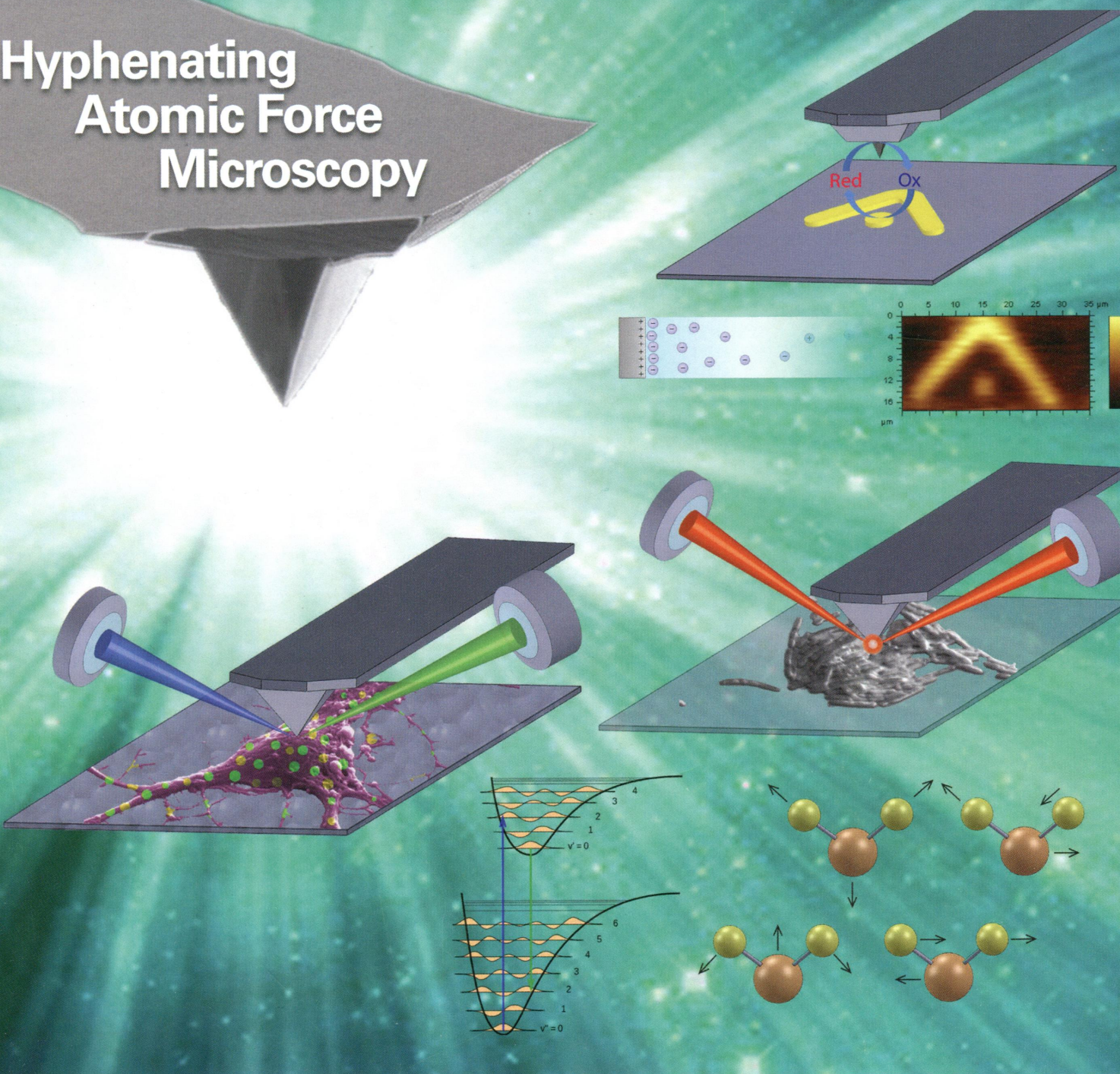


TH,
A53/4

analytical chemistry

June 3, 2014 Volume 86 Number 11

Hyphenating Atomic Force Microscopy



ON THE COVER: Hyphenating scanning force microscopy with fluorescence microscopy, spectroscopy or electrochemical techniques as presented in the cover illustration yields multi-parametric information in analytical and bioanalytical chemistry. Artwork created by Alexander Eifert.

Editorial

5189

[dx.doi.org/10.1021/ac5017826](https://doi.org/10.1021/ac5017826)**Too Busy to Review?**

Jonathan V. Sweedler

Features

5190

[dx.doi.org/10.1021/ac5008128](https://doi.org/10.1021/ac5008128)**Hyphenating Atomic Force Microscopy**

Alexander Eifert and Christine Kranz*

Perspectives

5201

[dx.doi.org/10.1021/ac501664t](https://doi.org/10.1021/ac501664t)**Asymmetric Flow Field-Flow Fractionation in the Field of Nanomedicine**

Michael Wagner, Stephan Holzschuh, Anja Traeger, Alfred Fahr, and Ulrich. S. Schubert*

Letters to Analytical Chemistry

5211

[dx.doi.org/10.1021/ac501293e](https://doi.org/10.1021/ac501293e)**Ratiometric and Time-Resolved Fluorimetry from Quantum Dots Featuring Drug Carriers for Real-Time Monitoring of Drug Release in Situ**

Rijun Gui, Ajun Wan,* Yalei Zhang, Huili Li,* and Tingting Zhao

5215

[dx.doi.org/10.1021/ac501547u](https://doi.org/10.1021/ac501547u)**Noninvasive Hypoxia Monitor Based on Gene-Free Engineering of Lactate Oxidase for Analysis of Undiluted Sweat**

Medeya M. Pribil, Gennady U. Laptev, Elena E. Karyakina, and Arkady A. Karyakin*

Technical Notes

5220  [dx.doi.org/10.1021/ac500637p](https://doi.org/10.1021/ac500637p)

Electrothermal Vaporization for Universal Liquid Sample Introduction to Dielectric Barrier Discharge Microplasma for Portable Atomic Emission Spectrometry

Xiaoming Jiang, Yi Chen, Chengbin Zheng, and Xiandeng Hou*

5225  [dx.doi.org/10.1021/ac500904p](https://doi.org/10.1021/ac500904p)

Enhancing the Quality of H/D Exchange Measurements with Mass Spectrometry Detection in Disulfide-Rich Proteins Using Electron Capture Dissociation

Cedric E. Bobst* and Igor A. Kaltashov

5232  [dx.doi.org/10.1021/ac500918g](https://doi.org/10.1021/ac500918g)

Identification of Mitochondria-Targeting Anticancer Compounds by an *in Vitro* Strategy

Xiang Zhang, Shuyue Zhang, Shaobin Zhu, Sha Chen, Jinyan Han, Kaimin Gao, Jin-zhang Zeng, and Xiaomei Yan*

5238  [dx.doi.org/10.1021/ac501092y](https://doi.org/10.1021/ac501092y)

Fabrication Route for the Production of Coplanar, Diamond Insulated, Boron Doped Diamond Macro- and Microelectrodes of any Geometry

Maxim B. Joseph, Eleni Bitziou, Tania L. Read, Lingcong Meng, Nicola L. Palmer, Tim P. Mollart, Mark E. Newton, and Julie V. Macpherson*

Articles

5245  [dx.doi.org/10.1021/ac4030895](https://doi.org/10.1021/ac4030895)

Improved Multifrequency Phase-Modulation Method That Uses Rectangular-Wave Signals to Increase Accuracy in Luminescence Spectroscopy

Santiago Medina-Rodríguez, Ángel de la Torre-Vega,* Francisco J. Sainz-Gonzalo, Marta Marín-Suárez, César Elosúa, Francisco J. Arregui, Ignacio R. Matias, Jorge F. Fernández-Sánchez,* and Alberto Fernández-Gutiérrez

5257  [dx.doi.org/10.1021/ac4031829](https://doi.org/10.1021/ac4031829)

Novel Gas Chromatographic Detector Utilizing the Localized Surface Plasmon Resonance of a Gold Nanoparticle Monolayer inside a Glass Capillary

Fong-Yi Chen, Wei-Cheng Chang, Rih-Sheng Jian, and Chia-Jung Lu*

5265  [dx.doi.org/10.1021/ac403699h](https://doi.org/10.1021/ac403699h)


3D Imaging of Enzymes Working in Situ

F. Jamme,* D. Bourquin, G. Tawil, A. Viksø-Nielsen, A. Buléon, and M. Réfrégiers

5271  [dx.doi.org/10.1021/ac4041179](https://doi.org/10.1021/ac4041179)

Nanodiscs and Electrospray Ionization Mass Spectrometry: A Tool for Screening Glycolipids Against Proteins


Aneika C. Leney, Xuxin Fan, Elena N. Kitova, and John S. Klassen*

5278  [dx.doi.org/10.1021/ac404162w](https://doi.org/10.1021/ac404162w)

Fiber-Enhanced Raman Multigas Spectroscopy: A Versatile Tool for Environmental Gas Sensing and Breath Analysis
Stefan Hanf, Robert Keiner, Di Yan, Jürgen Popp, and Torsten Frosch*

5286  [dx.doi.org/10.1021/ac404246w](https://doi.org/10.1021/ac404246w)

pQuant Improves Quantitation by Keeping out Interfering Signals and Evaluating the Accuracy of Calculated Ratios
Chao Liu, Chun-Qing Song, Zuo-Fei Yuan, Yan Fu, Hao Chi, Le-Heng Wang, Sheng-Bo Fan, Kun Zhang, Wen-Feng Zeng, Si-Min He, Meng-Qiu Dong,* and Rui-Xiang Sun*

5295  [dx.doi.org/10.1021/ac404250z](https://doi.org/10.1021/ac404250z)

Improving Ion Mobility Measurement Sensitivity by Utilizing Helium in an Ion Funnel Trap
Yehia M. Ibrahim,* Sandilya V. B. Garimella, Aleksey V. Tolmachev, Erin S. Baker, and Richard D. Smith

5300  [dx.doi.org/10.1021/ac500024n](https://doi.org/10.1021/ac500024n)

4-Amino-1-(3-mercapto-propyl)-pyridine Hexafluorophosphate Ionic Liquid Functionalized Gold Nanoparticles for IgG Immunosensing Enhancement
Rui Li, Kangbing Wu, Changxian Liu, Yin Huang, Yanying Wang, Huaifang Fang, Huijuan Zhang, and Chunya Li*

5308  [dx.doi.org/10.1021/ac500161k](https://doi.org/10.1021/ac500161k)

Statistical Homogeneous Cluster Spectroscopy (SHOCSY): An Optimized Statistical Approach for Clustering of ¹H NMR Spectral Data to Reduce Interference and Enhance Robust Biomarkers Selection
Xin Zou, Elaine Holmes, Jeremy K. Nicholson, and Ruey Leng Loo*

5316  [dx.doi.org/10.1021/ac500108n](https://doi.org/10.1021/ac500108n)

Efficient Calculation of Exact Fine Structure Isotope Patterns via the Multidimensional Fourier Transform
Andreas Ipsen

5323  [dx.doi.org/10.1021/ac5001338](https://doi.org/10.1021/ac5001338)










Synthesis-Modification Integration: One-Step Fabrication of Boronic Acid Functionalized Carbon Dots for Fluorescent Blood Sugar Sensing
Pengfei Shen and Yunsheng Xia*

5330  [dx.doi.org/10.1021/ac5001916](https://doi.org/10.1021/ac5001916)

Dependence of Filopodia Morphology and the Separation Efficiency of Primary CD4⁺ T-Lymphocytes on Nanopillars
Gil-Sung Kim, Dong-Joo Kim, Jung-Hwan Hyung, Myung Kyu Lee, and Sang-Kwon Lee*

5338  [dx.doi.org/10.1021/ac500247f](https://doi.org/10.1021/ac500247f)

Multiplex Microfluidic Paper-based Immunoassay for the Diagnosis of Hepatitis C Virus Infection
Xuan Mu,* Lin Zhang, Shaoying Chang, Wei Cui, and Zhi Zheng*

- 5345  [dx.doi.org/10.1021/ac500276r](https://doi.org/10.1021/ac500276r)
Laser Capture Microdissection Coupled with On-Column Extraction LC-MSⁿ Enables Lipidomics of Fluorescently Labeled *Drosophila* Neurons
Sarita Hebbar, Wolf Dieter Schulz, Ulrich Sauer, and Dominik Schwudke*
- 5353  [dx.doi.org/10.1021/ac500329k](https://doi.org/10.1021/ac500329k)
Two-Photon Probe for Cu²⁺ with an Internal Reference: Quantitative Estimation of Cu²⁺ in Human Tissues by Two-Photon Microscopy
Dong Eun Kang, Chang Su Lim, Ji Yeon Kim, Eun Sun Kim, Hoon Jai Chun, and Bong Rae Cho*
- 5360  [dx.doi.org/10.1021/ac500340t](https://doi.org/10.1021/ac500340t)
In-Depth Structural Characterization of *N*-Linked Glycopeptides Using Complete Derivatization for Carboxyl Groups Followed by Positive- and Negative-Ion Tandem Mass Spectrometry
Takashi Nishikaze,* Shin-ichirou Kawabata, and Koichi Tanaka
- 5370  [dx.doi.org/10.1021/ac500458s](https://doi.org/10.1021/ac500458s)
Incorporating a Hybrid Urease-Carbon Nanotubes Sensitive Nanofilm on Capacitive Field-Effect Sensors for Urea Detection
José R. Siqueira Jr.,* Denise Molinnus, Stefan Beging, and Michael J. Schöning*
- 5376  [dx.doi.org/10.1021/ac500383c](https://doi.org/10.1021/ac500383c)
Structural Analysis of an Intact Monoclonal Antibody by Online Electrochemical Reduction of Disulfide Bonds and Fourier Transform Ion Cyclotron Resonance Mass Spectrometry
Simone Nicolardi,* André M. Deelder, Magnus Palmblad, and Yuri E. M. van der Burgt
- 5383  [dx.doi.org/10.1021/ac5003933](https://doi.org/10.1021/ac5003933)
Quantification of each Serogroup Polysaccharide of *Neisseria meningitidis* in A/C/Y/W-135-DT Conjugate Vaccine by High-Performance Anion-Exchange Chromatography-Pulsed Amperometric Detection Analysis
Seshu Kumar Gudlavalleti,* Erika Nicole Crawford, Jeffery David Harder, and Jeeri Raghava Reddy
- 5391  [dx.doi.org/10.1021/ac5004689](https://doi.org/10.1021/ac5004689)
Atmospheric Peroxy Radical Measurements Using Dual-Channel Chemical Amplification Cavity Ringdown Spectroscopy
Yingdi Liu and Jingsong Zhang*
- 5399  [dx.doi.org/10.1021/ac5004757](https://doi.org/10.1021/ac5004757)
Classification of Spent Reactor Fuel for Nuclear Forensics
Andrew E. Jones, Phillip Turner, Colin Zimmerman, and John Y. Goulermas*
- 5406  [dx.doi.org/10.1021/ac500487b](https://doi.org/10.1021/ac500487b)
***In Situ* Monitoring of Structural Changes during Formation of 30S Translation Initiation Complex by Energy Dissipation Measurement Using 27-MHz Quartz-Crystal Microbalance**
Hiroyuki Furusawa,* Yumi Tsuyuki, Shuntaro Takahashi, and Yoshio Okahata*

5416  [dx.doi.org/10.1021/ac500497n](https://doi.org/10.1021/ac500497n)
Microchip Zone Electrophoresis for High-Throughput Analysis of Monoclonal Antibody Charge Variants
Tobias D. Wheeler,* Jing Lucy Sun, Sina Pleiner, Holger Geier, Philine Dobberthien, Joey Studts, Rajendra Singh, and Bahram Fathollahi*

5425  [dx.doi.org/10.1021/ac5005037](https://doi.org/10.1021/ac5005037)
Comparative Analysis of Chemical and Microbial Profiles in Estuarine Sediments Sampled from Kanto and Tohoku Regions in Japan
Taiga Asakura, Yasuhiro Date, and Jun Kikuchi*

5433  [dx.doi.org/10.1021/ac5005103](https://doi.org/10.1021/ac5005103)
Quantitating Metabolites in Protein Precipitated Serum Using NMR Spectroscopy
G. A. Nagana Gowda* and Daniel Raftery*

5441  [dx.doi.org/10.1021/ac500572g](https://doi.org/10.1021/ac500572g)
Five-Column Chromatography Separation for Simultaneous Determination of Hard-to-Detect Radionuclides in Water and Swipe Samples
Xiongxin Dai* and Sheila Kramer-Tremblay

5448 [dx.doi.org/10.1021/ac500654a](https://doi.org/10.1021/ac500654a)
Determination of the ^{14}C Content in Activated Steel Components from a Neutron Spallation Source and a Nuclear Power Plant
Dorothea Schumann,* Tanja Stowasser, Benjamin Volmert, Ines Günther-Leopold, Hanspeter Linder, and Erich Wieland


5455  [dx.doi.org/10.1021/ac5006553](https://doi.org/10.1021/ac5006553)
Amperometric Biosensor System for Simultaneous Determination of Adenosine-5'-Triphosphate and Glucose
Ivan S. Kucherenko,* Daria Yu. Didukh, Oleksandr O. Soldatkin, and Alexei P. Soldatkin


5463  [dx.doi.org/10.1021/ac500667h](https://doi.org/10.1021/ac500667h)
Ultrafast PubChem Searching Combined with Improved Filtering Rules for Elemental Composition Analysis
Arjen Lommen*

5470  [dx.doi.org/10.1021/ac5008317](https://doi.org/10.1021/ac5008317)
Urine Sample Preparation in 96-Well Filter Plates for Quantitative Clinical Proteomics
Yanbao Yu,* Moo-Jin Suh, Patricia Sikorski, Keehwan Kwon, Karen E. Nelson, and Rembert Pieper*


5478  [dx.doi.org/10.1021/ac500945m](https://doi.org/10.1021/ac500945m)
Novel LC-MS² Product Dependent Parallel Data Acquisition Function and Data Analysis Workflow for Sequencing and Identification of Intact Glycopeptides
Sz-Wei Wu, Tsung-Hsien Pu, Rosa Viner, and Kay-Hooi Khoo*

5487  [dx.doi.org/10.1021/ac500752t](https://doi.org/10.1021/ac500752t)
Graphene Fluorescence Switch-Based Cooperative Amplification: A Sensitive and Accurate Method to Detection MicroRNA
Haiyun Liu, Lu Li, Qian Wang, Lili Duan, and Bo Tang*


5494  [dx.doi.org/10.1021/ac500979g](https://doi.org/10.1021/ac500979g)
Customized Metabolomics Database for the Analysis of NMR ^1H – ^1H TOCSY and ^{13}C – ^1H HSQC-TOCSY Spectra of Complex Mixtures
Kerem Bingol, Lei Bruschiweiler-Li, Da-Wei Li, and Rafael Brüschiweiler*


5502  [dx.doi.org/10.1021/ac501463u](https://doi.org/10.1021/ac501463u)
Target-Specific Imaging of Transmembrane Receptors Using Quinonyl Glycosides Functionalized Quantum Dots
Wei Ma, Hui-Ting Liu, Xiao-Peng He,* Yi Zang, Jia Li,* Guo-Rong Chen, He Tian, and Yi-Tao Long*

5508  [dx.doi.org/10.1021/ac500771q](https://doi.org/10.1021/ac500771q)
Turn-on Fluorescent Dopamine Sensing Based on *in Situ* Formation of Visible Light Emitting Polydopamine Nanoparticles
Adem Yildirim and Mehmet Bayindir*

5513  [dx.doi.org/10.1021/ac500785u](https://doi.org/10.1021/ac500785u)
New Insights into Electrocatalysis Based on Plasmon Resonance for the Real-Time Monitoring of Catalytic Events on Single Gold Nanorods
Chao Jing, Frankie James Rawson, Hao Zhou, Xin Shi, Wen-Hui Li, Da-Wei Li, and Yi-Tao Long*

5519  [dx.doi.org/10.1021/ac500832a](https://doi.org/10.1021/ac500832a)
Monitoring Charge Flux to Quantify Unusual Ligand-Induced Ion Channel Activity for Use in Biological Nanopore-Based Sensors
Florika C. Macazo and Ryan J. White*

5526  [dx.doi.org/10.1021/ac500972x](https://doi.org/10.1021/ac500972x)
Multiplexed Parallel Reaction Monitoring Targeting Histone Modifications on the QExactive Mass Spectrometer
Hui Tang, Huasheng Fang, Eric Yin, Allan R. Brasier, Lawrence C. Sowers, and Kangling Zhang*

5535  [dx.doi.org/10.1021/ac5009207](https://doi.org/10.1021/ac5009207)
Background-Free Referenced Luminescence Sensing and Imaging of pH Using Upconverting Phosphors and Color Camera Read-out
Robert J. Meier,* Johann M. B. Simbürger, Tero Soukka, and Michael Schäferling

5541  [dx.doi.org/10.1021/ac500926f](https://doi.org/10.1021/ac500926f)
Shiga-Like Toxin B Subunit of *Escherichia coli* as Scaffold for High-Avidity Display of Anti-immunocomplex Peptides
Gabriel Lassabe, Martín Rossotti, Andrés González-Techera,* and Gualberto González-Sapienza

5547  [dx.doi.org/10.1021/ac500992f](https://doi.org/10.1021/ac500992f)

Differentiating Sulfopeptide and Phosphopeptide Ions via Resonant Infrared Photodissociation

Amanda L. Patrick, Corey N. Stedwell, and Nicolas C. Polfer*

5553  [dx.doi.org/10.1021/ac5010037](https://doi.org/10.1021/ac5010037)

Redox and Label-Free Array Detection of Protein Markers in Human Serum

Xiliang Luo, Qiao Xu, Tim James, and Jason J. Davis*

5559  [dx.doi.org/10.1021/ac501061c](https://doi.org/10.1021/ac501061c)


A General Chemiluminescence Strategy for Measuring Aptamer–Target Binding and Target Concentration

Shiyuan Li, Duyu Chen, Qingtong Zhou, Wei Wang, Lingfeng Gao, Jie Jiang, Haojun Liang, Yangzhong Liu, Gaolin Liang, and Hua Cui*

5567  [dx.doi.org/10.1021/ac501068k](https://doi.org/10.1021/ac501068k)

Visual and Highly Sensitive Detection of Cancer Cells by a Colorimetric Aptasensor Based on Cell-Triggered Cyclic Enzymatic Signal Amplification

Xianxia Zhang, Kunyi Xiao, Liwei Cheng, Hui Chen, Baohong Liu, Song Zhang,* and Jilie Kong*

5573  [dx.doi.org/10.1021/ac501091n](https://doi.org/10.1021/ac501091n)

Proximity Hybridization-Triggered Signal Switch for Homogeneous Chemiluminescent Bioanalysis

Chen Zong, Jie Wu, Mengmeng Liu, Linlin Yang, Lin Liu, Feng Yan, and Huangxian Ju*

5579  [dx.doi.org/10.1021/ac501132r](https://doi.org/10.1021/ac501132r)

Structural Elucidation of Sulfaquinoxaline Metabolism Products and Their Occurrence in Biological Samples Using High-Resolution Orbitrap Mass Spectrometry

Rodrigo Barcellos Hoff,* Leonardo Meneghini, Tânia Mara Pizzolato, Maria do Carmo Ruaro Peralba, M. Silvia Díaz-Cruz, and Damià Barceló

5587  [dx.doi.org/10.1021/ac501322x](https://doi.org/10.1021/ac501322x)


Localized Surface Plasmon Resonance Nanosensing of C-Reactive Protein with Poly(2-methacryloyloxyethyl phosphor-ylcholine)-Grafted Gold Nanoparticles Prepared by Surface-Initiated Atom Transfer Radical Polymerization

Yukiya Kitayama and Toshifumi Takeuchi*

5595 [dx.doi.org/10.1021/ac501246k](https://doi.org/10.1021/ac501246k)

Full-Featured Electrochemiluminescence Sensing Platform Based on the Multichannel Closed Bipolar System

Xiaowei Zhang, Jing Li, Xiaofang Jia, Dongyue Li, and Erkang Wang*

 Supporting Information available via online article

 Web Enhanced Features available via online article