New Application Developments in PGMs – March 2010

Ruthenium complex fluorescence is selectively turned on by G-quadruplexes
Noteworthy Chemistry, 01 March 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_024236

Image: http://www.rsc.org/ej/CC/2010/b918045a/b918045a-s1.gif

Detecting G-quadruplex (four-stranded guanine-rich) structures is important in cancer research and drug development. Ruthenium complexes are widely used to study interactions with nucleic acids, but only weak selectivities between G-quadruplex and duplex structures have been observed. A research team led by X. Zhou at Wuhan University (China) has developed a new dinuclear Ru(II) complex with high quadruplex-selectivity.

Allylic gem-dibenzoates provide access toanti-1-ene-2,3-diols: Iridium.
Noteworthy Chemistry, 08 March 2010.

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_024284

S. B. Han, H. Han, and M. J. Krische at the University of Texas at Austin describe an efficient reaction in which an allylic gem-dibenzoate reductively couples with aldehydes under the catalytic control of an iridium complex. This method produces anti-alkoxyallylation products with high enantiomeric and diastereomeric control.

A new spin on conductivity: electric signals can propagate through an insulator: Platinum.
Scientific American, 11 March 2010.

http://www.scientificamerican.com/article.cfm?id=spin-waves-insulator

Electrons not only have charge, they also have spin--and electric insulators are not opaque to the latter property

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Platinum nanoparticles shown to strongly enhance the efficacy of radiation therapy.
Nanowerk Spotlight, 12 March 2010

http://www.nanowerk.com/spotlight/spotid=15275.php

Image: http://www.nanowerk.com/spotlight/id15275.jpg

Reporting their findings in a recent issue of Nanotechnology, Sandrine Lacombe, an associate professor in the Department of Chemistry at the Université Paris-Sud, and her collaborators discovered a strong enhancing effect of lethal damage in DNA induced by platinum nanoparticles when combined to fast carbon ion irradiation.

"This combination – platinum nanoparticles and hadron therapy – improves the efficacy of the radiation but also tumor targeting, thanks to the surface coating" says Lacombe. "It is thus a very promising method for cancer therapy."

Potent and selective photo-inactivation of proteins with peptoid-ruthenium conjugates.
Nature Chemical Biology, 14 March 2010

http://www.nature.com/nchembio/journal/v6/n4/abs/nchembio.333.html

Advances in high-throughput screening now enable the rapid discovery of bioactive small molecules, but these primary hits almost always exhibit modest potency. US researchers report a strategy for the transformation of these hits into much more potent inhibitors without compound optimization. Appending a derivative of Ru(II)(tris-bipyridyl)$^{2+}$, an efficient photosensitizer of singlet oxygen production, to synthetic protein-binding compounds results in highly potent and specific target protein inactivation upon irradiation with visible light.

Schematic: Percolation pathways on hydrogen-sensing film.
nanotechweb.org, 17 March 2010

http://nanotechweb.org/cws/article/lab/41994

Image: http://images.iop.org/objects/ntw/journal/9/3/10/image1.jpg

An Argonne National Laboratory team explores crossover behaviour in palladium film design.

Hydrogen-sensing mechanism depends on thickness: Palladium
nanotechweb.org, 17 March 2010

http://nanotechweb.org/cws/article/lab/41994

Schematic: Percolation pathways on hydrogen-sensing film,
http://images.iop.org/objects/ntw/journal/9/3/10/image1.jpg

An Argonne National Laboratory team explores crossover behaviour in palladium film design.

Dual sensing spray-on wash-off paints: Platinum, iridium.
Chemical Science, 18 March 2010.

http://www.rsc.org/Publishing/ChemScience/Volume/2010/04/dual_sensing.asp

Otto Wolfbeis at the University of Regensberg, Germany, and colleagues have developed luminescent water-soluble paints that measure pressure and temperature simultaneously. They took fluorescent platinum(II)porphyrin probes, which detect oxygen partial pressure and therefore barometric pressure, and made them soluble in water by impregnating them into water-soluble, oxygen-permeable polymer core-shell nanoparticles.

Increasing yield from gasification: A new process can make more fuel from biomass: Rhodium.
Technology Review, 19 March 2010

http://www.technologyreview.com/energy/24838/page1/
http://www.technologyreview.com/energy/24838/page2/

Researchers in the University of Minnesota and the University of Massachusetts, Amherst, have developed a method for gasifying biomass that converts all of the carbon into carbon monoxide. They found that to make the process work, it was necessary to precisely balance three variables: the amount of carbon dioxide, the amount of oxygen added, and the amount of methane relative to the amount of cellulose--a material derived from biomass. The mixture is fed into a high-temperature reactor that consists of a rhodium- and cerium-based catalyst. In the reactor, particles of cellulose are quickly

converted into a liquid, which spreads over the catalyst, enhancing the reactions that lead to the production of hydrogen and carbon monoxide gases.

Blueprint for "artificial leaf" mimics Mother Nature: Platinum.
ACS | News Releases, 25 March 2010

http://portal.acs.org/portal/PublicWebSite/pressroom/newsreleases/CNBP_024355

Image: http://web.1.c2.audiovideoweb.com/1c2web3536/Artificialleafhires.jpg

Tongxiang Fan, Ph.D. and colleagues Di Zhang, Ph.D. and Han Zhou, Ph.D., all with the State Key Lab of Matrix Composites at Shanghai Jiaotong University, Shanghai, China, first infiltrated the leaves of Anemone vitifolia - a plant native to China - with titanium dioxide in a two-step process. Using advanced spectroscopic techniques, the scientists were then able to confirm that the structural features in the leaf favorable for light harvesting were replicated in the new TiO_2 structure. Excitingly, the "Artificial Inorganic Leaf" (AIL) are eight times more active for hydrogen production than TiO_2 that has not been "biotemplated" in that fashion. AILs also are more than three times as active as commercial photo-catalysts. Next, the scientists embedded nanoparticles of platinum into the leaf surface. Platinum, along with the nitrogen found naturally in the leaf, helps increase the activity of the artificial leaves by an additional factor of ten.

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