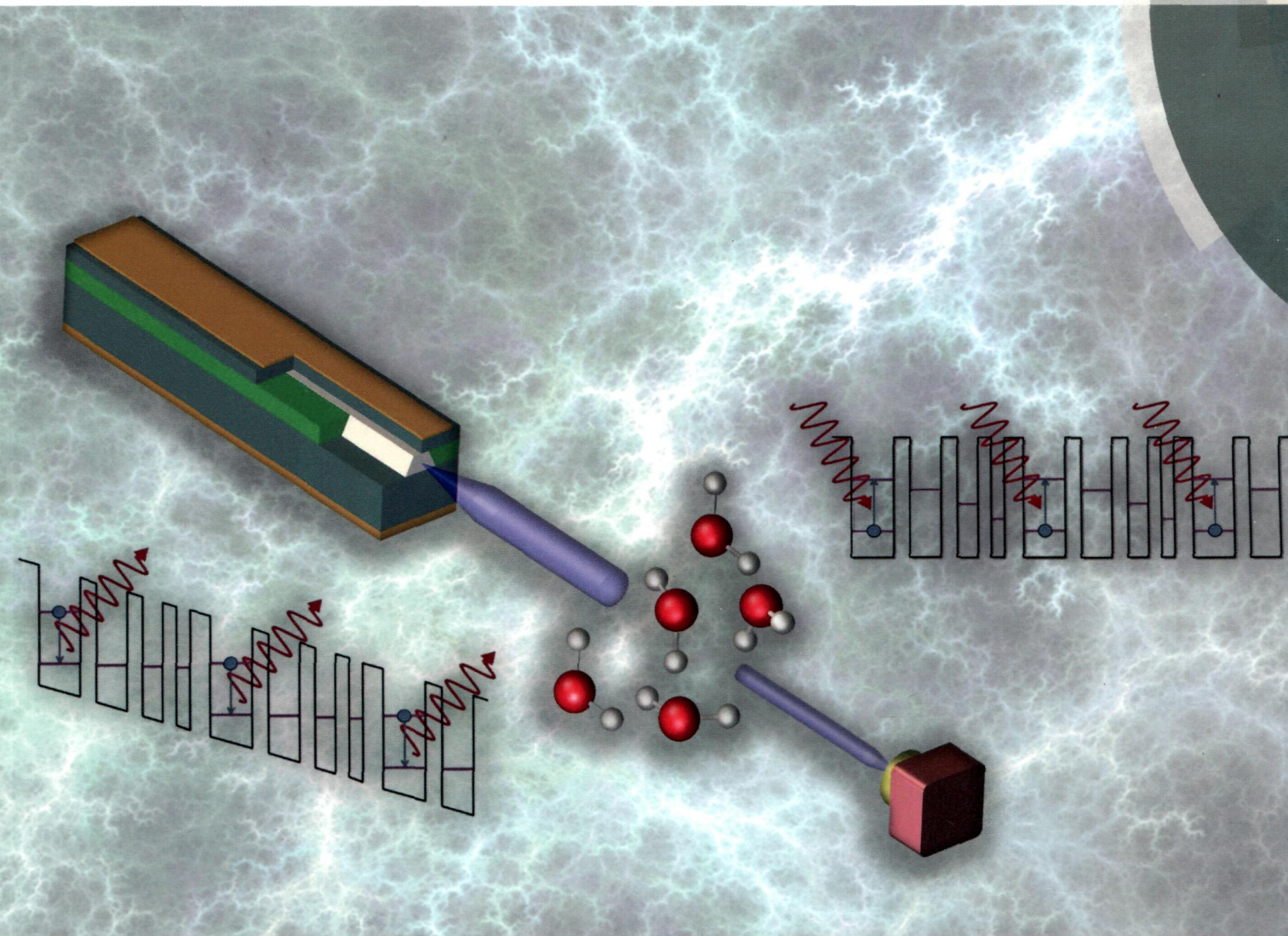


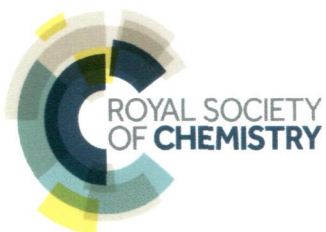
Analyst

www.rsc.org/analyst



Themed issue: Analysis in gases and liquids using quantum cascade lasers

ISSN 0003-2654



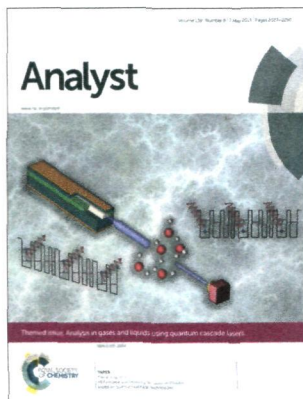
PAPER

Pierre Jouy *et al.*

Mid-infrared spectroscopy for gases and liquids based on quantum cascade technologies

IN THIS ISSUE

ISSN 0003-2654 CODEN ANALAO 139(9) 2029–2250 (2014)



Cover

See Pierre Jouy *et al.*, pp. 2039–2046. Image reproduced by permission of Pierre Jouy from *Analyst*, 2014, **139**, 2039.



Inside cover

See R. Kenneth Marcus *et al.*, pp. 2108–2113. Image reproduced by permission of R. Kenneth Marcus from *Analyst*, 2014, **139**, 2108.

THEMED ISSUE ARTICLES

EDITORIAL

2038

Editorial – analysis in gases and liquids using quantum cascade lasers

This Editorial introduces *Analyst's* themed collection on analysis in gases and liquids using quantum cascade lasers, guest edited by Boris Mizaikoff and Bernhard Lendl.



PAPERS

2039

Mid-infrared spectroscopy for gases and liquids based on quantum cascade technologies

Pierre Jouy,* Markus Mangold, Béla Tuzson, Lukas Emmenegger, Yu-Chi Chang, Lubos Hvozدارa, Hans Peter Herzig, Philip Wägli, Alexandra Homsy, Nico F. de Rooij, Alexander Wirthmueller, Daniel Hofstetter, Herbert Looser and Jérôme Faist

Compact QCL based sensors combining a cylindrical cell and a QCD for gases and a microfluidic system on a waveguide for liquids.

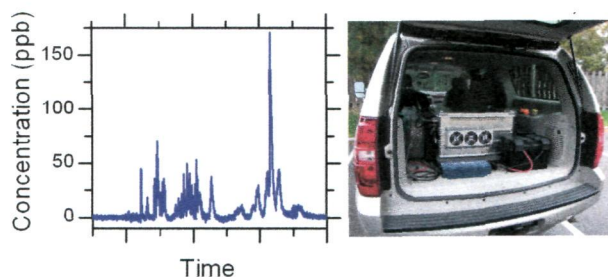


2047

Real-time trace gas sensing of fluorocarbons using a swept-wavelength external cavity quantum cascade laser

Mark C. Phillips,* Matthew S. Taubman, Bruce E. Bernacki, Bret D. Cannon, Robert D. Stahl, John T. Schiffern and Tanya L. Myers

Real-time sensing of fluorocarbons at low part-per-billion concentrations using an external cavity quantum cascade laser.

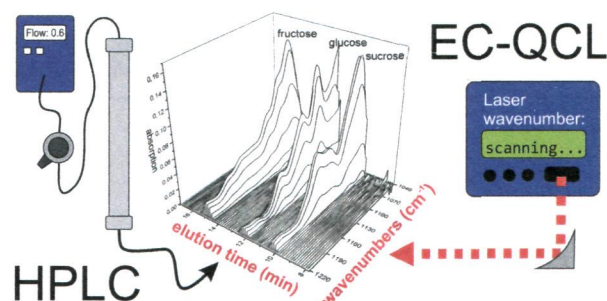


2057

High performance liquid chromatography with mid-infrared detection based on a broadly tunable quantum cascade laser

Timo F. Beskers, Markus Brandstetter, Julia Kuligowski, Guillermo Quintás, Manfred Wilhelm and Bernhard Lendl*

We present the first realization of spectroscopic HPLC detection based on an EC-QCL light source. Sugars and other contents of different beverages were determined as examples.

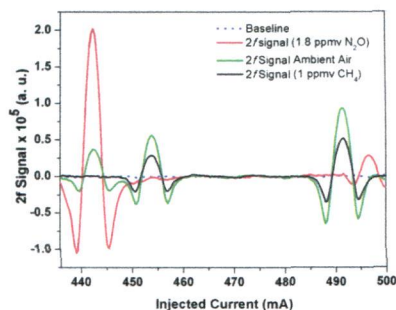


2065

A compact QCL based methane and nitrous oxide sensor for environmental and medical applications

Mohammad Jahjah, Wei Ren, Przemysław Stefański, Rafat Lewicki, Jiawei Zhang, Wenzhe Jiang, Jan Tarka and Frank K. Tittel*

A methane (CH_4) and nitrous oxide (N_2O) sensor based on a sensitive, selective and well established technique of quartz enhanced photoacoustic spectroscopy (QEPAS) was developed for environmental and biomedical measurements.

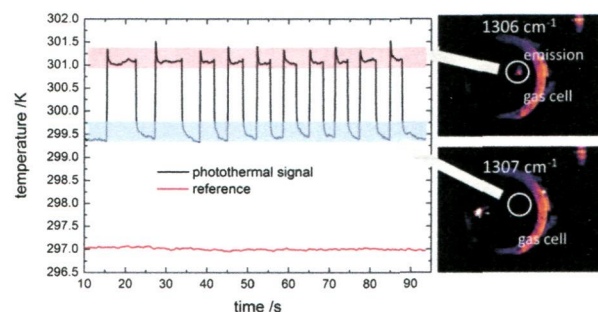


2070

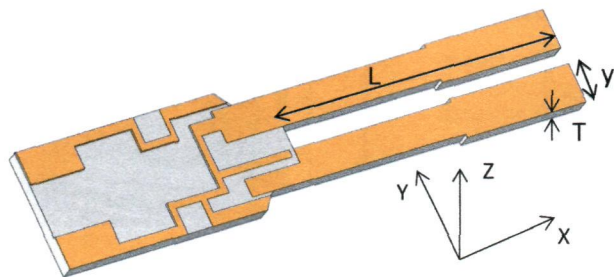
Broadband spectroscopy with external cavity quantum cascade lasers beyond conventional absorption measurements

Armin Lambrecht,* Marcel Pfeifer, Werner Konz, Johannes Herbst and Felix Axtmann

Powerful external cavity quantum cascade lasers enable unconventional broadband absorption measurements: fiber-ATR, vibrational dichroism, and photothermal emission spectroscopy.



2079



A quartz enhanced photo-acoustic gas sensor based on a custom tuning fork and a terahertz quantum cascade laser

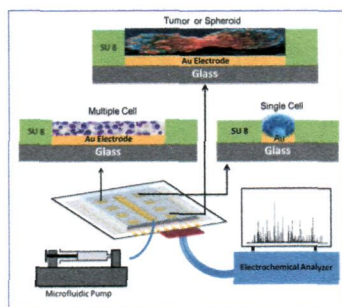
Pietro Patimisco, Simone Borri, Angelo Sampaolo, Harvey E. Beere, David A. Ritchie, Miriam S. Vitiello, Gaetano Scamarcio and Vincenzo Spagnolo*

An innovative quartz enhanced photoacoustic (QEPAS) gas sensing system operating in the THz spectral range and employing a custom quartz tuning fork (QTF) is described. The QTF dimensions are $3.3 \text{ cm} \times 0.4 \text{ cm} \times 0.8 \text{ cm}$, with the two prongs spaced by $\sim 800 \mu\text{m}$.

REGULAR RESEARCH ARTICLES

MINIREVIEWS

2088

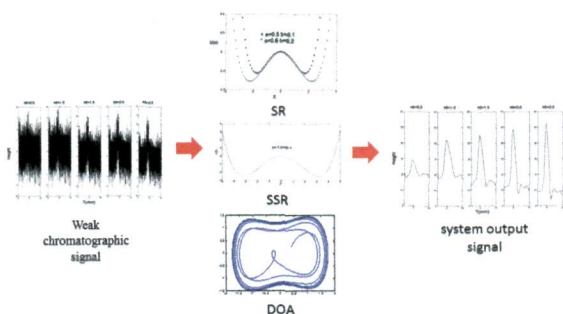


Chip based single cell analysis for nanotoxicity assessment

Pratikkumar Shah, Ajeet Kaushik, Xuena Zhu, Chengxiao Zhang and Chen-Zhong Li*

A microfluidic CoC system was developed for nanotoxicity assessment at single and multiple cell levels which can measure and compare the microscopic and macroscopic effects of nanoparticles interaction with cells, without interference from neighbor cells' cues and also overall integrative effects produced by nanoparticles and cell-cell communication.

2099



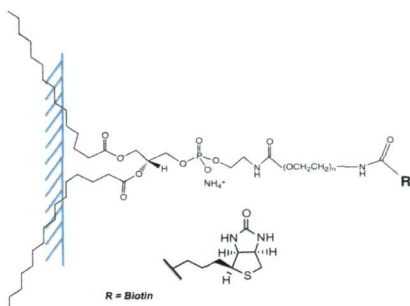
Improving the detection sensitivity of chromatography by stochastic resonance

Wei Zhang,* Jianru Guo, Bingren Xiang, Hongyan Fan and Fengguo Xu

This review aims to provide readers with an overview of various methodologies and approaches used to improve sensitivity through stochastic resonance (SR) methods, with special emphasis on applications to improve the detectability of analytes in chromatographic signals.

COMMUNICATIONS

2108



Head group-functionalized poly(ethyleneglycol)-lipid (PEG-lipid) surface modification for highly selective analyte extractions on capillary-channeled polymer (C-CP) fibers

Abby J. Schadock-Hewitt, Jennifer J. Pittman, Kenneth A. Christensen and R. Kenneth Marcus*

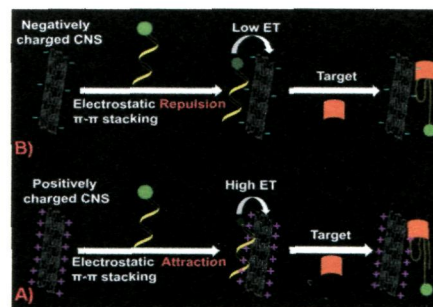
Polypropylene (PP) capillary-channeled polymer (C-CP) fibers were modified by adsorption of a head group-functionalized lipid to generate analyte-specific surfaces for application as a stationary phase in high performance liquid chromatography (HPLC) or solid phase extraction (SPE).

2114

Improving the fluorescence detection limit with positively charged carbon nanostructures as a low background signal platform

Xiulan He, Li Zhang, Hetong Qi, Ping Yu,* Junjie Fei* and Lanqun Mao*

We have demonstrated a new strategy to improve the fluorescence detection limit by enhancing the energy transfer efficiency between carbon structures and fluorescent dyes using polyimidazolium-functionalized carbon nanostructures as a low background signal platform.

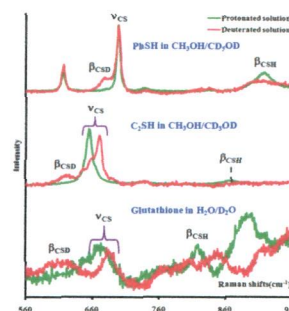


2118

Convenient detection of the thiol functional group using H/D isotope sensitive Raman spectroscopy

Sabyasachi Bandyopadhyay and Abhishek Dey*

Convenient detection of thiol groups using Raman spectroscopy.

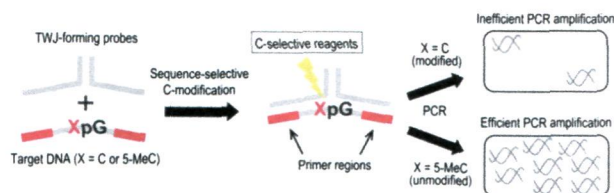


2122

Detection of single methylated cytosine using junction-forming DNA probes

Kenta Takanashi and Teru Kato*

Sequence-selective modification of a single cytosine using junction-forming DNA probes was applied for the quantitative-PCR-based detection of methylated cytosine.

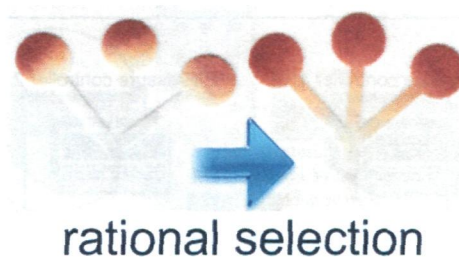


2127

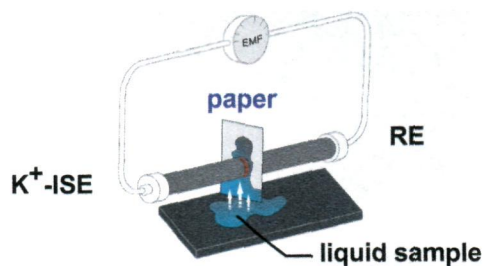
Rational selection of substrates to improve color intensity and uniformity on microfluidic paper-based analytical devices

Elizabeth Evans, Ellen Flávia Moreira Gabriel, Wendell Karlos Tomazelli Coltro and Carlos D. Garcia*

A systematic investigation was conducted to study the effect of paper type on the analytical performance of a series of microfluidic paper-based analytical devices (μ PADs) fabricated using a CO_2 laser engraver.



2133



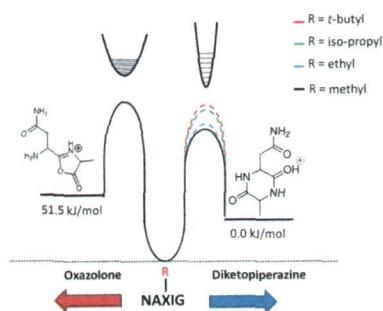
Potentiometric sensing utilizing paper-based microfluidic sampling

Jingwen Cui, Grzegorz Lisak, Sylwia Strzalkowska and Johan Bobacka*

This communication presents a new approach to potentiometric sensing utilizing paper-based microfluidic sampling and solid-contact electrodes.

PAPERS

2137

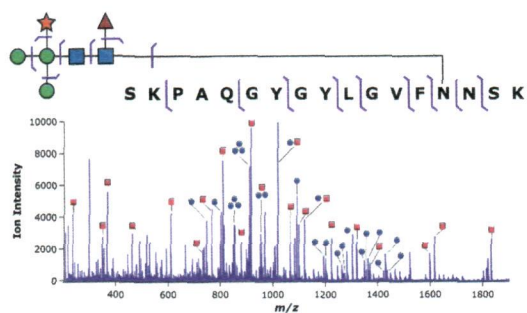


IR action spectroscopy shows competitive oxazolone and diketopiperazine formation in peptides depends on peptide length and identity of terminal residue in the departing fragment

L. J. Morrison, J. Chamot-Rooke and V. H. Wysocki*

Diketopiperazine formation in gas-phase peptides depends on the side-chain of the third residue.

2144

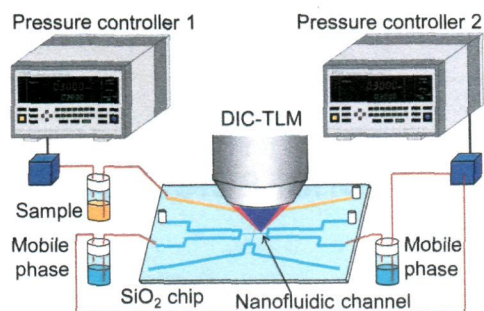


Energy-resolved collision-induced dissociation pathways of model N-linked glycopeptides: implications for capturing glycan connectivity and peptide sequence in a single experiment

Venkata Kolli and Eric D. Dodds*

A detailed understanding of energy-resolved vibrational activation/dissociation pathways enables extensive characterization of glycopeptide connectivity in a single experiment.

2154



Femtoliter-scale separation and sensitive detection of nonfluorescent samples in an extended-nano fluidic device

Hisashi Shimizu, Kazuma Mawatari and Takehiko Kitamori*

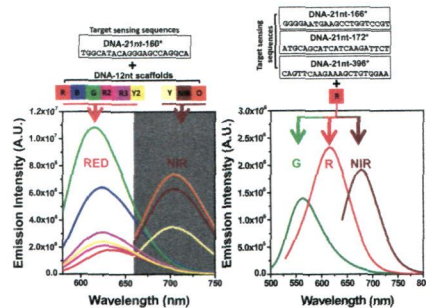
Liquid chromatography using a nanofluidic chip and DIC-TLM realized separation and detection of a 21 fL, 0.61 zmol nonfluorescent sample.

2158

In-solution multiplex miRNA detection using DNA-templated silver nanocluster probes

Pratik Shah, Peter Waaben Thulstrup, Seok Keun Cho, Yong-Joo Bhang, Jong Cheol Ahn, Suk Won Choi, Morten Jannik Bjerrum* and Seong Wook Yang*

Three DNA/AgNC probes with spectrally distinctive green, red and near-infrared emission are used to show a proof of concept for a rapid, single-step, and solution-phase multiplex miRNA detection method.

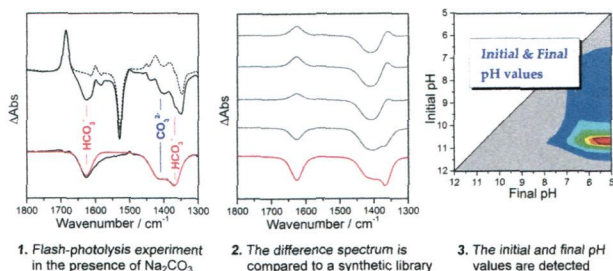


2167

The carbonate/bicarbonate system as a pH indicator for infrared spectroscopy

Maurizio Baldassarre and Andreas Barth*

Our three-step approach allows for immediate and accurate measurement of the initial and the final pH values in pH-jump experiments without the need for additional analyses.

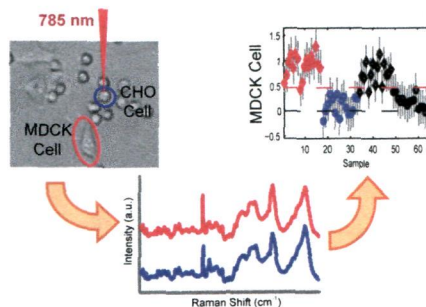


2177

Identifying the lineages of individual cells in cocultures by multivariate analysis of Raman spectra

Yelena Ilin and Mary L. Kraft*

Multivariate analysis of Raman spectra of individual fixed and living cells enables identification of cells in complex coculture environments.

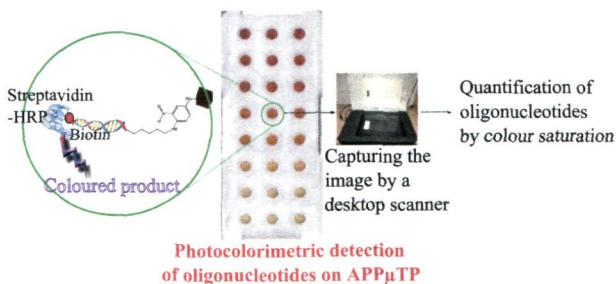


2186

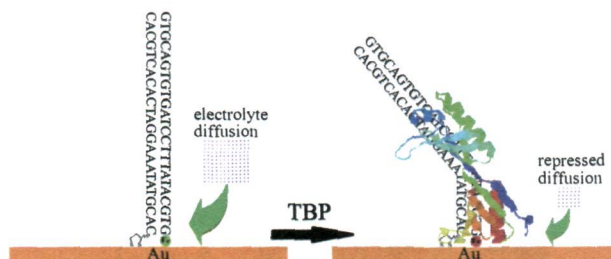
Image-based detection of oligonucleotides – a low cost alternative to spectrophotometric or fluorometric methods

Rajesh Ahirwar, Swati Tanwar, Shahila Parween, Ashok Kumar and Pradip Nahar*

We report the simple and low cost image-based quantitative detection of oligonucleotides without using a spectrophotometer or fluorometer.



2193

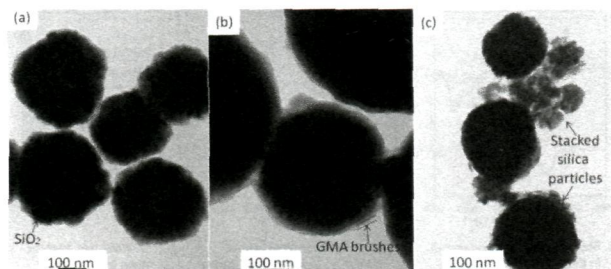


An electrochemical sensing platform based on local repression of electrolyte diffusion for single-step, reagentless, sensitive detection of a sequence-specific DNA-binding protein

Yun Zhang,* Fang Liu, Jinfang Nie,* Fuyang Jiang, Caibin Zhou, Jiani Yang, Jinlong Fan and Jianping Li

This paper describes for the first time an electrochemical biosensor, which employs a DNA probe modified with a redox tag close to electrode surface, for picomolar detection of a sequence-specific DNA-binding protein.

2199

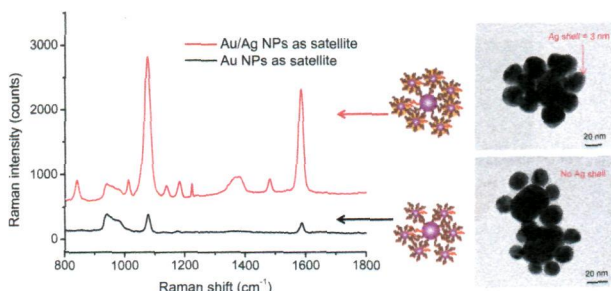


Preparation of hydrazine functionalized polymer brushes hybrid magnetic nanoparticles for highly specific enrichment of glycopeptides

Guang Huang, Zhen Sun, Hongqiang Qin, Liang Zhao, Zhichao Xiong, Xiaojun Peng, Junjie Ou* and Hanfa Zou*

Hydrazide chemistry is a powerful technique in glycopeptides enrichment.

2207

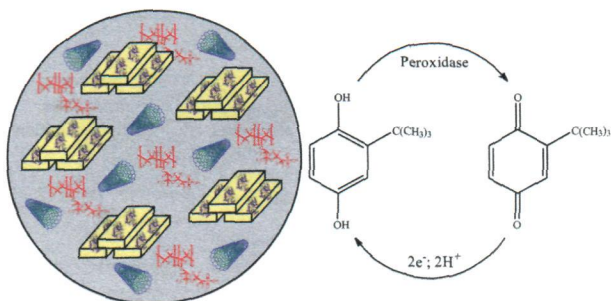


DNA-embedded Au–Ag core–shell nanoparticles assembled on silicon slides as a reliable SERS substrate

Zhong Zhang, Sha Zhang and Mengshi Lin*

The ssDNA embedded Au–Ag core–shell NPs were assembled on a silicon surface to form a SERS active core–satellite structure. The Raman intensity of the assembly using DNA embedded Au–Ag core–shell NPs is 8–10 times higher than that of the assembly using Au NPs as satellites.

2214



Enzymatic biosensors based on ingá-cipó peroxidase immobilised on sepiolite for TBHQ quantification

Tássia Regina de Oliveira, Gregory Ferreira Grawe, Sally Katiuce Moccelini,* Ailton J. Terezo and Marilza Castilho

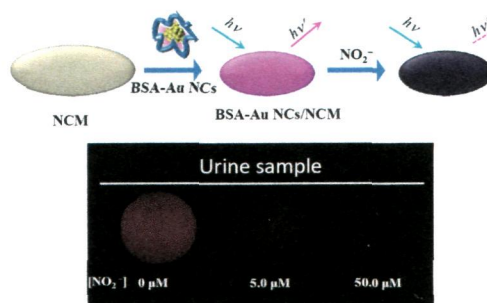
A biosensor for *tert*-butylhydroquinone in salad dressing samples was developed by modifying a carbon paste with carbon nanotubes and nafion together with ingá-cipó peroxidase immobilised on sepiolite.

2221

Nitrite ion-induced fluorescence quenching of luminescent BSA-Au₂₅ nanoclusters: mechanism and application

Binesh Unnikrishnan, Shih-Chun Wei, Wei-Jane Chiu, Jinshun Cang, Pang-Hung Hsu* and Chih-Ching Huang*

A BSA-Au NC (bovine serum albumin stabilized gold nanocluster)-modified nitrocellulose membrane (BSA-Au NC/NCM) has been fabricated for detection of nitrite in urine.

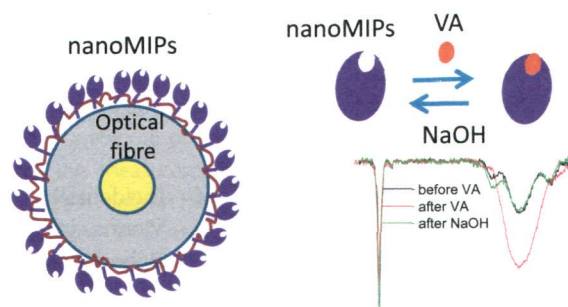


2229

Selective vancomycin detection using optical fibre long period gratings functionalised with molecularly imprinted polymer nanoparticles

Sergiy Korposh,* Iva Chianella, Antonio Guerreiro, Sarah Caygill, Sergey Piletsky, Stephen W. James and Ralph P. Tatam

Molecularly imprinted polymer nanoparticles (nanoMIPs) were deposited onto an optical fibre long period grating (LPG) sensor for the first time with aim of the specific detection of antibiotics.

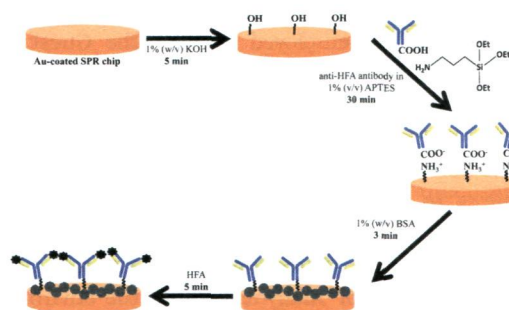


2237

Surface plasmon resonance-based immunoassay for human fetuin A

S. K. Vashist,* E. M. Schneider and J. H. T. Luong

A highly-sensitive surface plasmon resonance-based immunoassay for human fetuin A based on a rapid and highly simplified antibody immobilization procedure.



2243

A novel electrochemical chiral sensor for 3,4-dihydroxyphenylalanine based on the combination of single-walled carbon nanotubes, sulfuric acid and square wave voltammetry

Lisha Chen, Fengxia Chang, Lingchen Meng, Meixian Li and Zhiwei Zhu*

The combination of SWV with chiral SWCNTs and H₂SO₄ shows chiral discrimination for 3,4-dihydroxyphenylalanine, and the three are indispensable for this chiral recognition.

