research associate at the University of Wisconsin (Madison) and joined New Mexico State University (NMSU) at 1980. From 2001-2004, he held a Regents Professorship and a Manasse Chair positions at NMSU.

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The unique properties of nanoscale material (nanoparticles, nanowires and nanotubes) offer excellent prospects for the monitoring and controlling biomolecular interactions. This presentation will describe new multi-amplification/multi-tag particle-based bioelectronic assays based on different biomaterial-nanoparticle assemblies. We will also describe novel nanowire-based strategies for controlling and tuning on-demand bioelectrocatalytic reactions (Figure).

Combining the catalytic enlargement of the metal-particle tags with the effective 'built-in' amplification of electrochemical stripping analysis, paved the way to highly sensitive bioassays with remarkably low (fmol) detection limits. New amplification platforms for carrying numerous redox tags, including carbon nanotubes and polystyrene beads, will be discussed in connection to ultrasensitive detection of proteins and nucleic acids. Such nanomaterial 'carriers' maximize the number of tags captured per binding event. The high sensitivity of the new protocols was combined with an efficient magnetic separation. The use of nanowires as tracers and barcodes will also be discussed. The use of magnetic beads has been extremely useful for discriminating against unwanted constituents, including a large excess of co-existing mismatched and non-complementary oligomers, chromosomal DNA, RNA and proteins. TEM imaging has indicated that the DNA hybrid links the metal nanoparticles to the magnetic beads. A new electrochemical coding bioassay, based on different inorganic-colloid (quantum dots) nanocrystal tracers, whose metal components yield well-resolved highly sensitive stripping voltammetric signals for the corresponding proteins, DNA and glycans targets, will be described. The use of aptamers for nanoparticle-based detection of multiple proteins will also be discussed. Finally, new adaptive nanowires capable of providing an on-demand control of various sensing and detection operations will be illustrated. The new nanowire-based mediated activation of bioelectrocatalytic reactions offers great promise for regulating the operation of biofuel cells, bioreactors, and biosensing devices in response to specific needs.

