

# NEW PATENTS

## ELECTROCHEMISTRY

### Water Treatment Process

ADEPT TECHNOLOGIES A/S *World Appl.* 02/22,506

H<sub>2</sub>O used for cooling equipment, etc., is subjected to an ion exchange biocide step, in an electrochemical reactor having alternating corrugated anodes and cathodes connected by a DC power supply. Ion-exchange H<sub>2</sub>O is in contact with a pair of electrodes in the presence of a catalyst, such as Pt. Microorganism build-up is avoided and regeneration times are minimised.

### Rhodium Electrocatalyst for Oxygen Reduction

DE NORA SpA *U.S. Patent* 6,358,381

A S-containing Rh catalyst, for the electroreduction of O<sub>2</sub> in an industrial electrolyser, is obtained by sparging a solution of Rh salt with H<sub>2</sub>S, followed by drying, grinding and heating at 300–800°C. The catalyst is highly resistant to corrosion and poisoning by organic species, so is suitable for use in aqueous HCl electrolysis that contains organic contaminants.

## ELECTRODEPOSITION AND SURFACE COATINGS

### Platinum Plating Solution

TANAKA KIKINZOKU KOGYO KK

*Japanese Appl.* 2002/038,293

A Pt plating bath with neutral pH, comprises diamminedenitro-, hexahydroxo-, hexaammine-Pt hydroxy salt and/or H<sub>2</sub>PtCl<sub>6</sub> of a H<sub>2</sub>O-soluble Pt salt; and glycine, iminodiacetic acid and/or nitrilotriacetic acid. The bath does not decompose at the anode side, can attain a high current efficiency, a high plating speed and contains no Na or K inhibitors.

## APPARATUS AND TECHNIQUE

### Humidity Sensor in ICE

NGK SPARK PLUG CO LTD *European Appl.* 1,197,748

A humidity sensor (1) is used to measure atmospheric moisture content in exhaust pipes, etc., by the change in electrical resistance of a moisture sensitive layer. It comprises: an insulating substrate, containing a heater and a temperature measurement resistor; a lower Pt electrode; a moisture sensitive layer (Al<sub>2</sub>O<sub>3</sub> with TiO<sub>2</sub> and SnO<sub>2</sub>); and an upper electrode. (1) has very high accuracy over a long time.

### Microsensor for Fluid Flow Measurement

HONEYWELL INT. INC *World Appl.* 02/21,083

A robust sensor incorporates a sensor die made of a material with thermal transmission characteristics that avoid saturation of the sensor, and sensing elements. It comprises a Pt layer covered by a SiN passivation layer. The microsensor can measure high mass flux airflow and liquid properties under high pressure. It is stable, with a wide dynamic range and rapid-response operation in harsh environments.

### Electrode Ink for Oxygen Sensor

DELPHI TECHNOLOGIES INC *U.S. Patent* 6,365,036

An O<sub>2</sub> sensor (1) comprises a solid electrolyte, such as Y<sub>2</sub>O<sub>3</sub> doped ZrO<sub>2</sub>, disposed between, and in intimate contact with, two electrodes connected by an electrical lead. The first (sensing) electrode is exposed to the sensing gas, such as an exhaust gas. The second (reference) electrode (2) is exposed to a reference gas. (2) comprises: 86.4–92 wt.% of Pt, Au, Pd, Rh, Ir, Os and/or Ru; ZrO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>. (1) measures O<sub>2</sub>, hydrocarbons and NO<sub>x</sub> in car exhausts.

### Organic Light Emitting Diodes (OLEDs)

AGILENT TECHNOLOGIES INC *U.S. Patent* 6,366,017

OLEDs with superior brightness are formed on opaque Si substrates and have an anode, comprising a reflective layer of Pt, Pd, Ir, Au, etc.; an electroluminescent organic active layer; an injection layer; and a transparent organic cathode of thiophenes, polyanilines, etc. Light from the active layer is reflected by the reflective layer to increase the apparent brightness of the diode in the forward direction.

### Electrooptic Device

SONY CORP

*U.S. Patent* 6,372,558

An electrooptic device (1) such as a LED is prepared using an active matrix substrate with a built-in high-performance driver, containing a single crystal Si thin film, such as Si hydride containing Pt, Pd, W, Mo, Si, etc., of high electron/hole mobility uniformly deposited at a relatively low temperature. (1) has high switching properties and a low leak current. A large-screen-display panel has high image quality and definition, a narrow frame and high efficiency.

### Organic Luminescent Element

FUJI PHOTO FILM CO LTD *Japanese Appl.* 2002/056,976

An organic luminescent element (1) for use in a surface light source of a full-colour display, a back light, an array of a printer light source, etc., is formed by laminating a transparent electrode, an organic compound layer, and a back face electrode, onto a substrate. A luminous layer contains an ortho-metallised Ir complex and an electron transport material. (1) is able to illuminate in plurality, with high brightness and luminous efficiency, and can be easily manufactured to a large size.

## HETEROGENEOUS CATALYSIS

### Pt Group Metal Catalyst

DEGUSSA AG

*European Appl.* 1,190,768

A catalyst contains 0.1–80 wt.% of Pt group metal crystalline nanoparticles (0.5–80 nm), such as Rh, dispersed in an oxidic macroporous phase of  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub> and TiO<sub>2</sub>. It is manufactured by flame pyrolysis of an aqueous solution of Pt group metal salts and salts of the support materials. The catalyst is used for the hydrogenation of organic compounds.

## NOx-Trap Composition

JOHNSON MATTHEY PLC *World Appl.* 02/40,139

A NO<sub>x</sub>-trap composition comprises a NO<sub>x</sub> storage component and a Rh component. The NO<sub>x</sub> storage component may comprise at least one alkali metal, such as K and/or Cs, and a rare earth metal, such as La, Y, Ce, etc., or their mixture. The support comprises CeO<sub>2</sub>, ZrO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, or their physical or mixed oxide mixture. The resulting NO<sub>x</sub>-trap composition stores NO<sub>x</sub> at relatively high temperatures, where the Rh component functions as both an oxidation catalyst and as a NO<sub>x</sub> reduction catalyst. A preferred application is in treating lean-burn gasoline engine exhaust gases.

## Layered Catalyst Composition

UOP LLC *World Appl.* 02/41,990

A layered catalyst composition comprises an inner core, such as  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>, bonded to an outer layer consisting of a refractory inorganic oxide, such as  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>. The outer layer contains a uniformly dispersed Pt group metal, such as Pt, and a promoter metal, such as Sn. The composition can also contain a modifier metal, such as Li; the atomic ratio of the Pt group metal to the modifier metal is 0.1–5. The catalyst composition shows improved durability and selectivity for dehydrogenating hydrocarbons.

## Pt Group Metal Catalyst on Boron Nitride Support

M.-H. REI *et al.* *U.S. Appl.* 2002/0,013,222

A catalyst (1) used for oxidising volatile organic compounds comprises a Pt group metal, selected from Pt, Pd, Rh and Ru, supported on BN. (1) is prepared by dissolving a Pt group metal complex compound (2) in an organic solvent and mixing the solution with the BN to wet it by spreading (2) on its surface. The Pt group metal complex is then reduced to metal at a specific temperature by a gas.

## Methanol Modifying Catalyst

NISSAN MOTOR CO LTD *Japanese Appl.* 2002/059,005

A MeOH modifying catalyst (1), with high activity, selectivity and durability, is obtained by dispersing Zn oxide and/or Al oxide and Cu oxide in a mixed solution of a H<sub>2</sub>O-soluble compound of Pt and/or Pd and a H<sub>2</sub>O-soluble Zn compound to form oxides of Pt and/or Pd and Zn, followed by heating to form an alloy. (1) is very efficient for H<sub>2</sub> production and can be used in a compact fuel-modifying apparatus.

## Catalyst for Manufacturing Hydrogen

NATL. INST. ADV. IND. TECHNOL.

*Japanese Appl.* 2002/059,006

A catalyst for H<sub>2</sub> manufacture comprises a composite metal oxide containing an alkaline earth metal, Ti, Ni and Ru with an atomic ratio of alkaline earth metal to Ti of 1:1. The alkaline earth metal and Ti forms a perovskite structure. The catalyst produces H<sub>2</sub> by the modifying reaction of coke oven gas and steam. It is catalytically active for a long time without being affected by H<sub>2</sub>S contained in the coke oven gas.

## HOMOGENEOUS CATALYSIS

### Epoxyorganosilicon Compounds

CROMPTON CORP *U.S. Patent* 6,365,696

Epoxyorganosilicon compounds are produced by the Pt-catalysed hydrosilation reaction of ethylenically unsaturated epoxides and a Si hydride in the presence of a carboxylic acid salt. The Pt catalyst is a solution of H<sub>2</sub>PtCl<sub>6</sub>. The presence of carboxylic acid salts in the compositions of the epoxyorganosilicon compounds increases their stability.

### Transfer Hydrogenation Process and Catalyst

AVECIA LTD *U.S. Patent* 6,372,931

A catalytic transfer hydrogenation process for transfer hydrogenation of ketones and imines, preferably prochiral, uses a catalyst comprising a Rh, Ru and Ir cyclopentadienyl complex coordinated to bidentate ligands, such as diamines and aminoalcohols, specially those with chiral centres. The H donor is a secondary alcohol or a mixture of triethylamine and formic acid. The process is used for making optically active compounds.

### Optically Active Alcohols

TAKASAGO INT. CORP *Japanese Appl.* 2002/037,760

An optically active alcohol (1) comprises a substitutable 1–15C alkyl group (substituent is a halogen atom, hydroxyl, amino group, etc.) and an aryl group (a 1–8C lower alkyl group or a substitutable benzyl group). (1) is obtained by an asymmetric hydrogenation of a  $\beta$ -keto acid in the presence of a Ru complex including an optically active tertiary diphosphine compound. The process gives (1) with a desired absolute configuration and high optical purity.

## FUEL CELLS

### Anode Structure

JOHNSON MATTHEY PLC *World Appl.* 02/25,759

An anode structure (1) used in PEMFCs comprises a Ru catalyst, essentially of Ru deposited on a conducting support. The Ru is in metallic form or in a form that is readily reducible to the metallic form at temperatures of 25–150°C. (1) prevents poisoning of the electrocatalyst in PEMFCs by impurities in the fuel stream, such as CO, from the reformat fuel stream to the anode.

### Fuel Cell Electrode Catalyst

MATSUSHITA ELECTRIC IND. CO

*Japanese Appl.* 2002/042,825

A fuel cell electrode (1) is composed of Pt particles, with  $\geq 5$  wt.% of them being of cubic or regular tetrahedron shape, on C. (1) is produced from a Pt colloid solution made by bubbling H<sub>2</sub> through an aqueous solution of platinum chloride, K and Na polyacrylate, followed by additions of a conductive C material. The pH of the solution can be  $\leq 3$  to  $\geq 12$ . The Pt colloidal particles and the C material are separated from the liquid by heating at 180–350°C. The catalyst has superior characteristics for smaller amounts of Pt.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### Transparent Electrically Conductive Film

SUMITOMO OSAKA CEMENT CO LTD

*World Appl.* 02/15,201

A transparent electrically conductive film (1) has an electrically conductive layer comprising fine Ru and Au particles, and also fine Ag particles. The weight ratio range of Ru to Au particles is 40:60 to 99:1. (1) exhibits excellent electromagnetic wave shielding and reflection reducing effects and has high chemical stability. The display has excellent visibility.

### Structure of a Capacitor Section of a DRAM

KABUSHIKI KAISHA TOSHIBA *U.S. Appl.* 2002/0,011,618

Capacitors for use in DRAM are formed in the trenches made in a SiO<sub>2</sub> interlayer insulator. Each trench contains an insulating film on the sides and a Ru storage electrode. A capacitor insulating film made of BSTO is formed on the storage electrode, and a Ru plate electrode is formed on the capacitor insulating film. Adjacent capacitors are electrically isolated. Secure storage capacitance and improved electric charge holding characteristics are obtained.

### Palladium-Spot Leadframes for Semiconductors

TEXAS INSTRUMENTS INC

*U.S. Patent* 6,376,901

A leadframe (1) for solder-plated semiconductor devices comprises a base metal of Cu, Cu alloy, etc., fully covered with a layer of Ni plating, which is further plated with Pd to selectively cover areas intended for bonding wire attachments. (1) can be fabricated at reduced cost while its functions are maximised. (1) is used for the assembly of IC chips by wire bonding interconnection, and then encapsulation.

### Ruthenium Bias Compensation Layer

HEADWAY TECHNOLOGIES INC

*U.S. Patent* 6,396,671

A spin valve structure is subjected to only small bias point shifts by sense current fields while having good GMR characteristics. It contains a Ru layer of ~ 15 Å between the seed layer and the free layer. This acts as an effective bias control layer with the added benefit of having interfaces highly favourable to specular reflection of the conduction electrons. The h.c.p. crystal structure of this Ru layer also improves the crystalline quality of the free layer thereby improving its performance with respect to the GMR ratio.

### Iridium Used in Electrodes for Ignition Plugs

TANAKA KIKINZOKU KOGYO KK

*Japanese Appl.* 2002/045,905

Ir or an Ir alloy wire or a bar with round cross-section is efficiently formed into a square cross-section or a tape shape by heating with an electric current as it passes between rollers. The current flows between a pair of work rollers and the wire. Guide rollers control the movement and heat the wire. The Ir or the Ir alloy formed by this method is made into the electrode for ignition plugs.

### Laminated Piezoelectric Ceramics

TOKIN CERAMICS CORP

*Japanese Appl.* 2002/050,803

Laminated piezoelectric ceramics for preventing migration and reducing short-circuiting fracture under a humid environment contain an insulator layer which is so formed that the inner electrodes are polarised in different polarities at every other layer. Au, Pt and Pd are then glazed on the entire surface of a side surface to form an outer electrode to secure conduction with the inner electrode.

### Manufacture of Chip Resistors

TAIYOSHA DENKI KK

*Japanese Appl.* 2002/064,003

A chip resistor has an upper electrode protective layer (1) formed on the top surface of an upper electrode layer under a part where another protective layer comes into contact with a plating layer. (1) is made of a thick film of high S-resistant material such as a Ag alloy containing  $\geq 5.0\%$  Pd. (1) never corrodes even if a gap is formed between one of the protective layers and a plating layer. The manufacturing cost is reduced and preventive effect is high.

## MEDICAL USES

### Fireable Dental Alloy

CENDRES ET METAUX SA

*European Appl.* 1,193,320

A high Au content dental alloy, which exhibits very good mechanical characteristics, consists (in wt.%): 7.1–13.0 Pt, 0.1–8.0 Pd, 80–86.5 Au, 0–1.2 Ag, 0.7–3.5 Zn, 0–1.0 Fe, Ir, Ru, Rh, Ta, Mn, Re, Nb, 0–3.5 Sn, In, Ga or 0–0.5 Cu. The alloy has good firmness even after burning out high melting ceramic, reduced firing temperatures and normal expansion.

### Platinum Antitumour Complexes

ANORMED INC

*World Appl.* 02/28,871

Pt antitumour complexes, PtA<sub>2</sub>XZ and PtA<sub>2</sub>B<sub>2</sub>XZ, comprise pharmaceutically acceptable salts where each A is independently an anion. Each B is independently a halo, hydroxy, carboxylate, carbamate or a carbonate ester. Z is a substituted 5- or 6-membered, heterocyclic moiety wherein at least one substituent sterically hinders access of the Pt atom to a DNA strand of a tumour cell; Z is not pyridine. X is NH<sub>3</sub> or mono- or dialkyl-substituted NH<sub>3</sub>. The complexes are active against cancer cells and have improved aqueous solubility and activity.

### Terpyridine-Platinum(II) Complexes

ISIS INNOVATION LTD

*U.S. Appl.* 2002/0,013,306

The 2,2':6',2''-terpyridine-Pt(II) and substituted 2,2':6',2''-terpyridine-Pt(II) complexes have a N- or O- or halo nucleophile as the fourth ligand bonded to Pt. They are prepared by reacting a Pt complex of 1,5-cyclooctadiene with a 2,2':6',2''-terpyridine. Also claimed is a ribonucleoside or 2'-deoxyribonucleoside base labelled with them. They are potent intercalators of DNA and can interrupt DNA replication. They are antitumour agents or antiparasitic (antiprotozoal) agents for treatment of malaria.