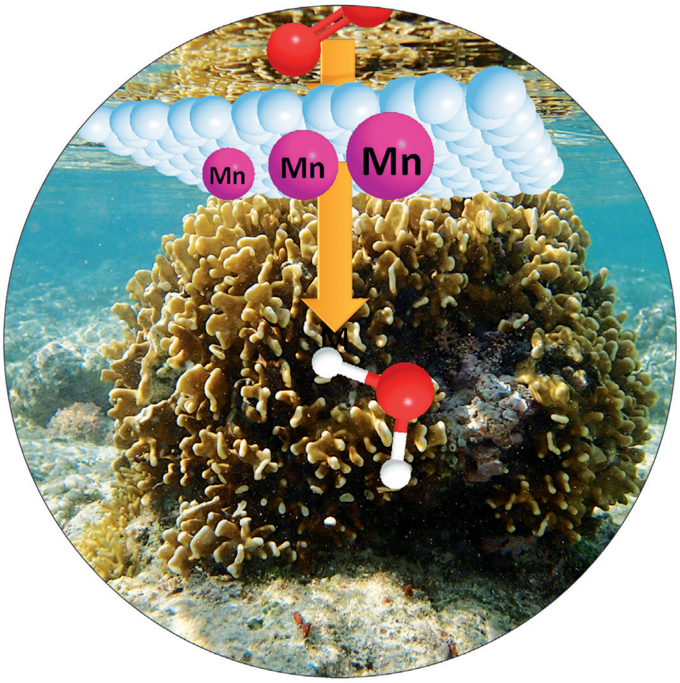
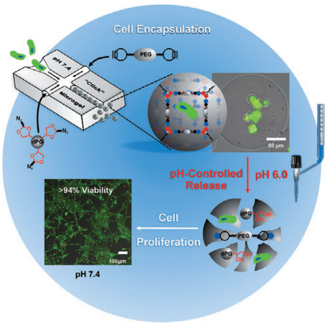
# The oxygen reduction reaction …



… (ORR) is of high industrial importance. A significant research effort has been directed to the so-called "metal-free" ORR. In their Communication on page 13818 ff., M. Pumera et al. show that the claimed "metal-free" electrocatalysis of the ORR on heteroatom-doped graphene is caused by metallic impurities. The picture shows the reduction of $O_2$ to water by a graphene sheet stained with manganese, with the Indonesian coral reef in the background.

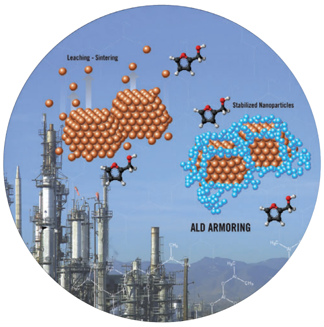


### Stimuli-Responsive Microgels

Bioorthogonal click chemistry and droplet-based microfluidics were used to fabricate pH-cleavable microgels, as reported by R. Haag et al. in their Communication on page 13538 ff.

### DNA Structures

S. Takahashi and N. Sugimoto demonstrate in their Communication on page 13774 ff. that high pressure causes unfolding of G-quadruplex DNA. The effect was repressed under conditions that mimic those in cells.



### Catalyst Stability

In their Communication on page 13808 ff., J. A. Dumesic et al. show that atomic layer deposition can be used to coat metallic nanoparticles, which prevents irreversible catalyst deactivation during liquid-phase catalytic processing.

## How to contact us:

**Editorial Office:**
E-mail: angewandte@wiley-vch.de
Fax: (+49) 6201–606-331
Telephone: (+49) 6201–606-315

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**Online Open:**
Margitta Schmitt, Carmen Leitner
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Fax: (+49) 6201–606-331
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**Courier Services:**
Boschstrasse 12, 69469 Weinheim

**Regular Mail:**
Postfach 101161, 69451 Weinheim

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***Spotlight on Angewandte's*** Sister Journals ***13506 – 13508***

## Author Profile

*“My favorite saying is when the going gets tough, the tough get going (meant ironically).*
*I admire Nelson Mandela …”*
This and more about Bruce C. Gates can be found on page 13510.

Bruce C. Gates ______ **13510**

## News


A. Jutand


J. J. E. Moreau


P. Braunstein


W. J. Stec


S. V. Ley


R. Sessoli


T. Kato


F. Boulmedais


C. Hureau


L. Jullien

Société Chimique de France 2013 Prize Winners ______ **13511 – 13512**

## Obituaries

John D. Corbett passed away on September 2, 2013. He contributed immensely to modern solid-state chemistry, and for many decades, he stood at the forefront of the fields of metal-rich halides and tellurides, Zintl phases, Zintl ions in solution, and noncarbon fullerenes.

John D. Corbett (1926–2013)

*G. Meyer,* A.-V. Mudring,**
*K. R. Poeppelmeier** ______ ***13513 – 13514***

## Books

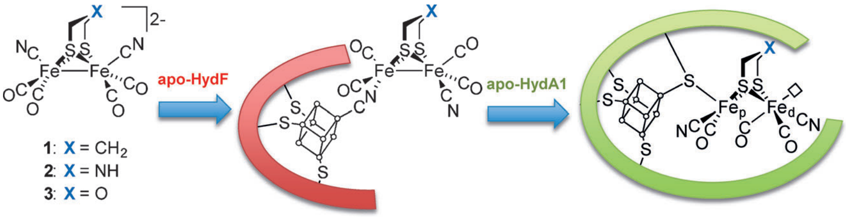
Heterocyclic Chemistry in Drug Discovery | Jie Jack Li | *reviewed by O. Thiel* ______ **13515**

## Highlights

### *Enzymology*

D. Schilter,*
T. B. Rauchfuss* ______ **13518 – 13520**

And the Winner is...Azadithiolate: An Amine Proton Relay in the [FeFe] Hydrogenases



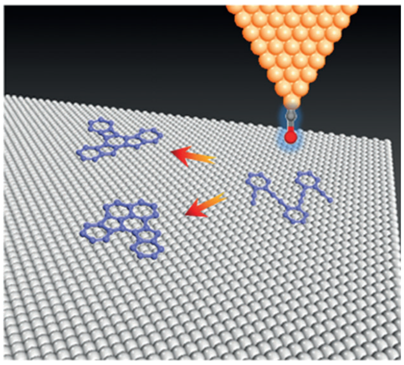
**A victory in the pocket**: An international team of chemists and biophysicists have resolved the long-standing question of the structure of the active site of the [FeFe] hydrogenases by assembling the active enzyme with a version of the active site synthesized in vitro (see scheme; HydF is a scaffold protein, HydA1 is a natural hydrogenase). The protein incorporating the diiron complex **2** showed similar activity to that of the natural enzyme.

### *Molecular Imaging*

J. Lu, K. P. Loh* ______ **13521 – 13523**

Single-Molecule Chemical Reactions Tracked at the Atomic-Bond Level

**On the right track**: Recent advances in noncontact atomic force microscopy (nc-AFM) have enabled the bond-resolved imaging of reaction pathways. In particular, unprecedented insights into complex enediyne cyclization cascades on silver surfaces were gained by single-molecule imaging.



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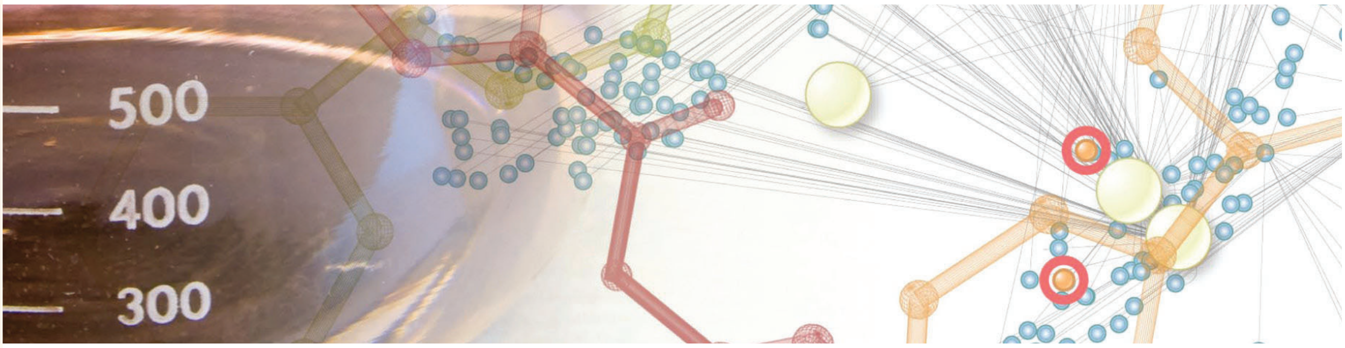

*Novartis is pleased to announce the 2013 recipients of the*

# Novartis Early Career Award in Organic Chemistry

### **Professor Nicolai Cramer,** *EPF Lausanne, Switzerland*

Nicolai Cramer earned his Ph.D. in 2005 in the group of Professor Sabine Laschat at the University of Stuttgart. After a stay with Professors Michio Murata and Sumihiro Hase at Osaka University he joined the group of Professor Barry M. Trost at Stanford University as a postdoctoral fellow. In 2007, he started his habilitation at the ETH Zürich associated to Professor Erick M. Carreira and in 2010 took his current position at EPF Lausanne. Professor Cramer has made major contributions to the field of enantioselective metal-catalyzed transformations and has been a pioneer in the development of catalytic methods for selective functionalization of relatively inert C-H and C-C bonds.

### **Professor Daniel Rauh,** *Technische Universität, Dortmund, Germany*

Daniel Rauh earned his Ph.D. in 2002 from Phillips-Universität Marburg working with Professor Gerhard Klebe. Later that year he spent time as a Research Fellow at the Genomics Institute of the Novartis Research Foundation (GNF) in San Diego. His postdoctoral studies began with Professor Milton Stubbs at Martin-Luther-Universität Halle-Wittenberg and then with Professor Kevan Shokat at the University of California, San Francisco. Professor Rauh started his independent career at Dortmund in 2006 and has made truly innovative contributions to the field of chemical biology in the development of high-throughput assay methodologies for the identification of allosteric kinase inhibitors, and in the creative design of functional probes for targeting proteins and dissecting oncogene dependencies.

The Novartis Early Career Award in Organic Chemistry is presented annually to outstanding scientists within 10 years of having established an independent academic research career, in the areas of organic or bioorganic chemistry in the broadest sense. Two winners are identified, from the Global Research community, each of whom receives an unrestricted research grant.

Past Awardees:

| | |
|---|---|
| **2012** | Sarah E. Reisman and Corey R.J. Stephenson |
| **2011** | David Chen and David Spiegel |
| **2010** | Karl Gademann and Jin-Quan Yu |
| **2009** | Christopher J. Chang and Magnus Rueping |
| **2008** | Matthew J. Gaunt and Jeffrey S. Johnson |
| **2007** | Lukas J. Goossen and Anna K. Mapp |
| **2006** | Armido Studer and F. Dean Toste |
| **2005** | Benjamin List and Dirk Trauner |
| **2004** | J. Stephen Clark and Jonathan P. Clayden |
| **2003** | Thorsten Bach |
| **2002** | Bernhard Breit and Thomas Carell |
| **2001** | Tim Donohoe |
| **2000** | Andrew Miller |
| **1999** | Alan Armstrong |
| **1998** | Mark Bradley |

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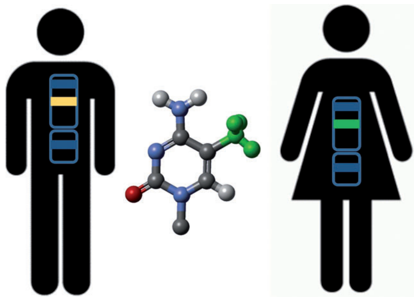
# Reviews

**Genomic Imprinting**

R. Z. Jurkowska,
A. Jeltsch* ______ **13524 – 13536**

Genomic Imprinting—The Struggle of the Genders at the Molecular Level

**Battle of the sexes**: Genomic imprinting, the parent of origin-dependent monoallelic expression of genes, mediates a parental conflict in mammals. It is based on the presence of a DNA methylation mark on one allele and affects about 100 genes, which are often involved in growth and development. This Review describes the molecular processes leading to the generation and preservation of imprints during development and summarizes the relevance of parental imprinting for human health.



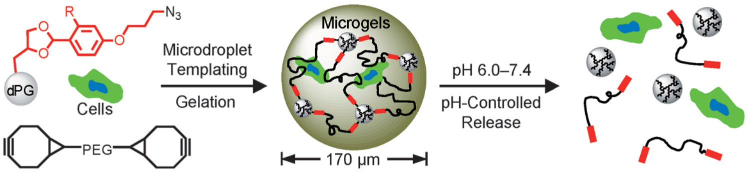
# Communications

**Stimuli-Responsive Microgels**

D. Steinhilber, T. Rossow, S. Wedepohl,
F. Paulus, S. Seiffert,
R. Haag* ______ **13538 – 13543**

A Microgel Construction Kit for Bioorthogonal Encapsulation and pH-Controlled Release of Living Cells

**Frontispiece**

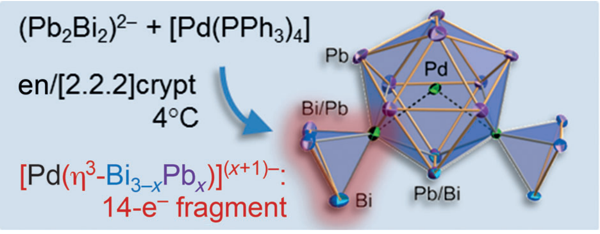


**Cells on demand**: pH-Cleavable cell-laden microgels with excellent long-term viabilities were fabricated by combining bioorthogonal click chemistry and microfluidics. Functionalized PEG and dendritic polyglycerol (dPG) derivatives served as bioinert microgel precursors for cell encapsulation and pH-controlled release. This 3D microgel construction kit provides an optimal and responsive environment for biological systems.

**Cluster Compounds**

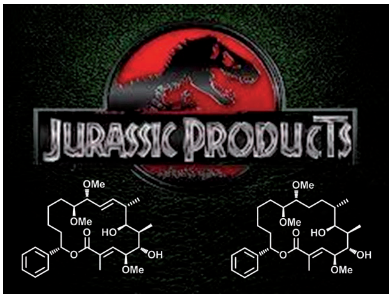
R. Ababei, W. Massa, K. Harms, X. Xie,
F. Weigend,* S. Dehnen* **13544 – 13548**

Unusual 14-Electron Fragments $[\mathrm{Pd}(\eta^3\text{-}\mathrm{Bi}_{3-x}\mathrm{Pb}_x)]^{(x+1)-}$ as Pseudo Lead Atoms in *closo*-$[\mathrm{Pd@Pd_2Pb_{10}Bi_6}]^{4-}$



**How to simplify a complex thing**: A salt of the heaviest intermetalloid cluster known to date, $[\mathrm{K([2.2.2]crypt)}]_4[\mathrm{Pd@Pd_2Pb_{10}Bi_6}]\cdot 2\,\mathrm{en}$, resulted from a reaction of $[\mathrm{Pd(PPh_3)_4}]$ with $[\mathrm{K([2.2.2]crypt)}]_2(\mathrm{Pb_2Bi_2})\cdot 2\,\mathrm{en}$ in ethane-1,2-diamine (en). The electron number of the ternary intermetalloid anion accords with Wade–Mingos rules, as the $[\mathrm{Pd}(\eta^3\text{-}\mathrm{Bi}_{3-x}\mathrm{Pb}_x)]^{(x+1)-}$ ($x = 0$, 1) 14-electron fragments formed in situ are isolobal with Pb atoms.

**Synthesis can provide molecules** such as paleo-soraphens A and B (see scheme) that are genetically encoded but not obtained from the natural source. Although it is unclear whether this is part of an evolutionary process or the consequence of the chemical synthesis, the biological evaluation of these genetically encoded natural products can shed light on how natural products are structurally optimized with respect to their biological profile.



### *Natural Products Chemistry*

H.-H. Lu, A. Raja, R. Franke, D. Landsberg, F. Sasse, M. Kalesse* ____ **13549–13552**

Synthesis and Biological Evaluation of Paleo-Soraphens

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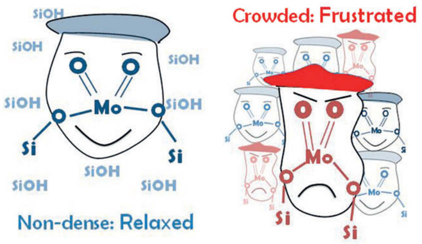

**Only uncomfortable seats left**: At high surface coverages of molybdenum oxide, at which surface hydroxy anchoring sites are limited, surface metal oxide molecules are forced to be anchored in strained/frustrated configurations. This strain leads to increased reactivity and explains the non-linear coverage dependence sometimes observed in monolayer-type supported metal oxide catalysts.

### *Heterogeneous Catalysis*

K. Amakawa, L. Sun, C. Guo, M. Hävecker, P. Kube, I. E. Wachs, S. Lwin, A. I. Frenkel, A. Patlolla, K. Hermann, R. Schlögl, A. Trunschke* ____ **13553–13557**

How Strain Affects the Reactivity of Surface Metal Oxide Catalysts

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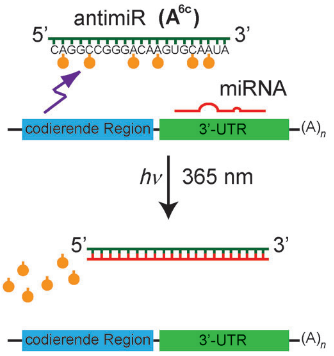

**The inhibition of microRNAs** (miRs) in a spatiotemporally defined manner by an exogenous trigger would help to specifically target the biological activity and avoid off-target effects. Novel antimiRs directed against miR-92a can be activated by irradiation (see scheme; 3′-UTR = 3′-untranslated region) In this way miR-92a is inhibited, the miR-92a target integrin α5 is derepressed, and angiogenesis of endothelial cells is enhanced.

### *Light-Induced Angiogenesis*

F. Schäfer, J. Wagner, A. Knau, S. Dimmeler,* A. Heckel* **13558–13561**

Regulating Angiogenesis with Light-Inducible AntimiRs

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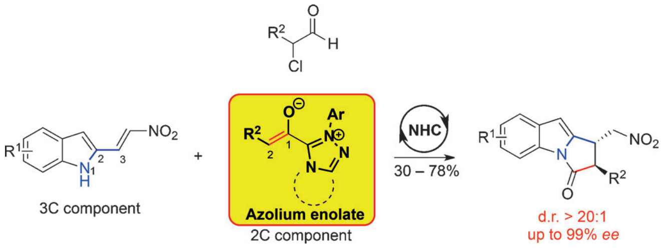


**NHC-enolate plus 3**: N-heterocyclic carbenes (NHCs) serve as organocatalysts for the [2+3] annulation of nitrovinylindoles with α-chloroaldehydes via an intermediate azolium enolate. The method provides *trans*-disubstituted pyrroloindolones with good yields and excellent diastereo- and enantioselectivities. Further transformations lead to tetracyclic pyrrolo[1,2-*a*]indoles with potential psychotropic and other bioactivities.

### *Organocatalysis*

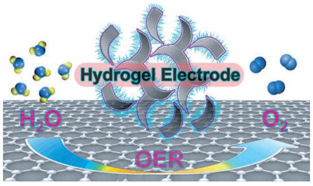
Q. Ni, H. Zhang, A. Grossmann, C. C. J. Loh, C. Merkens, D. Enders* ____ **13562–13566**

Asymmetric Synthesis of Pyrroloindolones by N-Heterocyclic Carbene Catalyzed [2+3] Annulation of α-Chloroaldehydes with Nitrovinylindoles

## Oxygen Evolution

S. Chen, J. J. Duan, M. Jaroniec,
S. Z. Qiao* ——— **13567 – 13570**

Three-Dimensional N-Doped Graphene Hydrogel/NiCo Double Hydroxide Electrocatalysts for Highly Efficient Oxygen Evolution

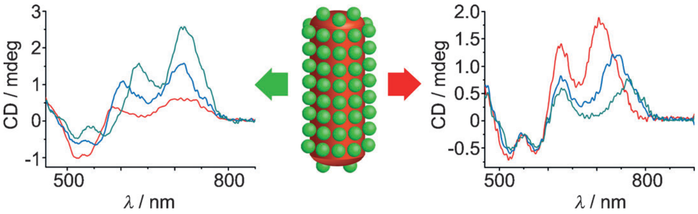


**A highly hydrated structure** was fabricated for catalyzing the oxygen evolution reaction (OER), which demonstrated significantly enhanced catalytic activity, favorable kinetics, and strong durability. The enhanced performance is correlated with the dual-active-site mechanism, and high hydrophilicity of the electrode can dramatically expedite the process of water oxidation into molecular oxygen.

## Controllable Optical Activity

Z. Zhu, J. Guo, W. Liu, Z. Li, B. Han,
W. Zhang,* Z. Tang* ——— **13571 – 13575**

Controllable Optical Activity of Gold Nanorod and Chiral Quantum Dot Assemblies

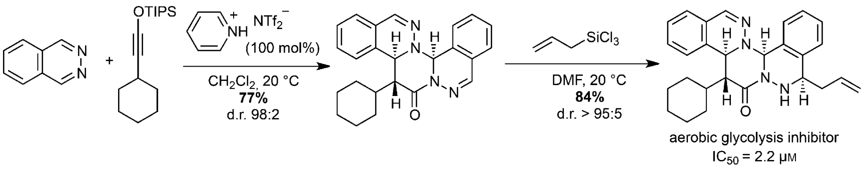


**The optical coupling** between Au nanorods (Au NRs) and chiral quantum dots (QDs) in assemblies is investigated by both experiment and theoretical calculations. The coupled optical activity in the visible-light region can be manipulated by changing either the aspect ratio of Au NRs (see picture; right) or the size of QDs (left).

## Synthetic Methods

T. J. Montavon, Y. E. Türkmen,
N. A. Shamsi, C. Miller, C. S. Sumaria,
V. H. Rawal,*
S. A. Kozmin* ——— **13576 – 13579**

[2+2+2] Cycloadditions of Siloxy Alkynes with 1,2-Diazines: From Reaction Discovery to Identification of an Antiglycolytic Chemotype



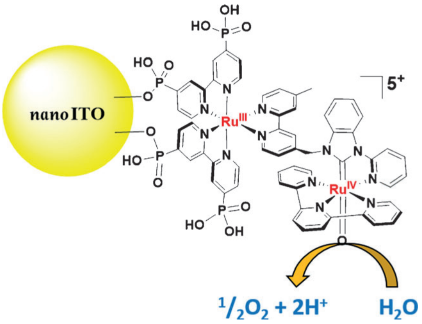
**Cycloaddition uncovered**: The title reaction produces novel polycyclic compounds with high efficiency and excellent diastereoselectivity under mild reaction conditions. A small-molecule library, synthesized using this reaction, yielded a novel chemotype which inhibited glycolytic ATP production by blocking glucose uptake in CHO-K1 cells. DMF = *N*,*N*-dimethylformamide, Tf = trifluoromethanesulfonyl, TIPS = triisopropylsilyl.

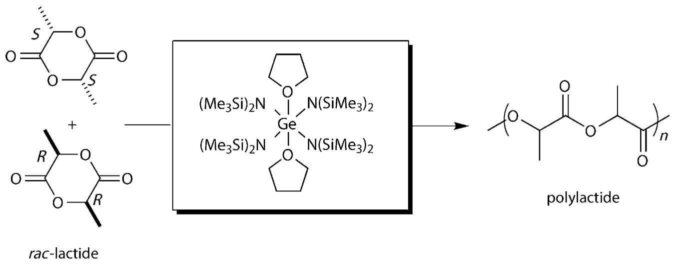
## Chromophore–Catalyst Assemblies

M. R. Norris, J. J. Concepcion, Z. Fang,
J. L. Templeton,
T. J. Meyer* ——— **13580 – 13583**

Low-Overpotential Water Oxidation by a Surface-Bound Ruthenium-Chromophore–Ruthenium-Catalyst Assembly

**When anchored to nanoITO** (indium tin oxide), the ruthenium chromophore–catalyst assembly shown acts as an electrocatalyst for water oxidation, with $O_2$ evolution occurring at an overpotential of 230 mV in 0.1 M $HClO_4$. The potential response of the electrode points to $3e^-/2H^+$ oxidized $[-Ru_a^{III}-Ru_b^{IV}=O]^{5+}$ as the active form of the assembly.





**Most germane**: Hexacoordinate germanium(IV) species exhibit unprecedented activities, yet controlled behavior, as initiators for the ring-opening polymerization of *rac*-lactide to form polylactide polymers (see scheme).

### *Polymerization Catalysis*

J. Guo, P. Haquette, J. Martin, K. Salim, C. M. Thomas* ———— **13584 – 13587**

Replacing Tin in Lactide Polymerization: Design of Highly Active Germanium-Based Catalysts

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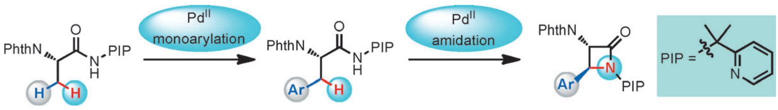

**Give Me an Ar, give Me an N**! Arylation of the methyl group in a simple derivative of readily available alanine under palladium catalysis was followed by intramolecular amidation at the same position to give chiral α-amino-β-lactams with a wide range of aryl substituents (see scheme; Phth = phthaloyl). The α-amino-β-lactams were obtained in moderate to high yields with good functional-group tolerance and high diastereoselectivity.

### *β-Lactam Synthesis*

Q. Zhang, K. Chen, W. Rao, Y. Zhang, F.-J. Chen, B.-F. Shi* ———— **13588 – 13592**

Stereoselective Synthesis of Chiral α-Amino-β-Lactams through Palladium(II)-Catalyzed Sequential Monoarylation/Amidation of C(sp$^3$)−H Bonds

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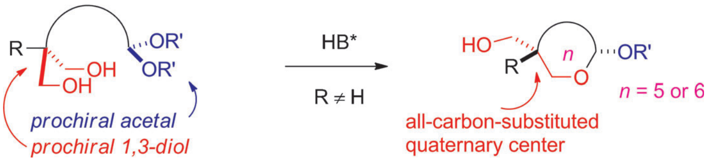

**Chiral phosphoric acids** (HB*) catalyze the asymmetric desymmetrization of *meso* 1,3-diols through mono-transacetalization with a tethered acetal unit (see scheme). This new strategy leads to the efficient assembly of tetrahydrofuran and tetrahydropyran skeletons bearing remote all-carbon-substituted quaternary stereocenters that are not straightforward to access by other methods.

### *Asymmetric Catalysis*

Z. Chen, J. Sun* ———— **13593 – 13596**

Enantio- and Diastereoselective Assembly of Tetrahydrofuran and Tetrahydropyran Skeletons with All-Carbon-Substituted Quaternary Stereocenters

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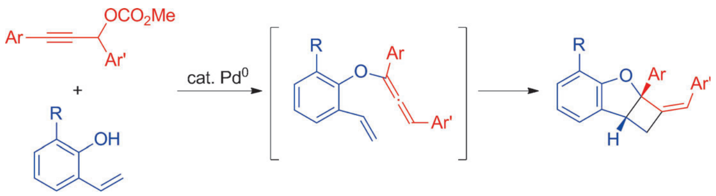


**Radical methods**: The title reaction proceeds in the presence of a palladium catalyst to deliver substituted tetrahydrocyclobuta[*b*]benzofurans in a stereoselective manner (see scheme). A radical mechanism is discussed.

### *Synthetic Methods*

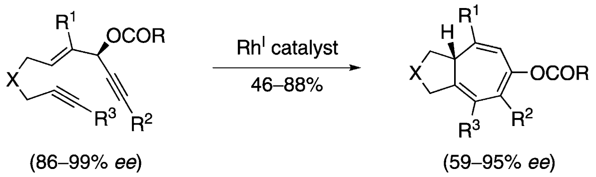
M. Yoshida,* S. Ohno, K. Namba ———— **13597 – 13600**

Synthesis of Substituted Tetrahydrocyclobuta[*b*]benzofurans by Palladium-Catalyzed Substitution/[2+2] Cycloaddition of Propargylic Carbonates with 2-Vinylphenols

### Cycloaddition

X.-z. Shu, C. M. Schienebeck, W. Song, I. A. Guzei, W. Tang* ____ **13601 – 13605**

Transfer of Chirality in the Rhodium-Catalyzed Intramolecular [5+2] Cycloaddition of 3-Acyloxy-1,4-enynes (ACEs) and Alkynes: Synthesis of Enantioenriched Bicyclo[5.3.0]decatrienes

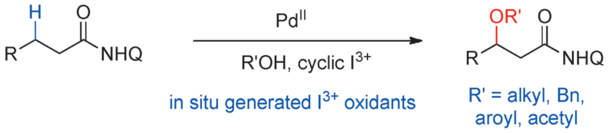


**Chiral bicycles**: Enantioenriched bicyclo[5.3.0]decatrienes were prepared from readily available chiral 3-acyloxy-1,4-enynes (ACEs) for the first time. In most cases, the chirality of the ACEs could be transferred to the bicyclic products with high efficiency. Inversion of the configuration was observed, thus confirming the predictions of previous computational studies.

### C–H Activation

G. Shan, X. Yang, Y. Zong, Y. Rao* ____ **13606 – 13610**

An Efficient Palladium-Catalyzed C–H Alkoxylation of Unactivated Methylene and Methyl Groups with Cyclic Hypervalent Iodine ($I^{3+}$) Oxidants

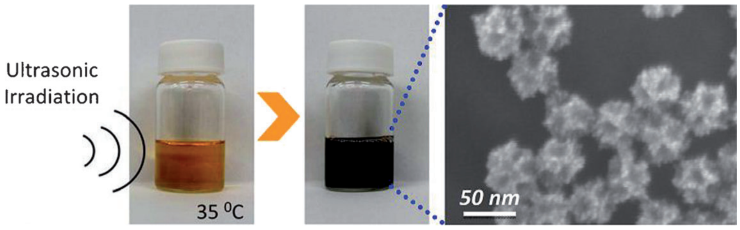


**All the hype**: The title reaction has been developed for the facile synthesis of a variety of complex alkyl ethers. Cyclic hypervalent iodine ($I^{3+}$) reagents serve as oxidants for this unique C–H alkoxylation reaction. The reaction demonstrates excellent reactivity, good functional-group tolerance, and high yields. Q = 8-aminoquinoline-derived auxiliary.

### Mesoporous Nanoparticles

H. Ataee-Esfahani, M. Imura, Y. Yamauchi* ____ **13611 – 13615**

All-Metal Mesoporous Nanocolloids: Solution-Phase Synthesis of Core–Shell Pd@Pt Nanoparticles with a Designed Concave Surface

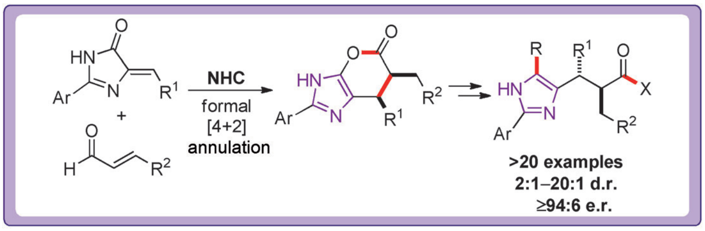


**Colloidal Pd@Pt** nanoparticles with uniform mesopores can be synthesized in one step by a facile solution-phase method involving slow reduction of metal species in strong acidic media. In this system, F127 micelles can directly act as a template to form the mesopores in the product, and the greater reducibility of the Pd species leads to the desired core–shell Pd@Pt nanocolloids.

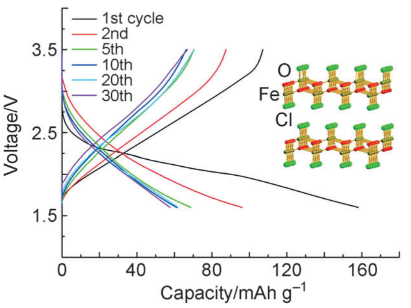
### Asymmetric Catalysis

E. O. McCusker, K. A. Scheidt* ____ **13616 – 13620**

Enantioselective N-Heterocyclic Carbene Catalyzed Annulation Reactions with Imidazolidinones



**Add acetic acid**: A highly stereoselective N-heterocyclic carbene (NHC)-catalyzed formal [4+2] annulation between α,β-unsaturated aldehydes and imidazolidinones for the synthesis of imidazoles has been developed. Acetic acid serves as a key additive to achieve high chemoselectivity for the formal [4+2] annulation product.



**A key challenge** of chloride ion batteries is to develop cathode materials that are stable in the electrolytes. Metal oxychlorides are presented as such a cathode material. The electrochemical performance and the reaction mechanisms of the BiOCl and FeOCl cathode were investigated. Both cathodes showed reversible reactions, including a major conversion reaction and a minor intercalation process, by chloride ion transfer during cycling.

### Rechargeable Batteries

X. Y. Zhao, Z. Zhao-Karger, D. Wang,
M. Fichtner* ———— 13621 – 13624

Metal Oxychlorides as Cathode Materials for Chloride Ion Batteries

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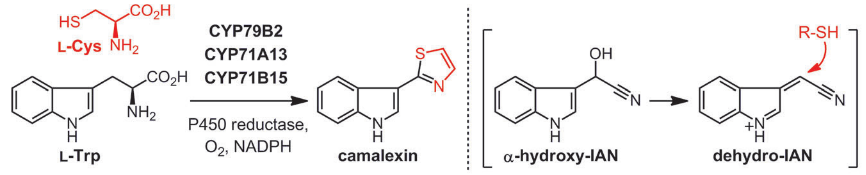

**Bringing it all together**: The missing key step in the biosynthesis of camalexin was uncovered by in vitro biochemical characterization. The coupling of Trp- and Cys-derived fragments through C–S bond formation (see scheme, right) is promoted by an unusual cytochrome P450 CYP71A13. The in vitro reconstitution of the camalexin biosynthesis (left) from Trp and Cys was achieved using just three cytochromes P450. IAN = indole-3-acetonitrile.

### Plant Biosynthetic Pathways

A. P. Klein, G. Anarat-Cappillino,
E. S. Sattely* ———— 13625 – 13628

Minimum Set of Cytochromes P450 for Reconstituting the Biosynthesis of Camalexin, a Major *Arabidopsis* Antibiotic

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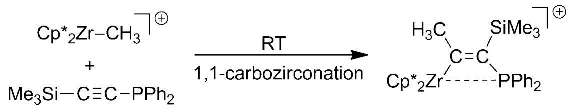

**Boron chemistry without the boron**: In a reaction analogous to 1,1-carboboration, $[Cp^*_2Zr{-}CH_3]^+$ reacts with diphenylphosphino(trimethylsilyl)acetylene by 1,1-carbozirconation to give a vicinal $[Zr]^+$/P system. Like B/P frustrated Lewis pairs, the $[Zr]^+$/P system undergoes 1,2-addition to unsaturated compounds (including $CO_2$) and reaction with metal complexes and up to three equivalents of CO.

### C–C Bond Formation

X. Xu, G. Kehr, C. G. Daniliuc,
G. Erker* ———— 13629 – 13632

1,1-Carbozirconation: Unusual Reaction of an Alkyne with a Methyl Zirconocene Cation and Subsequent Frustrated Lewis Pair Like Reactivity

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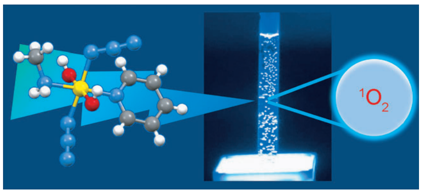
**Worth the excitement**: Highly reactive oxygen and nitrogen species are generated by photoactivation of the anticancer platinum(IV) complex *trans,trans,trans*-$[Pt(N_3)_2(OH)_2(MA)(Py)]$ (MA = methylamine, Py = pyridine). Singlet oxygen is formed from the hydroxido ligands and not from dissolved oxygen, and ammine ligands are products from the conversion of azido ligands to nitrenes. Both processes can induce oxidation of guanine.



### Photoactivated Platinum Complexes

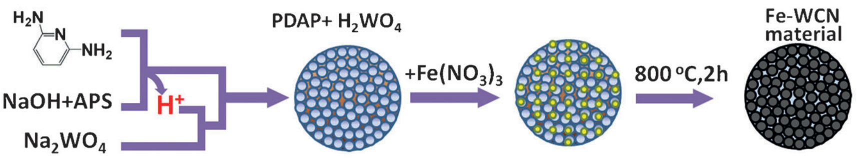
Y. Zhao, N. J. Farrer, H. Li, J. S. Butler,
R. J. McQuitty, A. Habtemariam,
F. Wang,* P. J. Sadler* —— 13633 – 13637

De Novo Generation of Singlet Oxygen and Ammine Ligands by Photoactivation of a Platinum Anticancer Complex

### Electrocatalysts

Y. Zhao, K. Kamiya, K. Hashimoto,*
S. Nakanishi* ——— **13638 – 13641**

Hydrogen Evolution by Tungsten Carbonitride Nanoelectrocatalysts Synthesized by the Formation of a Tungsten Acid/Polymer Hybrid In Situ



**A step forward for tungsten**: Nitrogen-rich tungsten carbonitride (WCN) nanomaterials can act as stable and efficient hydrogen evolution electrocatalysts with a much higher activity than conventional WCN materials. The use of a polymerization process provides a unique synthetic route to $H_2WO_4$ nanoparticles, which can then be used to synthesize the WCN-derived catalysts.

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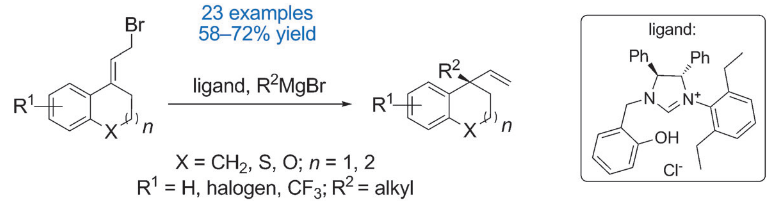
### Asymmetric Catalysis

D. Grassi, A. Alexakis* — **13642 – 13646**

Copper-Free Asymmetric Allylic Alkylation of Trisubstituted Cyclic Allyl Bromides Using Grignard Reagents



**AAA**: The asymmetric allylic alkylation (AAA) of trisubstituted cyclic allyl bromides with Grignard reagents is catalytic (2 mol % of ligand) and regioselective ($S_N2'/S_N2 = 91{:}9 \rightarrow 100{:}0$). The quaternary carbon centers are formed with good to high enantioselectivity (e.r. = 81.5:19.5 → 96:4).

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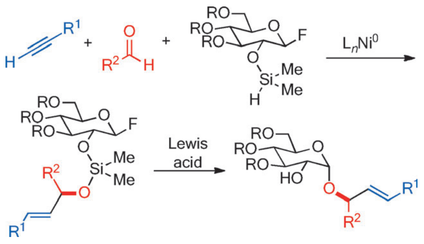
### Multicomponent Reactions

K. M. Partridge, S. J. Bader, Z. A. Buchan,
C. E. Taylor,
J. Montgomery* ——— **13647 – 13650**

A Streamlined Strategy for Aglycone Assembly and Glycosylation



**Multipurpose sugars**: Carbohydrate-derived silane reagents are utilized as the reductant for nickel-catalyzed aldehyde–alkyne reductive coupling reactions and as the glycosyl donor for subsequent intramolecular glycosylation. The approach enables the assembly of the carbon–carbon framework and stereochemical features of an aglycone while simultaneously establishing the site of glycosylation.

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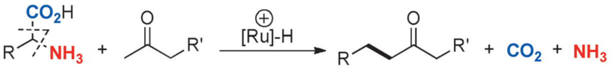
### Synthetic Methods

N. Kalutharage, C. S. Yi* **13651 – 13655**

Deaminative and Decarboxylative Catalytic Alkylation of Amino Acids with Ketones

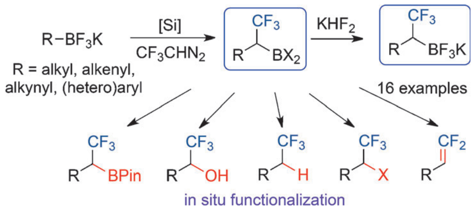


**It cuts two ways**: The cationic [Ru-H] complex catalyzes selective coupling of α- and β-amino acids with ketones to form α-alkylated ketone products. The reaction involves C–C and C–N bond cleavage which result in regio- and stereoselective alkylation using amino acids. A broad substrate scope and high functional-group tolerance is demonstrated.

## Synthetic Methods

O. A. Argintaru, D. Ryu, I. Aron,
G. A. Molander* ———— **13656 – 13660**

Synthesis and Applications of α-Trifluoromethylated Alkylboron Compounds

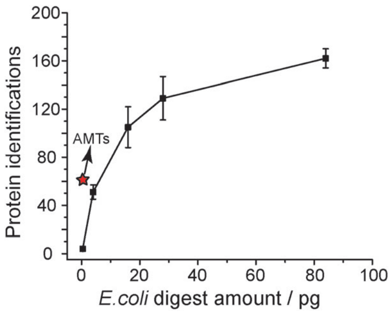


**RBF$_3$K is a chemist's BFF**: A metal-free synthetic route to unprecedented organoboron compounds bearing an α-trifluoromethyl substituent, employing a variety of trifluoroborate (RBF$_3$K) starting materials, is reported. These substrates represent the first isolated α-trifluoromethylated alkylboron building blocks, and these reagents lead to a variety of useful bench-stable, synthetic intermediates. Pin = pinacol.

## Ultrasensitive Analysis

L. Sun, G. Zhu, Y. Zhao, X. Yan, S. Mou,
N. J. Dovichi* ———— **13661 – 13664**

Ultrasensitive and Fast Bottom-up Analysis of Femtogram Amounts of Complex Proteome Digests



**Femtogram proteomics**: An ultrasensitive capillary zone electrophoresis–mass spectrometry system that is based on an improved nanospray interface has been developed. This system is used for the analysis of picogram to femtogram amounts of *E. coli* digests; for example, over 100 proteins were identified from 16 pg digests by tandem mass spectrometry. AMTs = accurate mass and time tags.

## Self-Organization

S. Polarz,* C. Bährle, S. Landsmann,
A. Klaiber ———— **13665 – 13670**

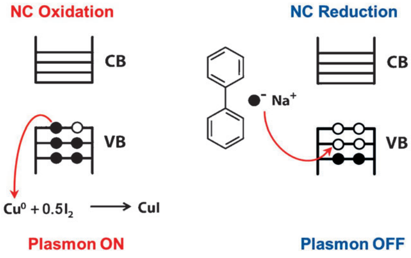
Panoscopic Structures by Hierarchical Cascade Self-Assembly of Inorganic Surfactants with Magnetic Heads Containing Dysprosium Ions

**Magnetic moustaches**: Inorganic surfactants (I-SURFs) with head groups containing Dy$^{3+}$ undergo a hierarchical self-organization cascade controlled by magnetic interactions. The resulting aggregates are shaped like dumbbells with frayed, moustache-like ends.

## Redox-Sensing Nanocrystals

P. K. Jain,* K. Manthiram, J. H. Engel,
S. L. White, J. A. Faucheaux,
A. P. Alivisatos* ———— **13671 – 13675**

Doped Nanocrystals as Plasmonic Probes of Redox Chemistry

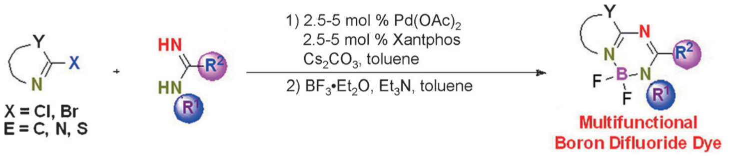


**A (nano)crystal-clear view**: With doped semiconductor nanocrystals, local chemical events can be probed through their perturbation of the carrier density of the nanocrystal. Examples demonstrate that redox processes and ligand chemistry can induce changes in the vacancy density within copper(I) sulfide nanorods, allowing such events to be detected by strong shifts in localized surface plasmon resonance.

## Fluorescent Dyes

D. Zhao, G. Li, D. Wu, X. Qin, P. Neuhaus, Y. Cheng, S. Yang, Z. Lu, X. Pu, C. Long, J. You* ———— **13676 – 13680**

### Regiospecific N-Heteroarylation of Amidines for Full-Color-Tunable Boron Difluoride Dyes with Mechanochromic Luminescence

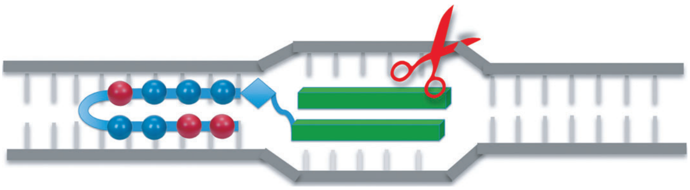


**Colors to dye for**: Palladium-catalyzed regiospecific N-heteroarylations of amidines with 2-halo-N-heteroarenes leads to a structurally diverse library of BF$_2$/amidine-based complexes. These dyes not only present full-visible-color solid-state emissions with large Stokes shifts and high fluorescence quantum yields, but also exhibit a full-color-tunable mechanofluorochromic nature.

## DNA Recognition

W. Kameshima, T. Ishizuka, M. Minoshima, M. Yamamoto, H. Sugiyama, Y. Xu,* M. Komiyama* ———— **13681 – 13684**

### Conjugation of Peptide Nucleic Acid with a Pyrrole/Imidazole Polyamide to Specifically Recognize and Cleave DNA



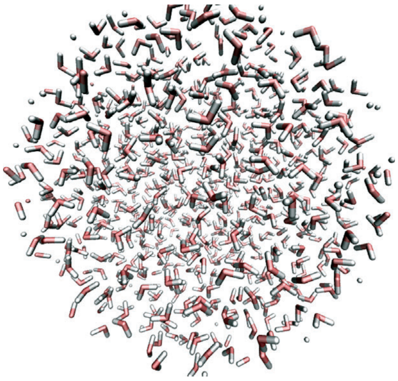
**Cut loose**: A pseudocomplementary peptide nucleic acid was tethered to a pyrrole/imidazole hairpin polyamide, and was used to selectively target a specific DNA sequence. Binding even occurs under high salt conditions. Furthermore, the conjugate facilitated sequence-specific scission of long dsDNA. This simple approach promises to resolve the technical difficulties in targeting DNA sequences with PNA.

## THz Excitation of Water

P. K. Mishra, O. Vendrell,* R. Santra ———— **13685 – 13687**

### Ultrafast Energy Transfer to Liquid Water by Sub-Picosecond High-Intensity Terahertz Pulses: An Ab Initio Molecular Dynamics Study

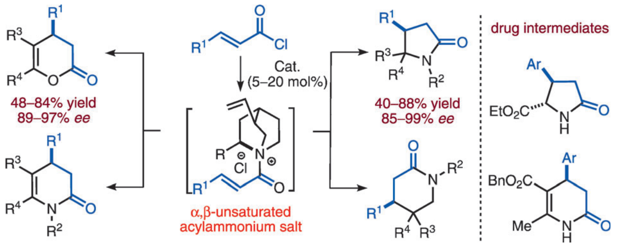
**Sub-picosecond heating** of bulk water is accomplished by ultrashort and intense THz pulses which are able to transfer a large amount of energy to the liquid. The energy transferred corresponds to a temperature jump of about 600 K. Liquid water becomes a structureless and hot gas-like system (see picture) still at the density of the liquid, in which the hydrogen-bonding structure has been washed out.



## Organocatalysis

S. Vellalath, K. N. Van, D. Romo* ———— **13688 – 13693**

### Direct Catalytic Asymmetric Synthesis of N-Heterocycles from Commodity Acid Chlorides by Employing α,β-Unsaturated Acylammonium Salts

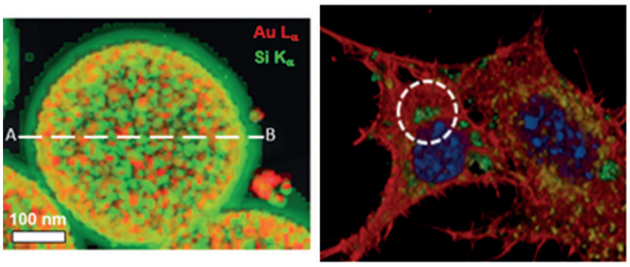


**Taming the beast, asymmetrically**: Modulation of the reactivity of acid chlorides, using cinchona alkaloid catalysts, results in chiral α,β-unsaturated acylammoniums, which react with nucleophiles enantioselectively to give pyrrolidinones, piperid-2-ones, and dihydropyridinones. This nucleophile-catalyzed Michael/proton transfer/lactamization or lactonization organocascade leads to chiral intermediates previously employed for the synthesis of bioactive pharmaceuticals.

## Intracellular Monitoring

P. Rivera_Gil, C. Vazquez-Vazquez,
V. Giannini, M. P. Callao, W. J. Parak,*
M. A. Correa-Duarte,*
R. A. Alvarez-Puebla* 13694–13698

Plasmonic Nanoprobes for Real-Time Optical Monitoring of Nitric Oxide inside Living Cells



**An optical sensor** was developed for the quantitative determination of intracellular nitric oxide. The sensor consists of plasmonic nanoprobes (see picture, left) that have a coating of mesoporous silica and an inner gold island film functionalized with a chemoreceptor for NO.

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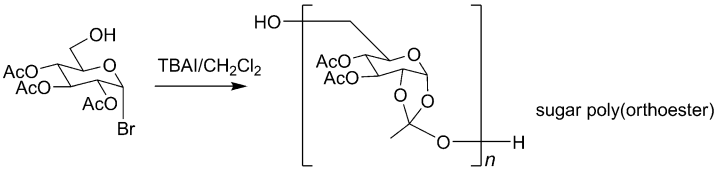
## Sugar Poly(orthoester)

L. Li, Y. Xu, I. Milligan, L. Fu,
E. A. Franckowiak,
W. Du* 13699–13702

Synthesis of Highly pH-Responsive Glucose Poly(orthoester)

**Inside Cover**



**We love sugar!** The synthesis of sugar-based polymers, wherein all sugar units are connected by orthoester linkages, was achieved by polymerization of a glucose-based difunctional AB monomer (see scheme, left). When tetra-*n*-butylammonium iodide (TBAI) was used as a promoter, polymers with molecular weights up to 6.9 kDa were synthesized in a polycondensation manner. These polymers are highly pH-responsive with a half-life of 0.9 hours at pH 6.

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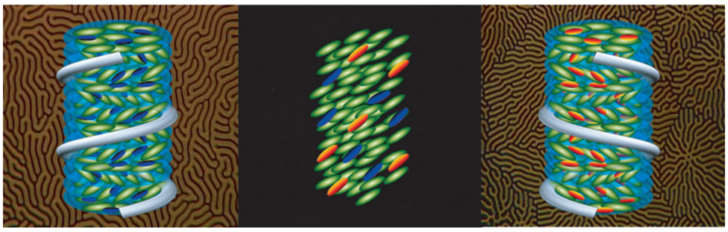
## Photodynamic Switches

Y. Li, C. Xue, M. Wang, A. Urbas,
Q. Li* 13703–13707

Photodynamic Chiral Molecular Switches with Thermal Stability: From Reflection Wavelength Tuning to Handedness Inversion of Self-Organized Helical Superstructures



**A good turn**: Three compounds that bear two axially chiral bridged binaphthyl units were developed as photodynamic chiral dopants for nematic liquid crystals. For compounds with suitable bridge lengths, a change in the dihedral angle induced a switch of the binaphthyl units from the *cisoid* to the *transoid* form upon UV irradiation, which led to an inversion of the handedness of the helices.

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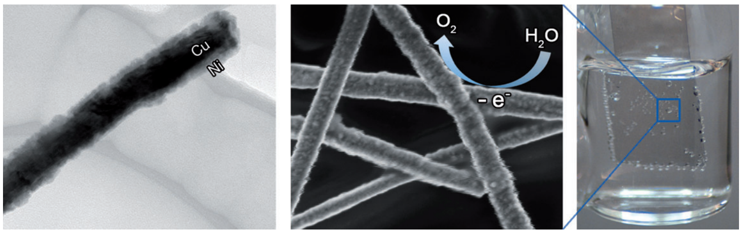
## Water Oxidation

Z. Chen, A. R. Rathmell, S. Ye,
A. R. Wilson, B. J. Wiley* 13708–13711

Optically Transparent Water Oxidation Catalysts Based on Copper Nanowires

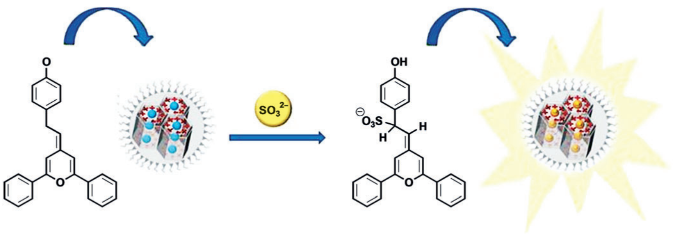


**Let the light shine through**: A transparent film of copper nanowires was transformed into an electrocatalyst for water oxidation by electrodepostion of Ni or Co onto the surface of the nanowires. These core–shell nanowire networks exhibit electrocatalytic performance equivalent to metal oxide films of similar composition, but are several times more transparent.

## Sensors

L. E. Santos-Figueroa, C. Giménez,
A. Agostini, E. Aznar, M. D. Marcos,
F. Sancenón, R. Martínez-Máñez,*
P. Amorós ______ 13712 – 13716

### Selective and Sensitive Chromofluorogenic Detection of the Sulfite Anion in Water Using Hydrophobic Hybrid Organic–Inorganic Silica Nanoparticles

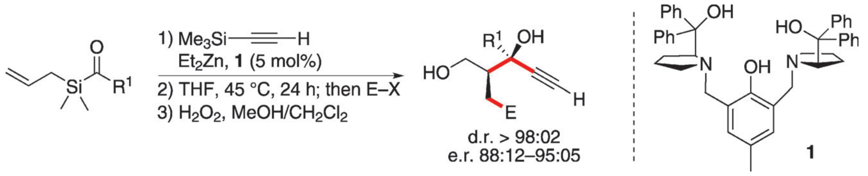


**In water and wine**: Chromofluorogenic detection of the sulfite anion in pure water was accomplished by using a new hybrid organic–inorganic material that contained a probe entrapped in hydrophobic biomimetic cavities. This material was used for the detection of sulfite in red wine.

## Asymmetric Synthesis

P. Smirnov, J. Mathew, A. Nijs, E. Katan,
M. Karni, C. Bolm, Y. Apeloig,
I. Marek* ______ 13717 – 13721

### One-Pot Zinc-Promoted Asymmetric Alkylation/Brook-Type Rearrangement/Ene–Allene Cyclization: Highly Selective Formation of Three New Bonds and Two Stereocenters in Acyclic Systems

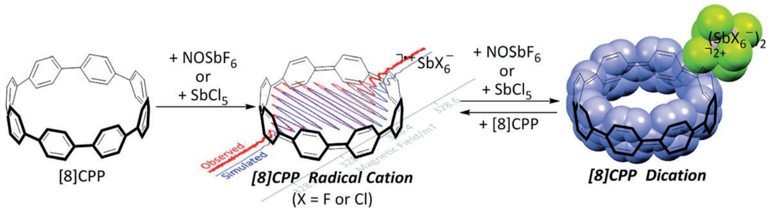


**It's as easy as 1, 2, 3**: In a one-pot sequence, two stereocenters and three new bonds were created with high selectivity through an asymmetric alkynylation of acyl silanes, a tandem Brook-type rearrangement and Zn–ene–allene cyclization, the addition of an electrophile, and finally oxidation (see scheme). The straightforward nature of the synthetic procedure contrasts strongly with the complexity of the densely functionalized products obtained.

## Radical Ions

E. Kayahara, T. Kouyama, T. Kato,
H. Takaya, N. Yasuda,
S. Yamago* ______ 13722 – 13726

### Isolation and Characterization of the Cycloparaphenylene Radical Cation and Dication

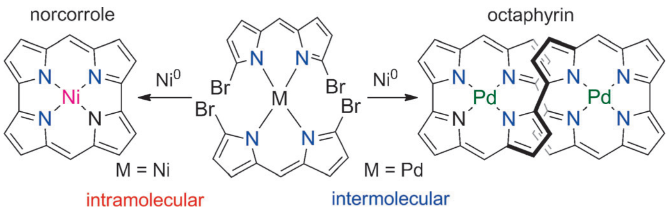


**Charged nanobelts**: The radical cation and the dication of [8]cycloparaphenylene ([8]CPP) were prepared and isolated as hexahaloantimonate salts by the one- or two-electron chemical oxidation of [8]CPP with NOSbF$_6$ or SbCl$_5$. ESR spectroscopy of CPP$^{\cdot+}$ and single-crystal X-ray analysis of CPP$^{2+}$ demonstrated that the spin and charge were equally and fully delocalized over the *para*-phenylene rings.

## Porphyrinoids

H. Kido, J.-Y. Shin,
H. Shinokubo* ______ 13727 – 13730

### Selective Synthesis of a [32]Octaphyrin(1.0.1.0.1.0.1.0) Bis(palladium) Complex by a Metal-Templated Strategy

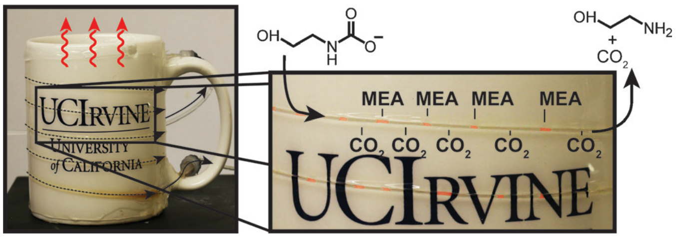


**A shapely figure**: A [32]octaphyrin(1.0.1.0.1.0.1.0) bis[palladium(II)] complex was selectively obtained through a metal-templated intermolecular homocoupling of a α,α′-dibromodipyrrin palladium(II) complex without formation the norcorrole. The weak antiaromatic character of the figure-eight [32]octaphyrin(1.0.1.0.1.0.1.0) system has been elucidated by spectroscopic measurements and DFT calculations.

## Waste Heat Chemistry

D. T. Nguyen,
A. P. Esser-Kahn* ______ 13731 – 13734

A Microvascular System for Chemical Reactions Using Surface Waste Heat

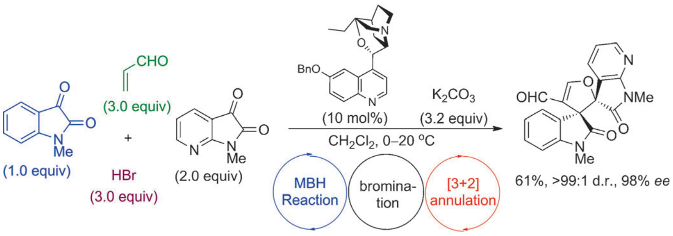


**Coffee-powered chemistry**: Low-grade waste heat on surfaces can be used to drive chemical reactions, including the regeneration of a $CO_2$ capture solution. Flowing two-phase heat transfer has been implemented within microvascular systems. This stripping system can be adapted to pre-fabricated surfaces, as demonstrated by a coffee mug containing a 1.2 m long microchannel. MEA = monoethanolamine

## Asymmetric Catalysis

Y.-L. Liu, X. Wang, Y.-L. Zhao, F. Zhu,
X.-P. Zeng, L. Chen, C.-H. Wang,
X.-L. Zhao, J. Zhou* ______ 13735 – 13739

One-Pot Tandem Approach to Spirocyclic Oxindoles Featuring Adjacent Spiro-Stereocenters

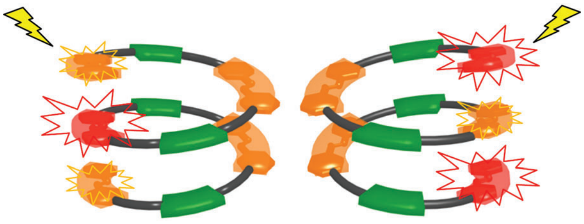


**All in a sequence**: An organocatalyzed Morita–Baylis–Hillman (MBH)/bromination/[3+2] annulation sequence for highly stereoselective syntheses of bis(spirooxindole)s featuring adjacent spiro-stereocenters is described. The key step is an unprecedented catalytic asymmetric [3+2] annulation of isatin-derived MBH adducts, containing a tetrasubstituted alkene moiety, with isatins.

## Smart Foldamers

Z. Yu, S. Hecht* ______ 13740 – 13744

Control over Unfolding Pathways by Localizing Photoisomerization Events within Heterosequence Oligoazobenzene Foldamers

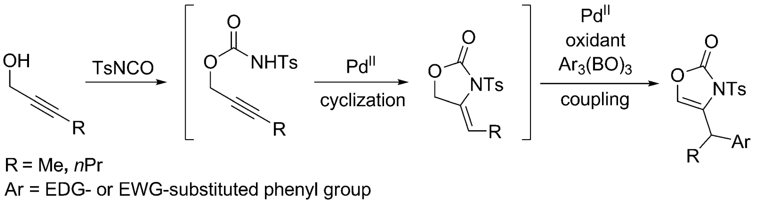


**From the inside out or from the outside in?** Two photoswitchable foldamers that incorporate azobenzene moieties as the energy-acceptor units have been designed. The pathway of helix unfolding can be controlled by localizing these photoinduced triggers (shown in red) either at the core (left) or at the termini (right) of the helix.

### Heterocycle Synthesis

S. K. Alamsetti, A. K. Å. Persson, T. Jiang, J.-E. Bäckvall* ———— **13745 – 13750**

Scalable Synthesis of Oxazolones from Propargylic Alcohols through Multistep Palladium(II) Catalysis: β-Selective Oxidative Heck Coupling of Cyclic Sulfonyl Enamides and Aryl Boroxines



**A whale of a scale**: The title oxidative Heck coupling proceeded with unusual β selectivity to generate a variety of branched substituted oxazolones (see scheme; Ts = *p*-toluenesulfonyl). The three-step synthesis from readily available starting materials with a simple palladium catalyst and inexpensive reagents could be carried out in a single reaction vessel or scaled up for the preparation of large amounts of these amino acid precursors.

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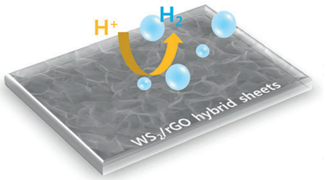
### Electrocatalysis

J. Yang, D. Voiry, S. J. Ahn, D. Kang, A. Y. Kim, M. Chhowalla,* H. S. Shin* ———— **13751 – 13754**

Two-Dimensional Hybrid Nanosheets of Tungsten Disulfide and Reduced Graphene Oxide as Catalysts for Enhanced Hydrogen Evolution

**Composite materials**: Tungsten disulfide and $WS_2$/reduced graphene oxide ($WS_2$/rGO) nanosheets were fabricated by hydrothermal synthesis using tungsten chloride, thioacetamide, and graphene oxide (GO) as starting materials. The $WS_2$ nanosheets are efficiently templated on the rGO layer. The $WS_2$/rGO hybrid nanosheets show much better electrocatalytic activity for the hydrogen evolution reaction (see picture) than $WS_2$ nanosheets alone.



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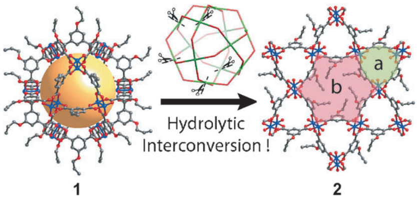
### Crystal Engineering

A. Mallick, B. Garai, D. D. Díaz, R. Banerjee* ———— **13755 – 13759**

Hydrolytic Conversion of a Metal–Organic Polyhedron into a Metal–Organic Framework



**Twist and release**: The metal–organic polyhedron **1** synthesized from 5-(prop-2-ynyloxy)isophthalic acid and $Cu(NO_3)_2 \cdot 3\,H_2O$ has a hydrophobic outer surface and a hydrophilic inner core. In an aqueous medium, the resulting polarity gradient led to the transformation of **1** into the 2D metal–organic framework **2**. This unique phenomenon enabled the gradual release of entrapped drug molecules.

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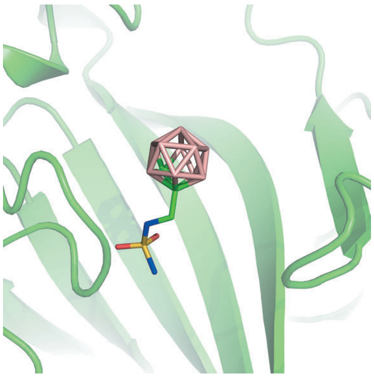
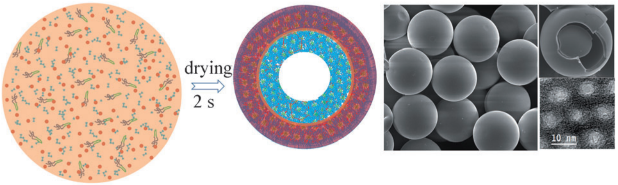
### Enzyme inhibition

J. Brynda, P. Mader, V. Šícha, M. Fábry, K. Poncová, M. Bakardiev, B. Grüner, P. Cígler, P. Řezáčová* — **13760 – 13763**

Carborane-Based Carbonic Anhydrase Inhibitors

**CA inhibitors**: Human carbonic anhydrases (CAs) are diagnostic and therapeutic targets. Various carborane cages are shown to act as active-site-directed inhibitors, and substitution with a sulfamide group and other substituents leads to compounds with high selectivity towards the cancer-specific isozyme IX. Crystal structures of the carboranes in the active site provide information that can be applied to the structure-based design of specific inhibitors.



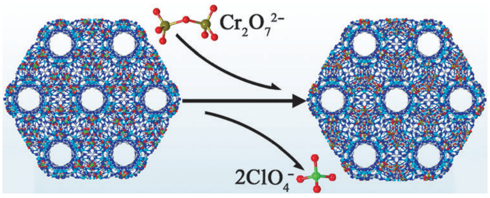


**Drying to meet you**: Using microfluidic jet spray drying technology in conjunction with the evaporation-induced self-assembly strategy gives fast assembly (2 s) of mesoporous carbon microspheres. The key feature of the drying is the formation of a rigid silica crust which locks the particle size and shape.

### *Mesoporous Microspheres*

Z. X. Wu, W. D. Wu, W. J. Liu,
C. Selomulya,* X. D. Chen,
D. Y. Zhao* ______ **13764 – 13768**

A General "Surface-Locking" Approach toward Fast Assembly and Processing of Large-Sized, Ordered, Mesoporous Carbon Microspheres

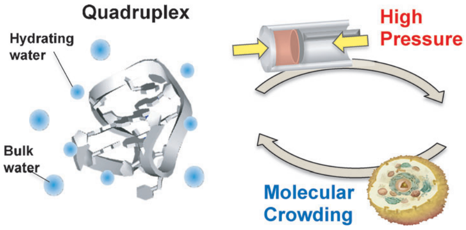


**Dichromate capture**: A 3D cationic metal–organic framework consisting of distorted octahedral and tetrahedral cages was constructed by using $Ag^I$ and 4,4′-bis(1,2,4-triazole). The complex exhibits fast exchange, high trapping capacity, and good selectivity for $Cr_2O_7^{2-}$ through single-crystal to single-crystal transformation. The complex also features a bluish violet luminescence that is distinctly quenched after $Cr_2O_7^{2-}$ exchange.

### *Metal–Organic Frameworks*

X. X. Li, H. Y. Xu, F. Z. Kong,
R. H. Wang* ______ **13769 – 13773**

A Cationic Metal–Organic Framework Consisting of Nanoscale Cages: Capture, Separation, and Luminescent Probing of $Cr_2O_7^{2-}$ through a Single-Crystal to Single-Crystal Process



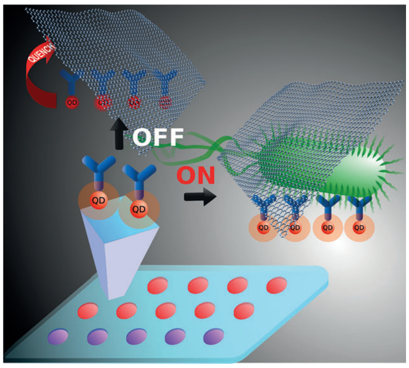
**Under pressure**: A DNA G-quadruplex was unfolded under high pressure, but crowding conditions repressed this effect owing to enthalpic contributions. Volumetric analysis showed that ethylene glycol or poly(ethylene glycol) decreased the volume change of the transition by more than fourfold owing to the alteration of the number and/or radii of hydrating water molecules.

### *DNA Structures*

S. Takahashi,
N. Sugimoto* ______ **13774 – 13778**

Effect of Pressure on the Stability of G-Quadruplex DNA: Thermodynamics under Crowding Conditions

*Inside Back Cover*



**Turned ON by a pathogen**: A highly sensitive pathogen-detection system has been designed and evaluated for the sensing of *E. coli* bacteria in diverse matrices. It employs antibody–quantum dot (Ab-QD) probes and exploits the extraordinary two-dimensional structure and fluorescence-quenching capabilities of graphene oxide.

### *Biodetection*

E. Morales-Narváez, A.-R. Hassan,
A. Merkoçi* ______ **13779 – 13783**

Graphene Oxide as a Pathogen-Revealing Agent: Sensing with a Digital-Like Response

## Conductive Paper

K. Hu, L. S. Tolentino, D. D. Kulkarni,
C. Ye, S. Kumar,
V. V. Tsukruk* ________ **13784 – 13788**

Written-in Conductive Patterns on Robust Graphene Oxide Biopaper by Electrochemical Microstamping

**The silk road**: By employing silk fibroin as a binder between graphene oxide films and aluminum foil for a facile, highly localized reduction process, conductive paper is reinvented. The flexible, robust biographene papers have high toughness and electrical conductivity. This electrochemical written-in approach is readily applicable for the fabrication of conductive patterned papers (see picture) with complex circuitries.

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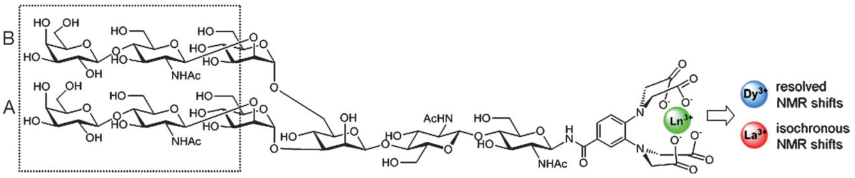
## NMR Spectroscopy

A. Canales, A. Mallagaray,
J. Pérez-Castells, I. Boos, C. Unverzagt,
S. André, H.-J. Gabius, F. J. Cañada,
J. Jiménez-Barbero* _____ **13789 – 13793**

Breaking Pseudo-Symmetry in Multiantennary Complex N-Glycans Using Lanthanide-Binding Tags and NMR Pseudo-Contact Shifts



**Controlling NMR shifts** by lanthanides tagged to a “symmetrical” N-glycan (see picture) reveals individual resonances for the residues of the otherwise identical A and B arms. This method provides a global perspective of conformational features and interactions in solution.

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DOI: 10.1002/anie.201309250

# 50 Years Ago …

*Angewandte Chemie International Edition* was first published in 1962, the mother journal first in 1888. In this monthly flashback, we feature some of the articles that appeared 50 years ago. This look back can open our eyes, stimulate discussion, or even raise a smile.

Decaying urine was shown to be the secret behind Chinese porcelain manufacture. In a Review, Armin Weiss discussed how pretreatment of kaolin in large pits containing urine produced kaolinite intercalation compounds with favorable ceramic properties. Topics of other Reviews included reactions of olefins with organotitanium compounds, the chemistry of isothiazoles, and phenol oxidation reactions.

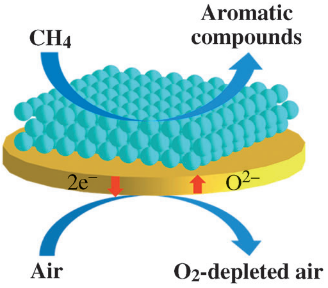
Rolf Zimmermann published two Communications on the reactions of α,β-unsaturated ketones. The first was on the synthesis of cyclic 1,2,6-thiadiazine-1,1-dioxide derivatives by the reaction of α,β-unsaturated ketones with sulfuryl amide. This cyclization reaction proceeded particularly smoothly with *p*-halogenobenzylideneacetophenones. The second Communication outlined the reaction of α,β-unsaturated ketones with thiourea to produce 2-iminotetrahydro-1,3-thiazine derivatives.

Emanuel Vogel et al. reported on the isomerization of *cis*-1,2-divinylcyclopentane. As well as the expected reversible *cis–trans* isomerization, *cis*,*cis*-cyclonona-1,5-diene is also produced at 220°C. This isomer is produced by a Cope rearrangement that proceeds through a six-center boat-form transition state.

Lamberto Malatesta et al. discussed the synthesis and properties of nitrosyl(triphenylphosphine)iridium compounds, which were obtained by treating the corresponding dihydrido compounds with NO. The products had very low infrared absorption frequencies, which suggested the presence of bridging NO units for some of the compounds.

*Read more in Issue 12/1963.*

### *Membrane Reactors*

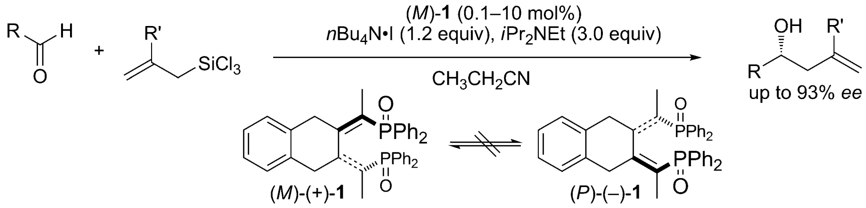


**Adding value with membranes**: Improved methane aromatization was achieved by using an oxygen-permeable membrane. The resulting membrane reactor shows a superior methane conversion and a higher resistance towards catalyst deactivation.

Z. Cao, H. Jiang,* H. Luo, S. Baumann,
W. A. Meulenberg, J. Assmann,
L. Mleczko, Y. Liu,
J. Caro* ________ **13794 – 13797**

Natural Gas to Fuels and Chemicals: Improved Methane Aromatization in an Oxygen-Permeable Membrane Reactor

### *Asymmetric Organocatalysis*

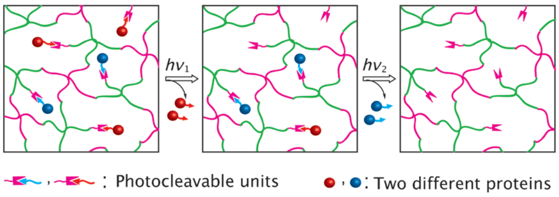


**Diene catalysts with a twist**: The title $C_2$-symmetric tetralin-fused 1,3-butadiene derivative is atropisomeric and can be resolved into the two helical enantiomers. The optically pure compound showed excellent enantioselectivity as well as unusually high catalytic activity as a chiral Lewis basic organocatalyst in the asymmetric allylation of various aldehydes with β-substituted allyltrichlorosilanes (see scheme).

M. Ogasawara,* S. Kotani, H. Nakajima,
H. Furusho, M. Miyasaka, Y. Shimoda,
W.-Y. Wu, M. Sugiura, T. Takahashi,*
M. Nakajima* ________ **13798 – 13802**

Atropisomeric Chiral Dienes in Asymmetric Catalysis: $C_2$-Symmetric (*Z*,*Z*)-2,3-Bis[1-(diphenylphosphinyl)-ethylidene]tetralin as a Highly Active Lewis Base Organocatalyst

### *Photoinduced Protein Delivery*



**On the right wavelength**: Photolabile molecular units that undergo photocleavage under light of different wavelengths can be used for the independent release of different dyes/proteins from a single, preloaded storage hydrogel (see scheme). The controlled release of each protein allowed them to be delivered sequentially and at experimenter-determined times.

M. A. Azagarsamy,
K. S. Anseth* ________ **13803 – 13807**

Wavelength-Controlled Photocleavage for the Orthogonal and Sequential Release of Multiple Proteins

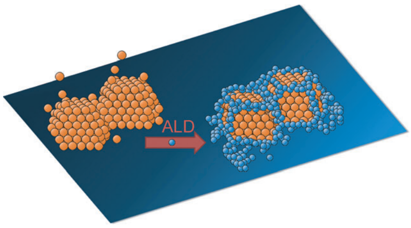
## Catalyst Stability

B. J. O'Neill, D. H. K. Jackson, A. J. Crisci, C. A. Farberow, F. Shi, A. C. Alba-Rubio, J. Lu, P. J. Dietrich, X. Gu, C. L. Marshall, P. C. Stair, J. W. Elam, J. T. Miller, F. H. Ribeiro, P. M. Voyles, J. Greeley, M. Mavrikakis, S. L. Scott, T. F. Kuech, J. A. Dumesic* ________ **13808 – 13812**

Stabilization of Copper Catalysts for Liquid-Phase Reactions by Atomic Layer Deposition

**Back Cover**

**Catalytic Armoring**: Atomic layer deposition (ALD) of alumina overcoats has been employed to stabilize base metal catalysts against sintering and leaching in liquid-phase conditions. Kinetic studies, characterization of the materials, and theoretical studies were used to elucidate the mechanism by which this stabilization of base metal nanoparticles is achieved.



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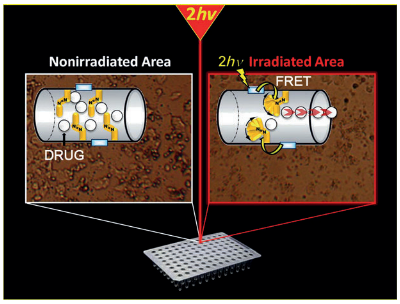
## Drug Delivery

J. Croissant, M. Maynadier, A. Gallud, H. Peindy N'Dongo, J. L. Nyalosaso, G. Derrien, C. Charnay, J.-O. Durand,* L. Raehm, F. Serein-Spirau, N. Cheminet, T. Jarrosson, O. Mongin, M. Blanchard-Desce, M. Gary-Bobo,* M. Garcia, J. Lu, F. Tamanoi, D. Tarn, T. M. Guardado-Alvarez, J. I. Zink* ________ **13813 – 13817**

Two-Photon-Triggered Drug Delivery in Cancer Cells Using Nanoimpellers

**A therapy of cancer cells**: Two-photon-triggered camptothecin delivery (see picture) with nanoimpellers was studied in MCF-7 breast cancer cells. A fluorophore with a high two-photon absorption cross-section was first incorporated in the nanoimpellers. Fluorescence resonance energy transfer (FRET) from the fluorophore to the azobenzene moiety was demonstrated.



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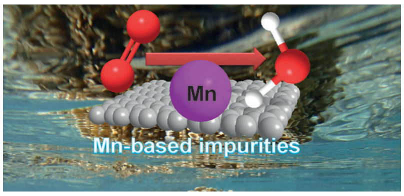
## Eelctrocatalysis

L. Wang, A. Ambrosi, M. Pumera* ________ **13818 – 13821**

"Metal-Free" Catalytic Oxygen Reduction Reaction on Heteroatom-Doped Graphene is Caused by Trace Metal Impurities

**Front Cover**

**Carbon materials**: Heteroatom-doped graphene surfaces are used as electrocatalysts for the oxygen reduction reaction. The claimed "metal-free" electrocatalysis of the oxygen reduction reaction is caused by metallic impurities (see picture) present within the graphene materials.



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Supporting information is available on www.angewandte.org (see article for access details).

A video clip is available as Supporting Information on www.angewandte.org (see article for access details).

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The Hot Papers are articles that the Editors have chosen on the basis of the referee reports to be of particular importance for an intensely studied area of research.

# Angewandte Corrigendum

Tuning a P450 Enzyme for Methane Oxidation

F. E. Zilly, J. P. Acevedo, W. Augustyniak, A. Deege, U. W. Häusig, M. T. Reetz* **2720–2724**

*Angew. Chem. Int. Ed.* **2011**, *50*

DOI: 10.1002/anie.201006587

In this study, the authors reported the use of perfluoro fatty acids as activating additives in the P450-BM3-catalyzed oxidative hydroxylation of small alkanes, which in the absence of these activators react with low TON values or are not accepted at all by the enzyme as in the case of propane or methane. In order to detect the alcohols formed in the aqueous medium, HPLC analysis was employed utilizing the pulsed amperometric detection method of LaCourse. While this method provides reliable data for 2-propanol produced from propane with correct TON values of about 3000, the authors have now realized that the data for methanol are incorrect. Due to the coincidental and unfortunate overlap of the methanol peak with the peak of an as-yet-unknown compound present in the aqueous reaction mixture, high TON numbers were incorrectly deduced. In the original communication, a control experiment using GC/MS was reported, which appeared to substantiate the presence of methanol, but it was not possible to quantify it. New experiments show that the unknown compound does not appear in the GC/MS chromatogram which contributed to the misinterpretation, i.e., either it is decomposed in the injection port of the GC or it is adsorbed most likely on the column. The authors now report that methanol of unknown origin appears only as a background compound in trace amounts, and that methane is not hydroxylated to any appreciable extent if at all. The details of this clarifying investigation systematically performed by C. G. Acevedo-Rocha (Marburg) and members of the Chromatography Department of the Mülheim Max Planck Institute, H. Hinrichs, F. Kohler, and A. Deege, will be reported in due course. M. T. Reetz sincerely apologizes for this unfortunate mishap.

The general method of activating P450-BM3 by the use of chemically inert perfluoro fatty acids as described in the original communication remains valid, as independently reported by the group of Y. Watanabe, who used the same concept in the successful oxidation of propane and of other alkanes including ethane, but not methane.[1,2] Theoretical investigations also provide an insight into the possible reaction mechanism for small alkane hydroxylation in the presence of perfluoro fatty acids.[3] The only presently known valid study of methane oxidation catalyzed by a P450 enzyme is due to Arnold and colleagues, who reported a TON value of 0.05 using another method without using additives.[4] The authors thank Prof. Y. Watanabe and Prof. O. Shoji for sharing data and exchanging plasmids as well as Dr. G.-D. Roiban and Dr. U. Linne for helpful discussions.

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[1] N. Kawakami, O. Shoji, Y. Watanabe, *Angew. Chem.* **2011**, *123*, 5427–5430; *Angew. Chem. Int. Ed.* **2011**, *50*, 5315–5318.
[2] N. Kawakami, O. Shoji, Y. Watanabe, *Chem. Sci.* **2013**, *4*, 2344–2348.
[3] C. Li, S. Shaik, *RSC Adv.* **2013**, *3*, 2995–3005.
[4] M. M. Chen, P. S. Coelho, F. H. Arnold, *Adv. Synth. Catal.* **2012**, *354*, 964–968.