CHEMISTRY & SUSTAINABILITY

# CHEMSUSCHEM

ENERGY & MATERIALS

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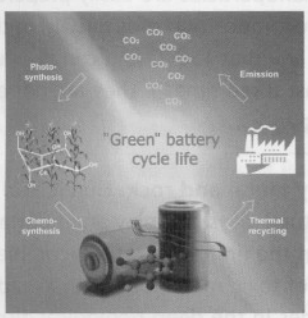
## COVER PICTURE



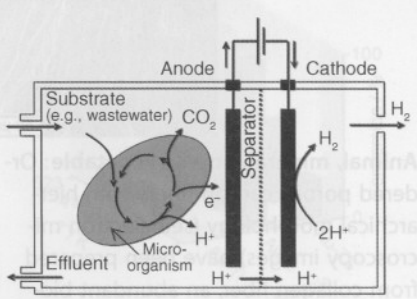

**The cover picture shows** a scheme illustrating a new concept in the design of electrode materials for the next generation of Li-ion batteries. At present, Li-ion batteries rely on the use of inorganic compounds, which are resource-limited and require significant amounts of energy either for their synthesis or recycling. Ideally, in the life cycle of a sustainable Li-ion battery, sunlight is used as the energy source and no additional $CO_2$ is produced. In their Full Paper on page 348 ff., F. Dolhem, P. Poizot et al. describe a radically different approach by which a new organic electrode material $Li_xC_6O_6$ has been developed using "green chemistry" concepts. *myo*-Inositol, which is available from renewable resources ($CO_2$-harvesting plants), is used as a precursor for the synthesis of the oxocarbon, and no toxic solvents are required during the processing steps. Importantly, the performances of $Li_xC_6O_6$ compare favourably with conventional insertion electrode materials.

## NEWS

Spotlights on our sister journals *278 – 279*

## HIGHLIGHTS

**An untapped potential**: An efficient and sustainable method for directly producing hydrogen from cellulose and fermentation end-products in a modified microbial fuel cell was recently reported. Bacteria grown from soil and wastewater feed on the organic matter, transferring electrons and releasing protons. Application of a small voltage to the circuit results in hydrogen generation.




*U. Schröder**
*281 – 282*
**From Wastewater to Hydrogen: Biorefineries Based on Microbial Fuel-Cell Technology**

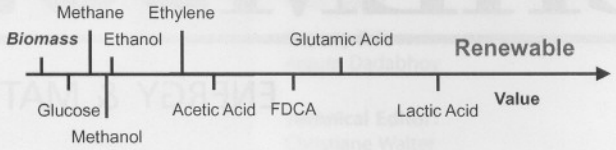
  

## CONCEPTS

*C. H. Christensen,* J. Rass-Hansen, C. C. Marsden, E. Taarning, K. Egeblad*

***283 – 289***

**The Renewable Chemicals Industry**



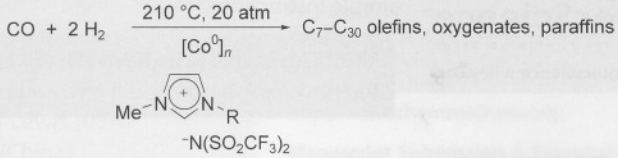

**Renewing the chemical industry**: What are the possibilities for establishing a renewable chemicals industry, one that features renewable resources as the dominant feedstock rather than fossil resources? It is proposed that such use of biomass can potentially be interesting from both an economical and ecological perspective and might well represent the most attractive way to use limited bioresources.

## COMMUNICATIONS

*D. O. Silva, J. D. Scholten, M. A. Gelesky, S. R. Teixeira, A. C. B. Dos Santos, E. F. Souza-Aguiar, J. Dupont**

***291 – 294***

**Catalytic Gas-to-Liquid Processing Using Cobalt Nanoparticles Dispersed in Imidazolium Ionic Liquids**

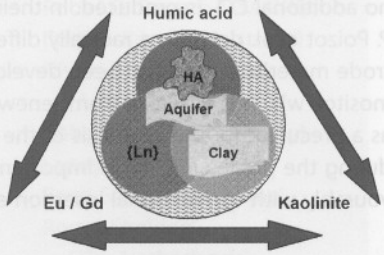



**FT special report**: Cobalt nanoparticles with a size of around 7.7 nm prepared in 1-alkyl-3-methylimidazolium bis(trifluoromethanesulfonyl)imidate ionic liquids are effective catalysts for the Fischer–Tropsch (FT) synthesis, yielding olefins, oxygenates, and paraffins ($C_7$–$C_{30}$). The nanoparticles are easily prepared by the decomposition of $[Co(CO)_8]$ in the ionic liquid at 150 °C and can be reused at least three times if they are not exposed to air.

*R. Kautenburger,* H. P. Beck*

***295 – 297***

**Waste Disposal in Clay Formations: Influence of Humic Acid on the Migration of Heavy-Metal Pollutants**

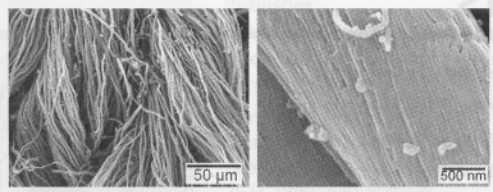



**Heavy metal and rock**: Humic acid (HA) in natural clays can play an important role in the (im)mobilization (complexation) of toxic metal ions such as radionuclides in the deep geological disposal of high-level radioactive waste. To better understand the influencing factors, the sorption behavior of $Eu^{3+}$ and $Gd^{3+}$ ions, as homologues of the actinides Am and Cm, was studied under various conditions.

*D. Deng, X. Liao,* B. Shi**

***298 – 301***

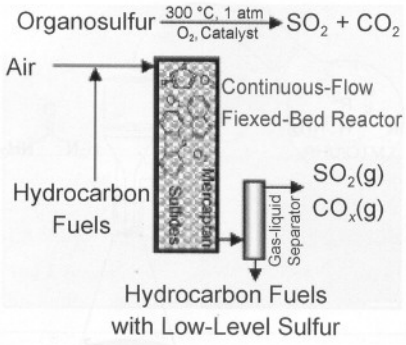
**Synthesis of Porous Carbon Fibers from Collagen Fiber**




**Animal, mineral, and/or vegetable**: Ordered porous carbon fibers with hierarchical morphology (see electron microscopy images) have been prepared from collagen fiber, an abundant biomass, by treatment with metal ions and vegetable tannin or glutaraldehyde. The pore size of the carbon fibers thus obtained can be controlled by varying the metal ion, the metal-to-collagen ratio, as well as the organic reagent.

**Cleaning up their act**: Sulfur compounds in fuels can be selectively converted into $SO_2$ by mixing the fuel with a small amount of air at around 300 °C at ambient pressure in a continuous-flow reactor packed with catalysts such as $Pt/CeO_2$, $Cu/CeO_2$, and $CuO/ZnO/Al_2O_3$. The aerobic oxidative desulfurization process opens up a cost-effective new technology for cleaning fuels.

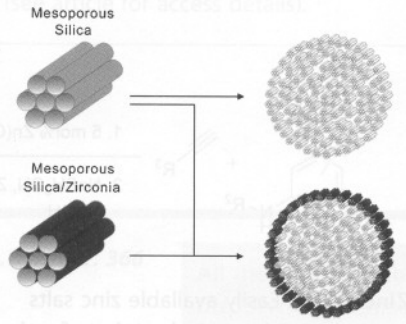



*Y. Lu,* Y. Wang, L. Gao, J. Chen, J. Mao, Q. Xue, Y. Liu, H. Wu, G. Gao, M. He*

***302 – 306***

**Aerobic Oxidative Desulfurization: A Promising Approach for Sulfur Removal from Fuels**

**Adsorbed in what it's doing**: Well-designed mesoporous silica adsorbents (see scheme) can contribute to the production of clean fuels through preferential adsorption of nitrogen- and sulfur-containing compounds from light gas oil and heavy catalytic naphtha in refinery streams. The adsorbent with Zr ions shows a higher adsorption capacity and affinity for sulfur compounds than its non-zirconia-containing counterpart.



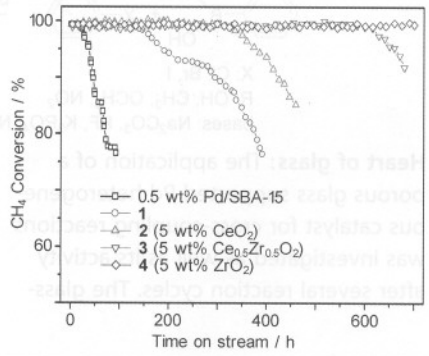

*J.-M. Kwon, J.-H. Moon, Y.-S. Bae, D.-G. Lee, H.-C. Sohn, C.-H. Lee**

***307 – 309***

**Adsorptive Desulfurization and Denitrogenation of Refinery Fuels Using Mesoporous Silica Adsorbents**

## FULL PAPERS

**Fire without smoke**: A series of Pd-based metal monolithic catalysts (0.5 wt% Pd/SBA-15/$Al_2O_3$/FeCrAl; **1**) were prepared for the catalytic combustion of methane to carbon dioxide and water. The addition of $Ce_{1-x}Zr_xO_2$ as promoter improves the activity and stability of the catalysts (**2**–**4**). The catalyst containing only $ZrO_2$ as promoter (**4**) is the most active and stable.

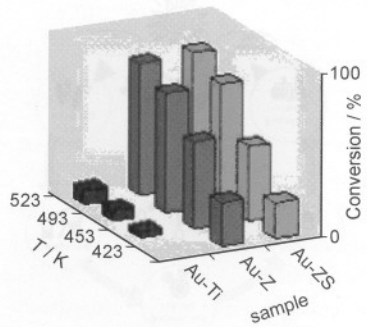



*F. Yin, S. Ji, P. Wu, F. Zhao, H. Liu, C. Li**

***311 – 319***

**Preparation of Pd-Based Metal Monolithic Catalysts and a Study of Their Performance in the Catalytic Combustion of Methane**

**An Au-spicious catalyst**: Gold-loaded zirconia (Au-Z) and sulfated zirconia (Au-ZS) catalysts show a high catalytic activity in the low-temperature water gas shift reaction. The sample prepared on sulfated zirconia exhibits higher stability than that prepared on the non-sulfated support. CO chemisorption, IR spectroscopy, and electron microscopy data strongly indicate the presence of highly dispersed, adsorbing gold sites.




*F. Menegazzo, F. Pinna,* M. Signoretto, V. Trevisan, F. Boccuzzi, A. Chiorino, M. Manzoli*

***320 – 326***

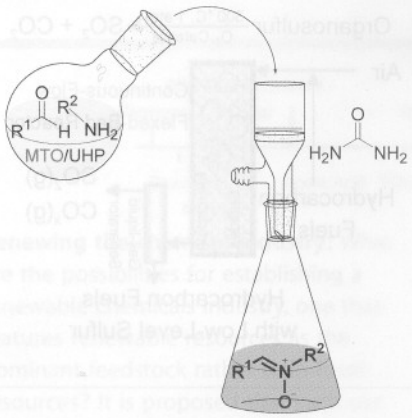
**Highly Dispersed Gold on Zirconia: Characterization and Activity in Low-Temperature Water Gas Shift Tests**

*F. Cardona, M. Bonanni, G. Soldaini, A. Goti**

*327 – 332*

**One-Pot Synthesis of Nitrones from Primary Amines and Aldehydes Catalyzed by Methyltrioxorhenium**

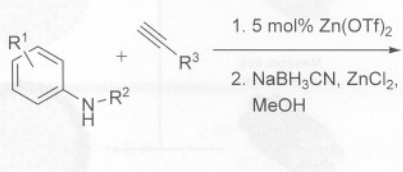



**Simple, selective, sustainable**: Nitrones can be synthesized from primary amines and aldehydes by a one-pot condensation/oxidation process with urea–hydrogen peroxide (UHP) in the presence of methyltrioxorhenium (MTO). At the end of the reaction, the solid urea is simply filtered off. The reaction is simple and high yielding (68–89%), and it allows the regioselective synthesis of nitrones from easily available starting materials.

*K. Alex, A. Tillack, N. Schwarz, M. Beller**

*333 – 338*

**General Zinc-Catalyzed Intermolecular Hydroamination of Terminal Alkynes**

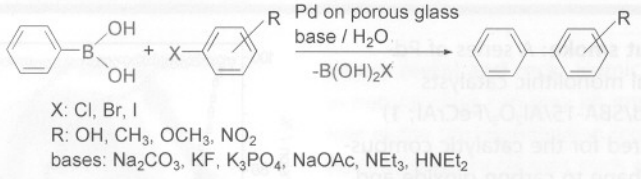



**Zinc green**: Easily available zinc salts are active and practical catalysts for the intermolecular hydroamination of terminal alkynes with anilines. The reactions proceed in the presence of $Zn(OTf)_2$ with excellent regioselectivity (>99%) and with high yields. Moreover, difficult functional groups such as nitro and cyano substituents are tolerated by the catalyst.

*C. Schmöger, T. Szuppa, A. Tied, F. Schneider, A. Stolle, B. Ondruschka**

*339 – 347*

**Pd on Porous Glass: A Versatile and Easily Recyclable Catalyst for Suzuki and Heck Reactions**

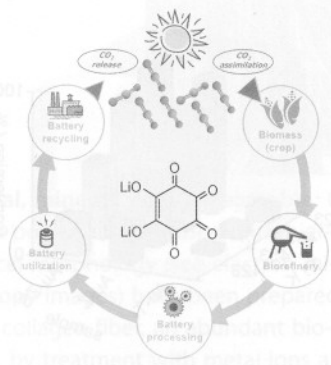



**Heart of glass**: The application of a porous glass supported Pd heterogeneous catalyst for cross-coupling reactions was investigated as well as its activity after several reaction cycles. The glass-supported Pd catalyst was applied in Suzuki and Heck reactions, and the influence of various parameters, such as the base employed, on its reusability was tested.

*H. Chen, M. Armand, G. Demailly, F. Dolhem,* P. Poizot,* J.-M. Tarascon*

*348 – 355*

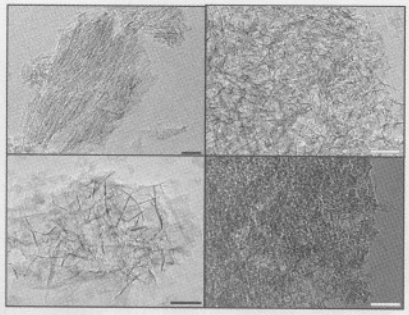
**From Biomass to a Renewable $Li_xC_6O_6$ Organic Electrode for Sustainable Li-Ion Batteries**




**Battery farming**: Li-ion batteries presently operate on inorganic insertion compounds, however, the abundance and life-cycle costs of materials for such batteries may present issues in the long term. In a radically different approach, the oxocarbon salt $Li_2C_6O_6$ has been developed from renewable resources ($CO_2$-harvesting entities) as a new organic electrode material.

**An appetite for arsenic**: γ-Alumina nanosorbents with iron(III) guests were prepared and studied for the removal of arsenic from drinking water. Morphologically controlled γ-alumina (see electron microscopy images) was prepared as the host solid by an ionothermal process, and subsequent sonochemical treatment was used to entrap $Fe^{III}$, which forms complexes with $As^{V}$.



*H. S. Park, Y.-C. Lee, B. G. Choi, W. H. Hong,* J.-W. Yang*

***356 – 362***

**Clean and Facile Solution Synthesis of Iron(III)-Entrapped γ-Alumina Nanosorbents for Arsenic Removal**

Supporting information at www.chemsuschem.org (see article for access details).

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

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