



New Application Developments in PGMs – May 2010

Convert ethylene and benzene to phenol precursor sec-butylbenzene in high yield: Palladium.

Patent Watch, 03 May 2010

http://portal.acs.org/portal/PublicWebSite/patent/archive/CNBP_024762

A. B. Dandekar and colleagues at ExxonMobil Chemical disclose a unique process that makes sec-butylbenzene in high yield and purity. In their invention, ethylene (instead of butenes) reacts with benzene over an MCM-22 zeolite modified with palladium.

New catalyst could move fuel cell technology closer to mainstream: Platinum

Texas A&M Engineering News | Texas A&M University, 07 May 2010

<http://engineering.tamu.edu/news/index.php/2010/05/07/new-catalyst-could-move-fuel-cell-technology-closer-to-mainstream/>

Image: Balbuena views a model showing the detachment of a platinum atom (grey) from a nanocatalyst surface, driven by the presence of oxygen (red) and acid agents (yellow),

<http://engineering.tamu.edu/news/wp-content/uploads/2010/05/balbuena.jpg>

Perla Balbuena and her research group at Texas A&M University, Artie McFerrin Department of Chemical Engineering, were able to demonstrate the potential durability and activity properties of a new “core-shell” composite material that can serve as a catalyst within a fuel cell. The material, she explains, still uses platinum but less of it, meaning it's cheaper. What's more, in its core, the material uses other key elements in a way that ensures the core particles will not segregate to the surface and dissolve in the polymeric membrane.

Chemist stitches up speedier chemical reactions: Ruthenium

EurekaAlert!, 09 May 2010

New details about the Piers catalyst will help chemical industry improve products

http://www.eurekaalert.org/pub_releases/2010-05/uoc-csu050510.php

In a paper published in Nature Chemistry, Warren Piers, a chemistry professor at the University of Calgary, and former graduate student Edwin van der Eide reveal the inner workings of the Piers ruthenium catalyst at a molecular level of detail not previously available.

Valeric biofuels from lignocellulose: Platinum.

tcetoday news, 13 May, 2010

<http://www.tcetoday.com/tcetoday/NewsDetail.aspx?nid=12770>

A "new platform" of cellulosic biofuels, valeric esters, has been developed by researchers at Shell Global Solutions.

The valerolactone is first hydrogenated to produce valeric acid. This is then esterified to produce valerate esters. The researchers say the hydrogenation of valerolactone has not previously been reported and the process was therefore developed by them. They tested 150 possible catalysts before finding that the most promising were based on platinum, with the process running at 400°C.

Opposites attract and inspire electrocatalyst: Platinum

PNNL: Research Highlights, May 2010

U.S., China team convince platinum and gold particles to come together and form nanocatalysts

<http://www.pnl.gov/science/highlights/highlight.asp?id=771>

Tiny gold particles will surround themselves with even smaller platinum particles, creating a complex structure that could turn formic acid into electricity in a fuel cell, according to scientists from China's Harbin Institute of Technology(Offsite link) and the Pacific Northwest National Laboratory.

Brown chemists report promising advance in fuel-cell technology: Palladium

Brown University Media Relations, 24 May 2010

<http://news.brown.edu/pressreleases/2010/05/core-shell>

Chemists at Brown University have come up with a promising advance in fuel cell technology. The team has demonstrated that a nanoparticle with a palladium core and an iron-platinum shell outperforms commercially available pure-platinum catalysts and lasts longer.

Make a photoswitching device by using layer-by-layer assembly of ruthenium(III) ions and terpyridine-functionalized carbon nanotubes

Noteworthy Chemistry, 24 May 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CTS_035100

J. Shi, Y. Dong, and co-workers at the Beijing Institute of Technology have developed an elegant process for making a photoswitching cell by using Ru(III) ions and multiwalled carbon nanotubes (MWCNTs) as assembly units.

New start for Pd(III) chemistry: Palladium

Latest News | Chemical & Engineering News, 24 May 2010, Volume 88, Number 21, p. 9

<http://pubs.acs.org/cen/news/88/i21/8821notw5.html>

A research group led by Liviu M. Mirica, a chemistry professor at Washington University in St. Louis, have shown that a novel organometallic Pd(III) complex with a pyridine-based macrocyclic ligand can react to form C–C bonds, opening up a new area of monopalladium chemistry.

Partial hydrogenation of internal alkynes gives alkenes with high cis-selectivity: Palladium
Noteworthy Chemistry, 24 May 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CTS_035100

J. Li, R. Hua, and T. Liu at Tsinghua University (Beijing) report that the combination of DMF and KOH is as an efficient hydrogen source for Pd(OAc)₂-catalyzed transfer semireduction of aryl- and alkyl-substituted alkynes.

A novel designer surface catalyst for oxidations: Platinum
Chemistry World, 27 May 2010

<http://www.rsc.org/chemistryworld/News/2010/May/27051002.asp>

Scientists in China at the Dalian Institute of Chemical Physics and University of Science and Technology of China have developed a new surface-based catalyst that can selectively oxidise carbon monoxide to carbon dioxide in the presence of hydrogen – making it potentially useful for hydrogen fuel cells, where carbon monoxide can poison the platinum electrodes. The catalyst is made by creating 'nanoislands' of ferrous oxide, around 3-5nm across, on a platinum surface by evaporating iron on to the surface in the presence of oxygen.

Squeezing information from materials under extreme pressure: Platinum
Science & Research Highlights | Advanced Photon Source, 28 May 2010

http://www.aps.anl.gov/Science/Highlights/Content/APS_SCIENCE_20100528.php

Image: Measurement of x-ray transmission (red highest, blue lowest) through a mixture of iron, platinum, and tungsten compressed to 282 GPa. The outer image, 40 μm x 40 μm, is resolved into 1-μm pixels, and shows only the roughly circular boundary of the diamond face compressing the sample. The inner portion, 15 μm x 15 μm, is resolved into 250-nm pixels, and clearly shows distinct regions of the three metals, http://www.aps.anl.gov/Science/Highlights/Images/APS_SCIENCE_20100528-1.jpg

A team of researchers from the U.S. Department of Energy's Argonne National Laboratory, the Carnegie Institution of Washington (CIW), National Cheng Kung University (Taiwan), and Stanford University used narrow x-ray beams at two beamlines operated by the Argonne X-ray Science Division of the Advanced Photon Source (APS) to probe a mixture of iron, platinum, and tungsten compressed in diamond anvil cell to pressures up to 2.82 million atmospheres. To make the samples, the researchers loaded a mixture of iron and platinum into a 10-μm hole drilled into a sheet of tungsten. They then squeezed the sheet between two diamond anvils with faces measuring 18 μm across.

Synthesize enantiopure trifluoromethyl-substituted amino acids: Rhodium
Noteworthy Chemistry, 31 May 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_024992

Image: http://portal.acs.org/portal/binfetch/consumption?fileUrl=/stellent/groups/web/documents/article/%7Eexport/CNBP_024992%7E5%7EHTML_DC_TEMPLATE%7ESNIPPET_LAYOUT/22870-5.jpg

Fluorinated bioactive compounds are a significant part of modern drug design. C. Benhaim and co-workers at Wyeth Research (Quebec) report the first synthesis of enantiopure (>99% ee) β-trifluoromethyl-α-amino acid precursors by using a stereoselective hydrogenation reaction. The synthesis strategy is based on forming prochiral alkenes such as 1 using Schollkopf's procedure. This reaction protects the amine site with a formyl group instead of acetyl. The formyl group is easily removed after subsequent reactions. A rhodium catalyst complex with a cyclic phosphorus ligand provides optimum results for hydrogenating 1 to give amino acid precursor 2.

Walk a dendritic tightrope to functional polyethylene nanoparticles: Palladium

Noteworthy Chemistry, 31 May 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_024992

Image:

http://portal.acs.org/portal/binfetch/consumption?fileUrl=/stellent/groups/web/documents/article/%7Eexpo rt/CNBP_024992%7E5%7EHTML_DC_TEMPLATE%7ESNIPPET_LAYOUT/22870-1.jpg

G. Sun and Z. Guan at the University of California, Irvine, generated functional, tailorable dendrimer-on-dendrimer nanoparticles with a one-pot, multistep, chain-walking polymerization (CWP). They functionalized a dendritic polyethylene (PE, ~320 kDa) with 3-butenolate (1), then activated it with a palladium catalyst precursor to yield a multivalent chain-walking catalyst (MVCWC, 2) with ~174 catalyst sites; TBDPS is tert-butyldiphenylsilyl. The dendritic MVCWC initiated the polymerization of ethylene to form high-molecular weight functional nanoparticles (3).

A chemoenzymatic procedure is the key to a novel chiral drug synthesis: Ruthenium

Noteworthy Chemistry, 31 May, 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_024992

Image:

http://portal.acs.org/portal/binfetch/consumption?fileUrl=/stellent/groups/web/documents/article/%7Eexpo rt/CNBP_024992%7E5%7EHTML_DC_TEMPLATE%7ESNIPPET_LAYOUT/22870-2.jpg

Rivastigmine (1) is a carbamate-based drug that functions as an acetylcholinesterase inhibitor and acts selectively to improve cognition and quality of life for patients with mild to moderate Alzheimer's disease. The tartrate salt of 1 is marketed under the trade name Exelon. M.-J. Kim and co-workers at Pohang University of Science and Technology (Korea) developed a strategy for making 1 that uses dynamic kinetic resolution (DKR) of a racemic intermediate with enzyme catalysis. DKR is a process in which in situ metal-catalyzed racemization is coupled with enzymatic resolution. In this study, the authors used a polymer-bound ruthenium complex 5 as the racemization catalyst.

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