OTHER-OPTICAL SYSTEMS / SERS & PLASMONICS

OS-25 **Determination of perfluorocarbon compounds in water using a mid-infrared attenuated total reflection sensor**
B. Pejcic[a], F. Rauh[a,b], M. Schwenk[a,b], M. Myers[a], L. Stalker[a], B. Mizaikoff[b]
[a]*CSIRO, Earth Science and Resource Engineering, Kensington, WA, Australia*
[b]*Institute of Analytical and Bioanalytical Chemistry, University of Ulm, Ulm, Germany*

OS-27 **Optical pH sensor based on poly(4-nitrophenol) modified sol-gel nanoparticles**
K. Balogh[a], L. Heilmann[b], A. Széchenyi[b], B. Kovacs[a]
[a]*Department of General and Physical Chemistry, University of Pécs, Pécs, Hungary*
[b]*Janos Szentagothai Research Centre, Pécs, Hungary*

OS-29 **New acridine-containing 1,2-dioxetanes as ultrasensitive labels in thermochemiluminescent bioanalysis**
M. Di Fusco[a], M. Guardigli[b], M. Mirasoli[b], D. Calabria[b], A. Quintavalla[b], M. Lombardo[b], C. Trombini[b], A. Roda[b]
[a]*Advanced Applications in Mechanical Engineering and Materials Technology Interdepartmental Center for Industrial Research, Alma Mater Studiorum, University of Bologna, Bologna, Italy*
[b]*Department of Chemistry "G. Ciamician", Alma Mater Studiorum, University of Bologna, Bologna, Italy*

OS-31 **Novel optical sensor systems at the fraunhofer EMFT**
J. Schmidt, B. Gruber, C. Goetz, J. Sporer, R.Freund, S. Holler, S. Trupp
Fraunhofer Institution for Modular Solid State Technologies EMFT, Workgroup Sensor Materials, Regensburg, Germany

SERS & PLASMONICS

SP-1 **Biosensor based on Fano resonance on an array of gold nanoparticles**
B. Spackova, H. Sípova, N. S. Lynn, P. Lebruskova, J. Homola
Institute of Photonics and Electronics, Academy of Science of CR, Prague, Czech Republic

SP-3 **Biosensing with SiO_2-covered SPR substrates in a commercial SPR-tool**
J. Ryken[a,b], J. Li[a,c], T. Steylaerts[a], R. Vos[a], J. Loo[a], K. Jans[a], W. Van Roy[a], T. Stakenborg[a], P. Van Dorpe[a,c], J. Lammertyn[b], L. Lagae[a,c]
[a]*IMEC, Leuven, Belgium*
[b]*Department of Biosystems (MeBioS), KU Leuven, Leuven, Belgium*
[c]*Department of Physics and Astronomy, KU Leuven, Leuven, Belgium*

SP-5 **Passive mixing structures for sensing performance enhancement of high-throughput sensors**
M. Bockova[a], N. S. Lynn Jr.[a], J. Martinez-Lopez[b], J. Homola[a]
[a]*Institute of Photonics and Electronics, Prague, Czech Republic*
[b]*Tecnológico de Monterrey, Monterrey, N.L., México*

SP-7 **Clinical study of cerebrospinal fluid of Alzheimer`s disease patients using an SPR biosensor**
K. Mrkvova[a], Z. Kristofikova[b], J. Ricny[b], D. Ripova[b], M. Vyhnalek[c], J. Hort[c], J. Laczo[c], J. Homola[a]
[a]*Institute of Photonics and Electronics AS CR, Prague, Czech Republic*
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[c]*Memory Disorders Clinic, Department of Neurology, Charles University in Prague, 2nd Faculty of Medicine and University Hospital Motol, Prague, Czech Republic*

SERS & PLASMONICS

SP-9 **Spatial resolution in prism-based SPRi: Toward individual living cells monitoring**
L. Laplatine[a], L. Leroy[a], R. Calemczuk[a], D. Baganizi[a,b], P. Marche[b], Y. Roupioz[a], T. Livache[a]
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[b]*Institut Albert Bonniot, INSERM - UJF U823, France*

SP-11 **SPR transducers with internal referencing**
S. Nizamov, V. Scherbahn, V. M. Mirsky
Faculty of Natural Sciences, Department of Biotechnology, Brandenburg University of Technology Cottbus-Senftenberg, Grossenhainer, Germany

SP-13 **Optical characterisation of nano-structured gold films to optimise the technology for biosensing applications**
A. Nabok[a], A. Tsargorodskay[a,b]
[a]*Sheffield Hallam University, Materials and Engineering Research Institute, UK*
[b]*The University of Sheffield, Department of Chemistry, UK*

SP-15 **SPR system for automatic detection of pathogens**
M. Trzaskowski, T. Ciach
Faculty of Chemical and Process Engineering, Warsaw University of Technology, Warszawa, Poland

SP-17 **Application of surface plasmon resonance technique ("SPR nanoscopy") for the specific detection of single biological nano-particles**
V. Shpacovitch[a], V. Temchura[b], P. Libuschewski[c], D. Siedhoff[c], F. Weichert[c], K. Überla[b], A. Zybin[a]
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[c]*Department of Computer Science VII, Technical University of Dortmund, Dortmund, Germany*

SP-19 **Plasmonic nanoparticles optimized for single molecule detection: SERS analysis of oligonucleotides/miRNA**
A. Virga[a], S. Ricciardi[a], A. Chiado[a], F. Frascella[a], P. Rivolo[a], C. Novara[a], A. Angelini[a], A. Lamberti[a], E. Descrovi[a], F. Geobaldo[a], F. Giorgis[a,b]
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[b]*Istituto Italiano di Tecnologia, Center for Space Human Robotics, Torino, Italy*

SP-21 **Nanoparticle detection and characterization using Surface Plasmon Polaritons**
A. Demetriadou, A. Kornyshev
Department of Chemistry, Imperial College London, London, UK

SP-23 **Facile and efficient synthesis of tunable plasmonic templates by electroless reduction of $AgNO_3$**
N. Pliatsikas[a], K. Vassilopoulos[b], G. Vourlias[a], M.A. Karakassides[a], P. Patsalas[a,b]
[a]*Aristotle University of Thessaloniki, Department of Physics, Thessaloniki, Greece*
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Interface Processes

Application of surface plasmon resonance technique ("SPR nanoscopy") for the specific detection of single biological nano-particles

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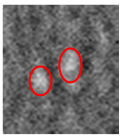
Introduction

SPR nanoscopy represents a novel **label-free** analytical method for the detection of **single** nano-objects. SPR nanoscopy allows to perform **specific** detection of biological nano-objects. SPR nanoscopy helps to visualize the binding of nano-objects in **real-time.** Moreover, this method is useful for determination of low concentrations of biological nano-particles in aqueous solutions.

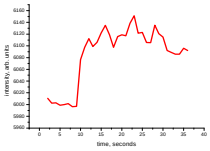
The method is based on the detection of single particles bound to the functionalized sensor surface. Functionalization could be performed different ways, for example, with target-specific antibodies.

SPR nanoscopy could be developed for a wide range of biomedical applications. Among them are: 1) detection the movement of nano-particles onto re-constructed bi-lipid membranes; 2) visualization the fusion of biological nano-particles with lipid membranes; etc.

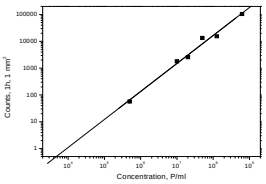
Analytical characteristics of SPR nanoscopy



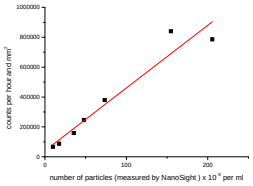
Binding image of HIV virus-like particles (HIV-VLPs)



Intensity step after particle binding



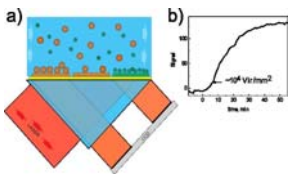
Measurements of particle concentration (200nm particles were used as a model)

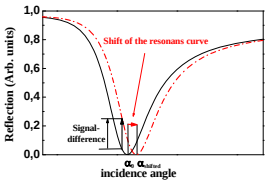


Dependency of counting rate from HIV-VLP concentration in probe

Detection of individual particles instead of particle layers

Classical SPR

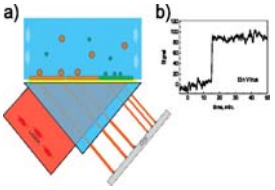


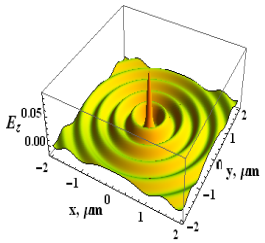


Classical SPR

The signal appears as a result of the shift of the resonance curve (after formation the layer of biomolecules onto sensor's surface)

SPR nanoscopy

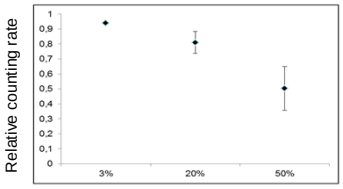




SPR nanoscopy

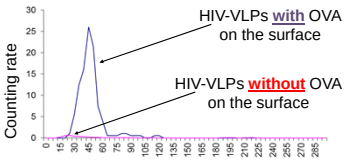
It is possible to visualize a signal because the appearance of concentric plasmon waves surrounding bound particle.

Results of current study



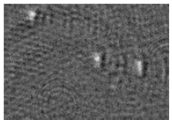
Concentration of serum (FCS) in buffer, in %

SPR nanoscopy is applicable for analysis of samples containing serum.

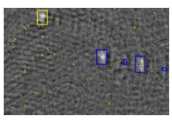


Intensity, arb. units

SPR nanoscopy specificaly detects the binding of bionano-particles to sensor's surface (antibody against ovalbumin (OVA) were used). HIV-VLPs means HIV virus-like particles.



Before analysis



Analysis the sequence of recorded images

SPR nanoscopy needs the development of new software for data analysis. Our colleagues from TU Dortmund already created a software, which successfuly analyzes images of 200nm particles.

Outlook

1) To develop an „array format" for simultaneous detection of different biological nano-objects.

2) To re-construct bi-lipid membrane onto sensor surface for further detection and visualization the movement and fusion of different biological nano-objects onto the sensor surface.

3) On-line monitoring of liquid media and air for the presence of target nano-particles in minor concentrations.

References

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A. Zybin, Y. A. Kuritsyn, E. L. Gurevich, V. V. Temchura, K. Überla, K. Niemax. Surface plasmon resonance for detection of dielectric nanoparticles and viruses. Plasmonics; 5, (**2010**) 31–35.