NEW PATENTS

ELECTROCHEMISTRY

Electrochemical Synthesis of Ozone
LYNNTECH INC. U.S. Patent 5,770,033
Electrochemical synthesis of ozone used in disinfection processes involves supplying a source of O₂ gas through a gas diffusion layer to a catalyst in a cathodic catalyst layer. The latter comprises a proton exchange polymer, PTFE and Pt, Pd, Ir, Au and/or Ni, and has a first surface of an ionically conducting membrane bonded mainly with H₂O and an acid, to an anode polymer, PTFE and Pt, Pd, Ir, Au and/or Ni, and has a surface in contact with a second surface. Current through the anode, cathode and ionically conducting membrane produces H₂O₂ at the cathode and O₃ at the anode. H₂ is not formed, resulting in lower costs.

ELECTRODEPOSITION AND SURFACE COATINGS

Coating a Superalloy Article
ROLLS-ROYCE PLC British Appl. 2,322,382–83A
Coating superalloy single crystal turbine blades or vanes to avoid premature failure involves applying Cr, Ti or Ta and diffusing to form an enriched layer, then forming a Pt aluminate-silicide coating from Pt, Si and Al, via diffusion and heat treatments; layers of Al₂O₃ and a thermal barrier are then added. During the diffusion heating the Al reacts with Pt to form Pt aluminate. Si does not diffuse into the superalloy.

Activation for Electroless Plating
MURATA MFG. CO. LTD. European Appl. 861,923A
A hydrophilic activating catalytic solution for electroless plating comprises a lactate, a Pd salt and an alkaline medium, which are applied to a substrate to form a photosensitive film. The film needs only short exposure to radiation to deposit a Pd catalyst on the substrate.

Deposition of Palladium Layer
WHITAKER CORP. World Appl. 98/38,351A
A Pd layer is deposited on a substrate by heat decomposition of a Pd precursor on the substrate surface. The precursor has the formula Pd(OOCR)ₓₚ₋ₓₚ (OOCR)ₓₚ₋ₓₚ such as glyoxalic Pd(II) glycolate, where R and Rₓ are H, alkyl, alkenyl, alkynyl or -Rₓ COOH; Rₓ is 1–5C alkyl substituted with 1–2 hydroxyl group. The Pd films can be deposited on electrical interconnects, flex circuits, multi-chip modules and printed wiring boards in an environmentally-friendly way.

Platinum Alloy Plating Bath
TANAKA KIKINZOKU KOGYO K.K. Japanese Appl. 10/212,592
A plating bath with high Mo concentration consists of a Pt compound, molybdenic acid, molybdate and a Fe group transition metal compound. The Pt film has improved ductility and is easily mouldable. It is used for insoluble anodes for electrolysis, sensors, etc.

APPARATUS AND TECHNIQUE

Gas Sensor for Detecting Gas
CTS CORP. U.S. Patent 5,779,980
A sensor for measuring gas concentrations in air, for example exhaust gas from I.C.E., has a resistor on an Al₂O₃ substrate, with a catalyst support structure of Al₂O₃ and glass on the resistor which binds them all together, and a Pd-containing catalyst. The sensor is compact, cost effective, durable, and can function in the harsh conditions of a car exhaust system.

Device for Abating Carbon Monoxide
E. I. DU PONT DE NEMOURS & CO. U.S. Patent 5,806,886
A device for abating CO generated during vehicle airbag inflation with combustion gases has a catalytic activation system comprising a supported Pd(II) salt in contact with a thermally stable oxidising agent. The device lowers CO and NOx contents in vehicle airbags inflated by pyrotechnic nitrocellulose inflators. The device is small and easily made.

HETEROGENEOUS CATALYSIS

Diesel Engine Catalyst
FORD GLOBAL TECHNOLOGIES INC. European Appl. 864,354A
A lean NOx catalyst for reducing the NOx concentration in diesel engine exhaust gases comprises a porous Al₂O₃ support; 5–40 wt. % of 12-tungstophosphoric acid; and ≥ 0.25 wt. % of Pt, Pd and/or Rh. A process for reducing the NOx concentration in the O₂-rich exhaust gas emissions of a diesel I.C.E. is also claimed. The catalyst has high resistance to S poisoning and begins to convert more NOx at a lower temperature, thus reducing cold start emissions.

Selective Hydrogenation Catalyst
NISSAN GIRDLER CATALYST CO. LTD. World Appl. 98/10,863A
A catalyst for selective hydrogenation of highly unsaturated hydrocarbon compounds contained in olefin compounds comprises Pd/Al₂O₃, in which the exposed faces of the Pd crystallites are mainly (100), (110) andor (111). The catalyst does not hydrogenate the olefin as a side reaction nor is there precipitation of carbonaceous material. It gives highly pure olefinic compounds and finds use in the petrochemical industry.

Conversion of Mixed Aromatic Hydrocarbons
MITSUBISHI OIL CO. World Appl. 98/12,159A
Mixed aromatic hydrocarbons containing ≥ 20 mol. % 9C alkyl substituted aromatics are converted to a product rich in toluene and/or xylene by contact with Pd on a dealuminated mordenite support with a Si:Al ratio of 12–30, and 10–50 wt.% SiO₂ binder, in the presence of H₂. The process gives high yields of toluene and/or xylenes in a stable operation with minimal coking and catalyst deactivation and low H₂ consumption.
Reduction of Nitrogen Oxides

GAZ DE FRANCE

World Appl. 98/15,339A

A catalyst for the reduction of NOx to N₂ in the presence of CH₄ comprises a mordenite small pore (< 5 Å) zeolite exchanged with Pd alone, with 0.4–0.6% Pd²⁺ or/and 1.2–3.2% Co⁰, all relative to total catalyst weight. The zeolite is the Na or ammonium form, with a molar ratio Si:Al of 5.5. The process avoids the use of NH₃ as a reducing agent and allows high conversion rates of NOx of ≤ 70% in 10% O₂.

Supported Palladium-Gold Catalysts

MILLENNIUM PETROCHEMICALS INC.

World Appl. 98/18,553A

A catalyst for vinyl acetate production comprises an inert support impregnated with Pd and Au salts, and calcined in a non-reducing atmosphere at 100–600°C to decompose ≥ 10% of the Pd and Au salts before reducing the Pd and Au to the metallic state. The catalyst can be tailored to have high selectivity at the higher calcination temperature and high activity at the lower temperature. Increased selectivity and activity for vinyl acetate production is achieved in the vapour-phase reaction of C₃H₆, CH₃COOH and O₂.

Reforming Hydrocarbons

CHEVRON CHEM. CO. LLC

World Appl. 98/30,656–57A

A catalytic reforming process using a halide-Pt L-zeolite catalyst in a metal-coated reactor system involves removing volatile acidic halide prior to loading and reforming the catalyst. The system containing the reactive metal, usually Sn, is contacted with a getter to produce movable metal, and then fixing the movable metal and/or the getter. Catalytic reforming of hydrocarbons to aromatics can then take place. The process reduces catalytic contamination from a freshly metal-coated reactor system, and when replacing a conventional catalyst with a halide catalyst.

Composition for Gasoline Engine

CLEAN DIESEL TECHNOLOGIES INC.

World Appl. 98/33,871A

A composition to add to gasoline to maintain or improve the performance of a three-way catalytic converter comprises a blend of Rh acetylacetonate and a fuel-soluble organo-Pt compound. The composition is fed to the combustion chamber where the organic parts of the Rh and Pt compounds are oxidised to give the metal active catalyst species. Exhaust gases are then passed to the catalytic converter, where the Rh and Pt are deposited. Emissions of NOx, HCs and CO are reduced while the performance of the three-way catalytic converter is maintained or improved.

Catalytic Composition

PHILLIPS PETROLEUM CO.

World Appl. 98/37,966A

A composition used for the selective catalytic hydrogenation of unsaturated hydrocarbons comprises Pd, a selectivity enhancer, such as Pb, Bi, Th, Ir, Sn, Sb, Ge, As, Cd and/or Hg, and an inorganic support. The support is SiO₂, Al₂O₃ and/or spinel. Diolefins can be selectively hydrogenated to monoolefins.

Emission Control System

JOHNSON MATTHEY PLC

World Appl. 98/40,153A

An emission control system for lean-burn I.C.E. comprises a first catalyst system (I) of Pt, and/or Pd and/or Rh, which gives a percentage conversion ratio of NOx:hydrocarbon of ≥ 0.2, at 230°C, space velocity of 25,000 h⁻¹ and hydrocarbon:NOx input ratio of 3:1, with the hydrocarbon being counted as equivalent to propane. A second catalyst system (II) has a hydrocarbon conversion of > 80% and CO conversion of > 70%. Exhaust gases from the engine pass over (I) then over (II). The system controls NOx emissions with high selectivity for NOx reduction, (I) has low space velocity, while (II) has high oxidation activity.

Gasoline Catalysts

GENERAL MOTORS CORP.

U.S. Patent 5,753,581

A catalyst comprises a substrate with a washcoat of Al₂O₃, CeO₂ and NiO impregnated with a Pt solution at pH 9.5–10.5, so that the Pt is associated with CeO₂ and Al₂O₃. A Rh solution is then impregnated into the washcoat at a pH 6.5–7.5, so that the Rh is associated with the CeO₂. This provides a low cost effective method to alter the association of Pt group metal catalysts with specific support oxides.

Purification of Terephthalic Acid

AMOCO CORP.

U.S. Patent 5,756,833

Terephthalic acid (TPA) is produced by liquid phase oxidation of p-xylene with an O₂-containing gas at 120–240°C in the presence of an oxidation catalyst of Co, Mn and Br components and a 1–6C monocarboxylic aliphatic acid solvent system containing H₂O. The impure TPA solution is purified with catalysts of Pt group metal/TiO₂ and Pd/C. The TPA has low levels of impurities and good colour.

Upgrading Naphtha to Gasoline

UOP

U.S. Patent 5,770,042

A process for selectively upgrading a naphtha feedstock, composed of paraffins and naphthenes, to obtain a product with increased isoparaffin content comprises contacting the feedstock and a paraffinic intermediate with a solid Pt group metal isomerisation catalyst in an isomerisation zone at 40–250°C. The cyclics concentrate produced is converted using a non-acidic catalyst (1) of Pt group metal(s) on a metal oxide or molecular sieve support at 100–550°C. (1) is effective at ring cleavage and gives improved octane values when combined with paraffin isomerisation.

Platinum and/or Ruthenium Catalysts

CSIR COUNCIL SCI. IND. RES.

U.S. Patent 5,792,875

Butyro lactone (1) or tetrahydrofuran (2) is prepared by hydrogenation of an alkyl ester of succinic or maleic acid at an elevated temperature in the presence of a bimetallic catalyst. The catalyst is obtained by impregnation of Al₂O₃ with an aqueous solution of Pt and/or Ru salts, followed by treatment with Sn salts. The Pt group metal:Sn ratio is 1:5–1:20. The support is then treated with an alkali solution followed by a B-containing solution. The process shows a high selectivity towards (1) and (2) at milder conditions.
Production of 4-tert-Butylcyclohexyl Acetate

SUMITOMO CHEM. CO. LTD.  
_Japanese Appl. 10/195,020_

The production of 4-tert-butylcyclohexyl acetate (1) comprises hydrogenating 4-tert-butylphenol with a Rh/C catalyst and a solvent in the presence of at least one of HCl, anhydric H2SO4, and perchloric acid and acetylating the obtained 4-tert-butylocyclohexanol. The hydrogenation takes place at 20-100°C. (1) is used as a perfume for cosmetics and soaps and can be obtained in ≥90% yield and ≥80% as the cis-isomer.

Hydrocracking of Gas Oil

COSMO OIL CO. LTD.  
_Japanese Appl. 10/195,457_

A method for hydrocracking various raw gas oils containing high S contents uses a mixture of catalysts. One catalyst contains 0.01-10 wt.% of Pt group metal carried on inorganic oxides, another comprises metals of Groups VI and VIII carried on inorganic oxides, at 300-380°C, 3.0-8.0 MPa and a liquid space velocity of 1.0-5 h⁻¹ for a H₂/oil volume ratio of 250-1500. The productivity is high and there is no need for H₂O.