



# JOURNAL OF MOLECULAR CATALYSIS A: CHEMICAL

## *PatentsALERT*

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## CATALYST PREPARATION

### 5811365

#### Zinc oxide composition for use in catalysts

Barry Nay, Surrey, United Kingdom, The British Petroleum Company Plc

The surface area of a zinc oxide composition is increased, and stabilized to heating, by incorporation of a tri or tetravalent metal especially aluminium or gallium, e.g. in the form of a spinel with the zinc oxide. The composition is preferably made by coprecipitation of zinc and a compound of said metal and then calcination. The zinc oxide composition may also incorporate a Group VIII metal and be used as a catalyst for a Fischer Tropsch process.

### 5817221

#### Composites formed using magnetizable material, acatalyst and an electron conductor

Leddy Johna; Amarasinghe Sudath; Tinoco Flavio, Iowa City, IA, United States, University of Iowa Research Foundation

Magnetic composites exhibit distinct flux properties due to gradient interfaces. The composites can be used to improve fuel cells and batteries and effect transport and separation of different species of materials, for example, transition metal species such as lanthanides and actinides. A variety of devices can be made utilizing the composites including a separator, an electrode for channeling flux of magnetic species, an electrode for effecting electrolysis of magnetic species, a system for channeling electrolyte species, a system for separating particles with different magnetic susceptibilities, improved fuel cells, batteries, and oxygen concentrators. Some composites can be used to make a separator for distinguishing between two species of materials and a flux switch to regulate the flow of a chemical species. Some composites can control chemical species transport and distribution. Other composites enable ambient pressure fuel cells having enhanced performance and reduced weight to be produced. Still other composites enable rechargeable batteries to be made that have longer secondary cycle life and improved output power. Methods involving these composites provide distinct ways for these composites to be utilized.

### 5817592

#### Process for the preparation of a hydrogenation catalyst

Heineke Daniel; Schneider Heinz-Walter; Thomé Alfred, Ludwigshafen, Germany, BASF Aktiengesellschaft

A process for the preparation of a hydrogenation catalyst by reduction of platinum in an oxidation stage of not less than 2 in an aqueous medium in the presence of a carboniferous support, optionally following partial poisoning with a sulfur, arsenic, tellurium, or antimony-containing compound, using a reducing agent, in which the reducing agent used is an ammonium or phosphonium salt of the general formula I (\*See Patent for Tabular Presentation\*) PS in which X stands for N or P, R stands for hydrogen, C1–C18 alkyl, C5–C10 cycloalkyl, phenyl radical, and also a C1–C4 alkyl radical substituted by phenyl, the phenyl radicals being mono- to tri-substituted by C1–C6 alkyl, halogen, nitro or amino, if desired, provided that the radicals R may be the same or different but cannot simultaneously denote hydrogen, if X is P, n is an integer of 1 to 3, and Y is an organic anion which can reduce platinum in an oxidation stage other than zero to platinum in the oxidation stage of zero.

### 5817593

#### Catalyst and process for producing amines

Chang Dane; Sherrod Fred A, Sugar Land, TX, United States, The Dow Chemical Company

This invention includes catalysts comprising rhenium (atomic number 75), nickel, cobalt, boron and copper and/or ruthenium impregnated on a support material and a process for preparing said catalyst, said process comprising (i) impregnating a mixture of metals comprising rhenium, cobalt, copper and/or ruthenium, boron and nickel on a support material selected from the group consisting of alpha-alumina, silica, silica-alumina, kieselguhrs or diatomaceous earths, and silica-titanias; and (ii) activating said catalyst by heating the catalyst in the presence of hydrogen at an effective temperature preferably in the range of about 150°C. to about 500°C. for a sufficient period preferably of from about 30 minutes to about 6 hours. A further feature of the present invention is a method for producing amine products by the catalytic amination of alkane or arylalkane derivatives including epoxides, monols, diols, polyethers, polyols, alcoholamines, ke-

tones, imino compounds iminoalcohols, ether alcohols, and mixtures thereof, said process comprising contacting said lower alkane or arylalkane derivatives with ammonia and/or reactant amine at an effective temperature preferably from 150 degrees C. to about 500 degrees C. and in the presence of hydrogen and the nickel–rhenium–cobalt–boron–copper and/or ruthenium catalyst as described hereinabove.

#### 5820922

##### Method for localized deposition of noble metal catalysts with control of morphology

Ricco Antonio J; Manginell Ronald; Huber Robert, Albuquerque, NM, United States, Sandia Corporation

A combustible gas sensor that uses a resistively heated, noble metal-coated, micromachined polycrystalline Si filament to calorimetrically detect the presence and concentration of combustible gases. A thin catalytic Pt film was deposited by CVD from the precursor Pt(acac)<sub>2</sub> onto microfilaments resistively heated to approximately 500 degrees C.; Pt deposits only on the hot filament. The filaments tested to date are 2 μm thick \*10 μm wide \*100, 250, 500, or 1000 μm-long polycrystalline Si; some are overcoated with a 0.25 μm-thick protective CVD Si<sub>3</sub>N<sub>4</sub> layer.

#### 5821185

##### Solid state proton and electron mediating membrane and use in catalytic membrane reactors

White James; Schwartz Michael; Sammells Anthony F, Boulder, CO, United States, Eltron Research Inc

This invention provides catalytic proton and electron mediating membranes useful in catalytic reactors. The membranes have an oxidation and a reduction surface and comprise a single-phase mixed metal oxide material of the formula: (\*See Patent for Tabular Presentation\*) PS wherein A is selected from Ca, Sr or Ba ions; B is selected from Ce, Tb, Pr, or Th ions; B' is selected from Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Al, Ga, or In ions, or combinations thereof; and x is greater than or equal to 0.02 and less than or equal to 0.5. The membranes can further comprise a catalyst on either the oxidation or reduction surface, or both. Membranes include those which are fabricated-by combining powders of metal oxides or metal carbonates of metal A ion, metal B ion and metal B' ion such that the stoichiometric ratio

A:B:B' is 1:1 – x:x where 0.2 < or =\*0.5, repeatedly calcining and milling the combined powders until a single-phase material is obtained and pressing and sintering the singlephase material to obtain a membrane.

#### 5821192

##### Method of improving the attrition resistance of V/SB oxide based catalyst

Seely Michael J; Friedrich Maria Strada; Suresh Dev Dhanaraj; Kocjancic Frank John, Twinsburg, OH, United States, The Standard Oil Company

A process for preparing a catalyst having the following formula: (\*See Patent for Tabular Presentation\*) PS wherein M = tin, titanium, lithium, sodium, potassium, molybdenum, tungsten, iron, chromium, cobalt, copper, gallium, niobium, tantalum, tellurium, bismuth, or mixtures thereof, a = 0.1 to 5, preferably 0.1 to 3, most preferably 0.1 to 2 b = 0.1 to 5, preferably 0.1 to 3, most preferably 0.1 to 2 c = 0.0 to 5, preferably greater than 0 to 5, most preferably 0.01 to 3, and x is a number sufficient to satisfy the valency requirements of the elements, comprising forming an aqueous slurry comprising vanadium and antimony, adding a peptizing agent free of any lithium compounds capable of providing hydroxide ions to said slurry and spray drying said slurry to form an attrition resistant catalyst.

## CATALYST REGENERATION

#### 5811363

##### Catalyst rejuvenation in hydrocarbon synthesis slurry with reduced slurry recontamination

Leviness Stephen C; Mitchell Willard N, Baton Rouge, LA, United States, Exxon Research and Engineering Company

A reversibly deactivated, particulate catalyst in a hydrocarbon synthesis slurry is rejuvenated by circulating the slurry from a slurry body through a rejuvenation zone in which hydrogen contacts the slurry and rejuvenates the catalyst to form a rejuvenated catalyst slurry and an offgas which contains catalyst deactivating species. The offgas is separated and removed from the rejuvenated slurry before it is passed back into the slurry body. This avoids or minimizes contamination and recontamination of the slurry body with the deactivating species produced by the rejuvenation process.

**5811468****Combination gas disengaging downcomer-rejuvenation tube for in-situ slurry catalyst rejuvenation (LAW541)**

Chang Min; Coulaloglou Constantine A; Hsu Edward C, Warren, NJ, United States, Exxon Research and Engineering Company

A reversibly deactivated, particulate catalyst in a hydrocarbon synthesis slurry is rejuvenated by circulating the slurry from a slurry body through (i) a gas disengaging zone to remove gas bubbles from the slurry and increase its density, (iii) a downcomer which feeds the gas reduced, dense slurry into the bottom of a rejuvenating tube and applies a positive hydrostatic pressure to the tube, (iii) a catalyst rejuvenation zone in which a catalyst rejuvenating gas, which also acts as a lift gas, contacts the catalyst in slurry to form a catalyst rejuvenated slurry and, (iv) back into the slurry body. Removing gas bubbles prior to rejuvenation improves the rejuvenation efficiency and the downcomer reduces the amount of rejuvenation gas required to maintain slurry circulation through the tube.

**5817589****Regeneration of catalyst comprising flushing with inert gas followed by flushing with hydrogen**

de Agudelo Magdalena Ramirez; de Godoy Zaida Hernandez; Navarro Raul; Guerra Julia, Caracas, Venezuela, Intevp SA

A process for regenerating a spent hydrogenation catalyst, comprising the steps of providing a catalyst comprising a support material selected from the group consisting of an inorganic oxide-zeolite composite, carbon and zeolite, and a catalytically active metal phase selected from the group consisting of partially reduced group IB metals and completely reduced group VIII metals, said metal phase being present in an amount of greater than or equal to about 0.03 wt %, and said catalyst having an initial diolefin hydrogenation activity, treating a hydrocarbon feedstock having a diolefin content of greater than or equal to about 0.1% and a nitrite content of greater than or equal to about 2 ppm with said catalyst until said initial diolefin hydrogenation activity of said catalyst decreases to a reduced diolefin hydrogenation activity, flushing said catalyst with an inert gas so as to remove traces of hydrocarbon

from said catalyst and thereby provide a flushed catalyst, and regenerating said flushed catalyst by further flushing said flushed catalyst with hydrogen so as to provide a regenerated catalyst having a regenerated diolefin hydrogenation activity which is greater than said reduced diolefin hydrogenation activity.

**5817702****Hydrocarbon synthesis catalyst slurry rejuvenation with gas disengagement**

Behrmann William C; Leviness Stephen C, Baton Rouge, LA, United States, Exxon Research And Engineering Company

A reversibly deactivated, particulate catalyst in a slurry hydrocarbon synthesis slurry is rejuvenated by circulating the slurry from a slurry body through (i) a gas disengaging zone to remove gas bubbles from the slurry, (ii) a catalyst rejuvenation zone in which a catalyst rejuvenating gas contacts the catalyst in the slurry to rejuvenate it and form a rejuvenated catalyst slurry and, (iii) back into the slurry body. Removing at least a portion of the gas bubbles improves the rejuvenation process.

**5820693****Process for recovering catalysts supports**

Patchett Joseph; Speronello Barry K; Nugent John M, Basking Ridge, NJ, United States

The present invention relates to a method of removing a coating, such as a spent catalyst coating, from a carrier such as a metal plate or a honeycomb carrier. The metal plates have a surface which has the catalyst coating. The honeycomb is of the type having a plurality of channels defined by honeycomb walls, the honeycomb walls the having a coating thereon. The method comprises directing a fluid stream which can comprise a cleaning liquid at the coated plate surface or into the honeycomb channels with sufficient force to loosen and remove at least some of the coating from the carrier surface. The carrier can then be separated from the liquid and dried. Where additional coating is to be removed, a stream of gas is directed at the carrier surface with sufficient force to loosen and remove at least some of the coating. The cleaned carrier can then be recoated. The present invention includes reclaimed and recoated articles.

**5821187****Process and apparatus for recoating a deactivated catalyst coating in a catalyst**

Zahn Wolfgang; Loose Gunter; Hirshmann Axe, Ludwigsburg, Germany, Mercedes-Benz AG

A process serves for recoating a deactivated catalyst coating of a catalyst for converting harmful constituents from the exhaust gas of an internal combustion engine, particularly in a motor vehicle. In this process, washcoat and/or noble metal compounds are sprayed by means of an aerosol into the catalyst. The noble metal compounds are subsequently brought into their elemental state by means of a reducing medium flowing through the catalyst, after which the washcoat applied is dried by heat treatment or calcination. In an apparatus for carrying out the process, a first line for a carrier gas and a second line for the washcoat and/or the noble metal compounds are provided. The first line is arranged at least partly in a region before the catalyst within the second line and at its ends nearest the catalyst is provided with an atomization device. The second line opens into the catalyst, with there being provided after the catalyst a third line which opens into a separator from which the first and the second lines lead away.

**5821270****Slurry hydrocarbon synthesis process with multi-stage catalyst rejuvenation**

Chang Min; Coulaloglou Constantine A; Hsia Stephen Ju-Ming; Mart Charles John, Warren, NJ, United States, Exxon Research and Engineering Company

A reversibly deactivated hydrocarbon synthesis catalyst in a hydrocarbon synthesis slurry is rejuvenated by successively passing the slurry through at least two rejuvenation stages external of the slurry reactor, each of which comprises a rejuvenation zone followed by an offgas removal zone. This is accomplished by using a lift pipe outside the reactor into which slurry from the reactor is passed and contacts a catalyst rejuvenating gas to partially rejuvenate the catalyst particles and form a rejuvenation offgas. The gas and slurry mixture are passed into a vessel in which the gas is removed from the slurry. Rejuvenation gas is bubbled into the slurry in the vessel to further rejuvenate the catalyst. A gas removing downcomer removes gas from the slurry

in the vessel before it is passed back into the reactor. The rejuvenation gas also acts as a lift gas in the lift pipe.

**CHEMICALS AND FINE CHEMICALS****5811515****Synthesis of conformationally restricted amino acids, peptides, and peptidomimetics by catalytic ring closing metathesis**

Grubbs Robert H; Miller Scott J; Blackwell Helen E, South Pasadena, CA, United States, California Institute of Technology

A method for synthesizing conformationally restricted amino acids, peptides, and peptidomimetics by ring closing metathesis. The method includes the steps of synthesizing a peptide precursor containing first and second unsaturated C–C bonds and contacting the peptide precursor with a RCM catalyst to yield a conformationally restricted peptide. Suitable peptide precursors may contain two or more unsaturated C–C bonds. These bonds may be olefinic bonds and may be contained in first and second alkenyl groups which may be allyl groups. The RCM catalyst may be a Ruthenium or Osmium carbene complex catalyst and more specifically, a Ruthenium or Osmium carbene complex catalyst that includes a Ruthenium or Osmium metal center that is in a +2 oxidation state, has an electron count of 16, and is pentacoordinated. The method may be carried out using solid-phase-peptide-synthesis techniques. In this embodiment, the precursor, which is anchored to a solid support, is contacted with a RCM catalyst and the product is then cleaved from the solid support to yield a conformationally restricted peptide.

**5811551****Palladium catalyzed indolization**

Chen Cheng-Yi; Larsen Robert D, Colonia, NJ, United States, Merck and Co Inc

We have found that indoles of structural formula (III): (\*See Patent for Chemical Structure\*) III can be cost-effectively synthesized in high yield by the palladium-catalyzed coupling/ring closure of a 2-halo- or 2-trifluoromethylsulfonyl-aniline and a cyclic ketone derivative. The process of the present invention is particularly useful to form indoles containing acid-la-

bile substituents such as triazole, acetyl, ketal, cyano, and carbamate, or indoles having a good leaving group in the benzyl position. The advantages of the present process are that it does not require the use of triphenyl phosphine or tetrabutyl ammonium chloride or lithium chloride. By this invention, there is provided a process comprising the step of contacting a compound of Structure I with a compound of Structure II to form a compound of Structure III: (\*See Patent for Chemical Structure\*) (\*See Patent for Tabular Presentation\*)

#### 5811580

##### **Process for the preparation of N-hydrocarbyl-substituted amides via the ritter reaction using solid clay catalysts**

Rhubright Douglas C, Chardon, OH, United States, The Lubrizol Corporation

Hydrocarbyl-substituted amides can be prepared in a catalyzed Ritter reaction by contacting a nitrile with a hydrocarbylating agent, in the presence of an acidified clay as the catalyst, under conditions conducive to the formation of the hydrocarbyl-substituted amide.

#### 5811614

##### **Catalytic norbornylation of aromatics**

Acholla Francis V; Santiesteban José G, Yardley, PA, United States, Mobil Oil Corporation

A process is disclosed for the catalytic norbornylation of aromatics comprising the steps of contacting norbornene and an aromatic hydrocarbon with an acidic solid catalyst containing a Group IVB metal oxide modified with an oxyanion of a Group VIB metal under norbornylation conditions to evolve a product containing norbornylated aromatics.

#### 5814112

##### **Nickel/ruthenium catalyst and method for aqueous phase reactions**

Elliott Douglas C; Sealock John L, Richland, WA, United States, Battelle Memorial Institute

A method of hydrogenation using a catalyst in the form of a plurality of porous particles wherein each particle is a support having nickel metal catalytic phase

or reduced nickel deposited thereon in a first dispersed phase and an additional ruthenium metal deposited onto the support in a second dispersed phase. The additional ruthenium metal is effective in retarding or reducing agglomeration or sintering of the nickel metal catalytic phase thereby increasing the life time of the catalyst during hydrogenation reactions.

#### 5817775

##### **Phosphines and catalysts containing the same**

Kohlpaintner Christian W; Hanson Brian E; Ding Hao, Oberhausen, Germany, Celanese International Corporation; Virginia Polytechnic I

The present invention provides novel a phosphine as a ligand (L) and having the formula (\*See Patent for Chemical Structure\*) wherein k, l, m, R', R'', R1–R9 and n are defined herein, and which can be complexed with a transition metal (M') and an auxiliary ligand Y to form a novel catalyst having the formula M'LxYZ useful in such applications as hydroformylation.

#### 5817831

##### **Alkylation of aromatic amines using a heteropoly catalyst**

Rhubright Douglas C; Burrington James D; Zhu Ping Y, Chardon, OH, United States, The Lubrizol Corporation

Aliphatic hydrocarbyl-substituted aromatic amines are prepared by reacting an aromatic amine and an aliphatic hydrocarbylating agent, such as an olefin, in the presence of a heteropolyacid catalyst such as Cs<sub>2</sub>.5H<sub>0</sub>.5PW<sub>12</sub>O<sub>40</sub>, for a period of time and at a temperature sufficient to permit reaction.

#### 5817838

##### **Process for manufacturing cyclocarbonates using a silver salt catalyst**

Gründler Hansjörg; Hansen Hans-Jürgen, Rheinfelden, Switzerland, Roche Vitamins Inc

A process for the manufacture of 4,4-disubstituted 5-methylene-1, 3-dioxolan-2-ones (cyclocarbonates) of the formula: (\*See Patent for Chemical Structure\*) I wherein R1 and R2 each independently signify a satu-

rated or olefinically-unsaturated aliphatic group or an aromatic group, or R1 and R2 together form tetra- or pentamethylene, by reacting a corresponding 3,3-disubstituted prop-1-yn-3-ol of the formula HC triple bond C–C(R1)(R2)–OH (II) with carbon dioxide in the presence of a quaternary ammonium or phosphonium salt as the catalyst comprising using a silver salt as a further catalyst. An alkali metal or quaternary ammonium or phosphonium salt of a carboxylic acid can also be used to increase the catalytic performance of the silver salt catalyst. Moreover, the addition of triphenylphosphine serves to accelerate the reaction to some extent. The silver salts catalyze this process significantly better than the previously utilized copper salts. Advantageously, the process uses much smaller amounts of catalyst, significantly shortens reaction times, and mandates less drastic reaction conditions. Cyclocarbonates produced by this process are valuable intermediates for the production of polymerizates and other useful substances, such as dyestuffs and carotenoids.

#### 5817855

##### **Copper-based catalysts, processes for their production and their use and a process for the production of alkyl halosilanes**

Langner Bernd; Stantke Peter; Leister Thomas; Steiner Matthias-Sven; Degen Bruno; Schartau Wolfgang; Licht Elke, Winsen/Luhe, Germany, Bayer Aktiengesellschaft; Norddeutsche Affinerie Aktiengesellschaft

The invention relates to copper-based catalysts, processes for their production and their use and to a process for the production of alkyl halosilanes in the presence of said catalysts.

#### 5817872

##### **Copper catalyst for the hydration of nitrile and preparation thereof**

Honda Tadatashi; Ohe Hiroshi; Ichikawa Shinichiro; Kuboyama Hisaharu; Miyazoe Satoru, Kanagawa ken, Japan, Mitsui Chemicals Inc

A copper catalyst obtained by reducing a precursor containing copper and aluminum and not containing substantially malachite and aluminum hydroxide permits preparation of amides with a high productivity and in a high selectivity by the hydration of nitrites.

#### 5817877

##### **Metal-catalyzed amination of organic sulfonates to organic amines**

Hartwig John F; Driver Michael S; Louie Janis; Hamann Blake, New Haven, CT, United States, Yale University

A process of preparing an organic amine having at least one unsaturated group, such as an arylamine, involving contacting an unsaturated organic sulfonate, such as an aryl sulfonate, with a reactant amine, such as an alkyl or aryl amine, in the presence of a base and a transition metal catalyst under reaction conditions. The transition metal catalyst contains a Group 8 metal and a chelating ligand, for example a Group 15-substituted arylene or Group 15-substituted metallocene, such as 1, 1'-bis(diphenylphosphino)-2,2'-binaphthyl or 1, 1'-bis(diphenylphosphino)-ferrocene, respectively. The aryl sulfonate can be prepared from a phenol and sulfonating agent.

#### 5817881

##### **Tetraalkylammonium polyoxoanionic oxidation catalysts**

Ellis Paul E; Lyons James E; Myers Harry K; Shaikh Shahid N, Downingtown, PA, United States, Sun Company Inc (R&M)

Alkanes are catalytically oxidized in air or oxygen using iron-substituted polyoxoanions (POAs) of the formula: (\*See Patent for Tabular Presentation\*) PS The M' (e.g., iron(III)/iron(II)) reduction potential of the POAs is affected by selection of the central atom X and the framework metal M, and by the number of tetra-butyl-ammonium groups. Decreased Fe(III)/Fe(II) reduction potential has been found to correlate to increased oxidation activity.

#### 5817886

##### **Process for production of alkyl ether of phenol and catalyst used therein**

Ariyoshi Kimio; Satoh Yuuichi; Saito Noboru, Suita, Japan, Nippon Shokubai Co Ltd

The present invention provides a process for producing an alkyl ether of a phenol from a phenol and an alcohol at a selectivity and a yield higher than in conventional processes, stably over a long period of time. The process is characterized by alkyl-etherifying a

phenol with an alcohol in the presence of an oxide catalyst comprising an alkali metal as a constituent element.

#### 5817895

##### **Process for the regeneration of a catalyst based on trivalent chromium compounds**

Cuzzato Paolo; Rinaldi Francesco; Bragante Letanzio, Treviso, Italy, Ausimont S p A

Process for the regeneration of a fluorination catalyst based on Cr(III) compounds optionally supported, which comprise a) treatment at 350°–40°C. with an air/inert gas mixture and b) treatment at 300°–380°C. with a mixture of an inert gas containing from 0.5 to 5% by volume of an aliphatic hydrocarbon C1–C8.

#### 5817896

##### **Catalytic method of replacing halogen in halocarbons**

Thomson James, Dundee, United Kingdom, The University Court of The University of Dundee

As replacements for chlorofluorocarbons, hydro-(chloro)fluorocarbons are synthesized by hydrogenating chlorofluorocarbons over a Pd/ZnO/gamma-Al<sub>2</sub>O<sub>3</sub> catalyst. The ZnO is partially reduced before use and assists the Pd to function catalytically for days instead of hours despite the evolution of halogen.

#### 5821390

##### **Catalytic gas-phase oxidation of propene to acrolein**

Ruppel Wilhelm; Wegerle Ulrike; Tenten Andreas; Hammon Ulrich, Frankenthal, Germany, BASF Aktiengesellschaft

A gas-phase mixture of propene and oxygen is catalytically oxidized by passing a reactant gas mixture comprising propene and oxygen through a plurality of catalyst containing contact tubes in a fixed bed reactor and simultaneously passing only one heat-exchange medium at elevated temperature over the exterior surfaces of the contact tubes in a longitudinal flow pattern which is cocurrent with the direction of flow of the reactants through said tube; simultaneously superposing a transverse flow on said longitudinal flow of heat

exchange medium by means of an arrangement of successive baffles along the contact tubes which leave passage cross-sections free, thereby resulting in a meandering flow of the heat-exchange medium through the reactor and setting the flow rate of said heat-exchange medium so that its temperature between the point of entry of the medium into the reactor and its point of exit increases by 2° to 10°C.; and obtaining product acrolein at a selectivity > or = 85 mol % from the reactor at a single pass propene conversion > or = 90 mol %.

## ENVIRONMENTAL CATALYSIS

#### 5809773

##### **Method and a device for catalyst emission control**

Gottberg Ingema, Vastra Frolunda, Sweden, AB Volvo

PCT No. PCT/SE92/00101 Sec. 371 Date Aug. 19, 1993 Sec. 102(e) Date Aug. 19, 1993 PCT Filed Feb. 20, 1992 PCT Pub. No. WO92/14912 PCT Pub. Date Sep. 3, 1992. A method and a device are disclosed for catalyst emission control including an electrically heated startup catalyst which is positioned adjacent a main catalyst in the exhaust pipe associated with the engine. Also provided are a source of current, a switch, a control unit, a lambda sensor, and an electrically operated air pump including an air channel inserted between the lambda sensor and the startup catalyst. In connection with startup of the engine the startup catalyst and/or the air pump are activated by means of the control unit. The invention provides improved purification of the exhaust gases emitted by the engine.

#### 5809775

##### **Reducing NOx emissions from an engine by selective catalytic reduction utilizing solid reagents**

Tarabulski Theodore J; Peter-Hoblyn Jeremy D; Valentine James, Brewster, NY, United States, Clean Diesel Technologies Inc

Urea or other solid NOx-reducing reagent is employed in a selective catalytic reduction process on emissions from diesel and lean-burn gasoline engines. The solid reagent is fed to a gas generator that produces a reactant gas by heating. In one embodiment the reactant gas is maintained at elevated temperatures to prevent condensation products from forming. The reac-



tant gas contains ammonia and is fed to the exhaust on an as-needed basis.

#### 5811063

##### **Mounting mat for fragile structures such as catalytic converters**

Robinson John W; Lebold Alan; Travers Mark, Hampton, SC, United States, Unifrax Corporation

A device for the treatment of exhaust gases such as a catalytic converter, a diesel particulate trap and the like, includes a housing having an inlet at one end and an outlet at its opposite end through which exhaust gases flow; a structure resiliently mounted within the housing, the structure having an outer surface and an inlet end surface at one end in communication with the inlet of the housing and an outlet end surface at an opposite end in communication with the outlet of the housing; and mounting element, disposed between the structure and the housing, for selectively exerting substantially stable mounting pressure against the housing and the structure over a temperature range of from about 20 degrees C. to at least about 1200 degrees C., wherein the mounting element is a flexible mounting mat including an integral, substantially non-expanding sheet comprising ceramic fibers, wherein the fibers are substantially shot free. The mat has flexible, structural integrity. A method of mounting a fragile structure in a device is also provided.

#### 5811064

##### **Poisoning resistant catalyst for exhaust gas converters**

Kojima Takao; Minoha Ken; Yamano Masar, Aichi, Japan, NGK Spark Plug Company Ltd

A poisoning-resistant catalyst for a catalytic converter, includes a support, a noble metal catalytic component deposited on the support, and a poisoning-preventive layer formed on the side of the catalytic component exposed to an exhaust gas, said poisoning-preventive layer having a compound containing at least one element selected from the Group IIa elements of the periodic table.

#### 5811067

##### **Catalytic method for selectively reducing nitrogen oxides**

Lecuyer Christin; Fakche Ahmed; Garbowski Edouar; Pommier Bernard; Primet Michel Levallois, Perret, France, Gaz de France

A method for the catalytic removal of nitrogen oxides, methane and carbon monoxide out of oxygen-rich exhaust gases emitted from motors that may combust natural gas by contacting the exhaust gas with a zeolite of the NFI structure that contains palladium. The palladium containing zeolite has been activated under oxygen prior to use by calcining the palladium containing zeolite at about 300°C. for about one hour, then calcining the palladium containing zeolite at about 500°C. for about one hour, and cooling the palladium containing zeolite to about 300°C.

#### 5811364

##### **Catalyst system for the purification of exhaust gas**

Suga Katsuo; Sekiba Toru, Yokosuka, Japan, Nissan Motor Co Ltd

A catalyst system for the purification of exhaust gas comprises at least two catalysts disposed on an exhaust system side of an engine and at least containing palladium as a catalyst component. In this case, each of catalysts disposed on upstream side and downstream side contains a given amount of an alkaline earth metal compound as an oxide conversion per 1 L of a carrier.

#### 5814285

##### **Poisoning-preventive layer-possessing support, poisoning-resistant catalyst, exhaust gas converter device, and poisoning-preventive gasoline composition**

Kojima Takao; Minoha Ken; Yamano Masaru, Aichi, Japan, NGK Spark Plug Company Ltd

Poisoning-preventive and poisoning-resistant materials are described, including: a poisoning-preventive layer-possessing support including a support and, formed thereon, a poisoning-preventive layer having a compound containing at least one element selected from the Group IIa element of the periodic table.

**5814287****Polymerization catalyst enhanced hydrocarbon trapping process**

Adamczyk Andrew Anthony; Logan Anthony David, Dearborn, MI, United States, Ford Global Technologies Inc

This invention is directed to a catalyst system for treating internal combustion engine exhaust gases, the system having enhanced hydrocarbon trapping efficiency which is particularly advantageous during cold start. The system comprises a hydrocarbon polymerization catalyst, a hydrocarbon trap located downstream of the hydrocarbon (HC) polymerization catalyst, advanced exhaust treatment catalyst. The hydrocarbon polymerization catalyst is capable of forming larger (HC) molecules from smaller HC molecules.

**5814293****Catalyst for the selective oxidation of sulfur compounds to elemental sulfur, process for preparing such catalyst and process for the selective oxidation of sulfur compounds to elemental sulfur**

Terörde Robert Johan Andreas Mari; Geus John Wilhel, Utrecht, Netherlands, Gastec N V; Comprimo B

PCT No. PCT/NL94/00226 Sec. 371 Date Jun. 18, 1996 Sec. 102(e) Date Jun. 18, 1996 PCT Filed Sep. 16, 1994 PCT Pub. No. WO95/07856 PCT Pub. Date Mar. 23, 1995. The invention relates to a catalyst on support for the selective oxidation of sulfur-containing compounds to elemental sulfur, comprising at least one catalytically active material applied to a support material, this catalyst being obtainable by applying the catalytically active material to a support material which comprises at least one alkali metal promotor.

**5814576****Catalyst for purifying exhaust gas and method of producing same**

Yamamoto Shinji, Yokosuka, Japan, Nissan Motor Company Ltd

A catalyst for purifying exhaust gas from an automotive internal combustion engine. The catalyst comprises a monolithic carrier which is coated with a catalyst component carrying layer which includes rhodium and a zirconium oxide. The zirconium oxide contains at

least one element selected from the group consisting of magnesium, calcium, strontium, barium, yttrium and lanthanum. The zirconium oxide in the catalyst component carrying layer has a composition represented by a general formula of  $(X)_aZr_bO_c$  where X is at least one element selected from the group consisting of magnesium, calcium, strontium, barium, yttrium and lanthanum; and a, b and c indicate ratios in number of atoms, in which a is within a range of from 0.01 to 0.6 on the assumption of b being 1.0, and c is a number of oxygen atom which satisfies valence of respective elements.

**5814577****Catalyst and fabrication method of same for purifying exhaust gases of automobile**

Park Sang-cheol; Pak Chan-ho, Seoul, Korea, Samsung Electro-Mechanics Company Ltd

A catalyst capable of purifying exhaust gases comprising an oxygen absorbing material and a carrier impregnated with a noble metal, and wherein the oxygen absorbing material comprises cobalt-cerium oxide.

**5817240****Catalytic fixed bed reactor systems for the destruction of contaminants in water by hydrogen peroxide**

Miller Christopher M; Valentine Richard L, Akron, OH, United States, The University of Akron

A process for the treatment of an aqueous media having contaminants therein, comprising adding hydrogen peroxide to the aqueous media; and exposing the aqueous media to a catalytic environment for a time long enough to form usable reactive intermediates and short enough to prevent scavenging of the usable reactive intermediates formed. Also provided is a reactor for achieving the process.

**5820832****Plate-type catalytic converter**

Hüttenhofer Klaus; Beer Josef-Konrad; Friede Heimo; Lammers Hendrik, Heroldsberg, Germany, Siemens Aktiengesellschaft

A plate-type catalytic converter includes a holder device and plates being coated with a catalytically active composition, being held one above the other in

the holder device and extending in a main flow direction. The plates include first and second adjacent plates forming at least one reaction chamber. At least the first plate has an approximately corrugated first structure oriented obliquely relative to the main flow direction for deflecting a flow medium flowing along the first structure from the main flow direction.

#### 5820835

##### **Assembly and method for making catalytic converter structure**

Sheller David Thomas; Whittenberger William A, Garrettsville, OH, United States, Engelhard Corporation

A catalytic converter is constructed by assembling a plurality of non-nestable foil leaves, each having opposite proximal and distal ends defining a leaf length. The proximal ends of the foil leaves are interconnected to provide a continuous flexible strip of overlapping foil leaves in which the distal ends of the leaves extend freely. The strip of foil leaves is subsequently formed to arrange the leaves to lie in curved paths radiating inwardly from the interconnected proximal ends toward a central area.

#### 5820836

##### **Rotating catalytic cleaning device for polluted effluents**

Morlec Jean; Bourcier Jacques, Saint Nazaire, France, Institute Francais du Petrole; Bourcier Jacques

PCT No. PCT/FR95/01692 Sec. 371 Date Jan. 3, 1997 Sec. 102(e) Date Jan. 3, 1997 PCT Filed Dec. 18, 1995 PCT Pub. No. WO96/20039 PCT Pub. Date Jul. 4, 1996. A process of cleaning a gas and a rotating catalytic gas cleaning device including a crown of vertical axis driven into rotation in a cage. The crown has an annular catalyst bed covering its inner wall and an annular thermal load, outside the catalytic bed, made of a material exhibiting a large heat exchange surface. A polluted gas is radially passed from a peripheral inlet to a central zone of the crown with crossing of an annular thermal load and a catalytic layer. The gas is radially passed gas from the central zone to a peripheral outlet, while again crossing the catalytic bed and thermal load with thermal exchange.

#### 5821190

##### **Catalyst comprising iridium, alkaline metal, alkaline earth or rare earth metal, and metal carbide or metal nitride**

Kurabayashi Katsumi; Kosaki Yukio; Ito Takashi; Nagata Makoto, Numazu, Japan, N E Chemcat Corporation

The present invention provides a catalyst and method for purifying exhaust gases, having superior performance of NO<sub>x</sub> purification to exhaust gases containing oxygen and nitrogen oxides, particularly superior performance of NO<sub>x</sub> elimination to exhaust gases from lean-bum engines with excess oxygen, and a wider effective temperature range of NO<sub>x</sub> elimination, and also superior heat resistance at high temperature, said catalyst for purifying exhaust gases comprises, as indispensable contents, iridium and alkaline metal loaded on a carrier which is at least one selected from metal carbide and metal nitride, or these and at least one element selected from the group consisting of alkaline earth metal elements and rare earth metal elements, and said method using these catalyst.

#### 5821194

##### **Catalyst for purifying the exhaust gas of vehicles**

In Chi-Bum, Puch'On, Korea, Kia Motors Corporation

A catalyst for purifying the exhaust gas of vehicles having a metallic flat substrate in a scroll form, a metallic corrugated substrate formed in a scroll and engaged with the flat substrate, an intermediate layer of ceramic provided on both surfaces of the flat and the corrugated substrates, and a catalytic layer provided on the intermediate layer. The corrugated substrate and the flat substrates have a plurality of holes which are filled with the intermediate layer of ceramic.

## **POLYMERIZATION AND POLMER CATALYSIS**

#### 5811362

##### **Process for preparing a Ziegler-type spherical catalyst for alpha-olefin polymerization process**

Da Silva Jaime Correia; De Figueiredo Cecilia Maria Ooelho, Rio de Janeiro, Brazil, Petroleo Brasileiro S A -Petrobras

A proces for preparing a spherical support for the polymerization of alpha-olefins from an ammonium

dawsonite which is spray-dried and formed into spherical particles which are then calcined and impregnated with titanium to produce a spherical catalyst of good mechanical strength is described. Also described is the polymerization process which, in the presence of the spherical catalyst, yields polyolefin particles which preserve the spherical characteristics of the support, with low flow angle and good bulk density, as well as the product polyethylene obtained from the process.

#### 5811497

##### **Aromatic curing catalyst for epoxy resins**

Hayase Shuzi; Nakano Yoshihiko; Murai Shinji; Mikogami Yukihiko, Yokohama, Japan, Kabushiki Kaisha Toshiba

Disclosed herein is a curing catalyst comprising at least one compound which is a substituted or unsubstituted aromatic or heteroaromatic compound and having any one of groups (I) -O-R1, (II) -O-CY-R1, or (III) -O-CY-X-R1, the groups being directly bonded to the aromatic or heteroaromatic ring, in a number of 1 to 10 wherein R1 may be the same or different and is a substituted or unsubstituted hydrocarbon group having 1 to 20 carbon atoms, X is O or NH and Y is O or S. Furthermore, an epoxy resin composition comprising the curing catalyst is disclosed.

#### 5811499

##### **Synthesis of cis-1,4-polybutadiene rubber in presence of cobalt containing catalyst system**

Castner Kenneth Floyd, Uniontown, OH, United States, The Goodyear Tire and Rubber Company

It has been determined that 1,3-butadiene monomer can be polymerized into cis-1,4-polybutadiene rubber utilizing a cobalt-based catalyst system which is comprised of (a) an organocobalt compound, (b) a trialkylaluminum compound and (c) hexafluoro-2-propanol. The use of this catalyst system results in extremely fast rates of polymerization. The molecular weight of the cis-1,4-polybutadiene rubber made utilizing this cobalt-based catalyst system can be regulated by conducting the polymerization in the presence of 1,5-cyclooctadiene. This present invention more specifically discloses a

catalyst system which is particularly useful for polymerizing 1,3-butadiene monomer into cis-1, 4-polybutadiene, said catalyst system being comprised of (a) an organocobalt compound, (b) a trialkylaluminum compound and (c) hexafluoro-2-propanol. The subject invention further discloses a process for synthesizing cis-1,4-polybutadiene rubber which comprises polymerizing 1,3-butadiene in the presence of (a) an organocobalt compound, (b) a trialkylaluminum compound and (c) hexafluoro-2-propanol.

#### 5814574

##### **Catalyst compositions and process for preparing polyolefins**

McNally John Paul, Berkshire, United Kingdom, BP Chemicals Limited

A catalyst composition comprising at least one metallocene complex of general formula I or II (\*See Patent for Chemical Structure\*) wherein R is a univalent or divalent 1–20c hydrocarbyl, or a 1–20c hydrocarbyl containing substituent oxygen, silicon, phosphorus, nitrogen or sulphur atoms with the proviso that at least one R group contains a lewis base functionality and when there are two or more R groups present they may be the same or different, and when R is divalent it is directly attached to M and replaces a Y ligand, and wherein M is a Group IVA metal, Y is a univalent anionic ligand X is an organic group containing a cyclopentadienyl nucleus and for formula I n is an integer of 1 to 10 x is either 1 or 2, and for formula II, n, m and l are integers or 0 such that  $n + m + l > 0$ ,  $p = 0-2$ , and z is a c1 to c4 alkylene radical or a dialkyl germanium or silicon or an alkyl phosphine or amine radical or bis-dialkylsilyl or bis-dialkylgermanyl containing hydrocarbyl groups having 1 to 4 carbon atoms bridging the cyclopentadienyl nuclei.

#### 5814709

##### **Process for hydrogenation on conjugated diene polymers and catalyst composition suitable for use therein**

Shell Oil Company

The invention provides a catalyst composition suitable for hydrogenation of polymers containing ethylenic

unsaturation, which comprise: (a) a titanium compound of the formula, (\*See Patent for Chemical Structure\*) wherein A1 and A2 are the same or different and each represents a substituted or unsubstituted cyclopentadienyl or indenyl group, wherein X1 and X2 are the same or different and each represents hydrogen, halogen, a lower alkyl or lower alkoxy, optionally substituted phenyl or phenoxy, or aralkyl having from 7 to 10 carbon atoms, or phenylalkoxy having from 7 to 10 carbon atoms, carboxyl, carbonyl, a  $-\text{CH}_2\text{P}(\text{Phenyl})_2$ ,  $-\text{CH}_2\text{Si}(\text{lower alkyl})_3$ , or  $-\text{P}(\text{phenyl})_2$  group. (b) an alkali metal hydride, added as such or prepared in situ in the polymer solution from the alkali metal terminated living polymer and/or from additionally added alkali metal alkyl and hydrogen, the molar ratio of the alkali metal:titanium in the polymer solution during hydrogenation being at least 2:1; (c) a borium compound (\*See Patent for Tabular Presentation\*) PS wherein the symbols R1, R2 and R3 may be the same or different and each may represent hydrogen, halogen, lower alkyl or lower alkoxy, or phenyl optionally substituted by up to five substituents selected from halogen and lower alkyl, or benzyl having an optionally substituted phenyl ring as specified hereinbefore or wherein two of the symbols R may form together a monocyclic or bicyclic system which on its own may carry one or more substituents. A process for hydrogenation of polymers containing ethylenic unsaturation using these catalyst compositions is also described.

#### 5817590

##### **Catalyst for $\alpha$ -olefin polymerization containing a Lewis base**

Hasegawa Saiki; Yasuda Hisami; Yano Akihiro, Miken, Japan, Tosoh Corporation

A catalyst for olefin polymerization is provided which comprises, as the components, a) a metallocene compound, b) an ionizing ionic compound, c) an organoaluminum compound, and d) a Lewis base compound. This catalyst has a stable active species and improves productivity of an olefin polymer without deterioration of the catalytic activity the metallocene is represented by General Formula (1) or (2) where Cp-containing ligands may be Cp, fluorenyl, indenyl or tetrahydroindenyl and where the metal is a group 4 metal of the periodic table.

#### 5817591

##### **Polyolefin catalyst from metal alkoxides or dialkyls, production and use**

Shamshoum Edwar S; Bauch Christopher G, Houston, TX, United States, Fina Technology Inc

A method of forming a polyolefin catalyst component which includes chlorinating a magnesium alkoxide, solubilizing the chlorinated magnesium alkoxide into a hydrocarbon solvent utilizing an alcohol, and then precipitating a solid from the solvent by the dropwise addition of titanium tetrachloride. Two more titaniation steps follow, the first with an electron donor, the second without an electron donor, to produce a catalyst having an improved yield of polymer.

#### 5817709

##### **Sulfonimide catalysts polyfunctional material combination**

Szita Jenó; Ramesh Subba; Jacobs William; Brogan John Colin, Norwalk, CT, United States, Cytec Technology Corp

Sulfonimide cure catalysts are used with aminoplast crosslinking agents and resins capable of reacting with aminoplast crosslinking agents to prepare heat curable compositions capable of crosslinking to form coatings and articles. Liquid or solid curable compositions may be prepared. Solid sulfonimide catalysts used in combination with solid glycoluril type crosslinking agents are well suited for powder coating systems containing hydroxy- and carboxy-functional resins.

#### 5817725

##### **Process for the preparation of a catalytic system, process for the (CO) polymerization of olefins and (CO) polymers of at least one olefin**

Zandona Nicola, Waterloo, Belgium, Solvay Polyolefins Europe-Belgium (Société Anonyme)

(Co)polymerisation process according to which a mixture of a halogenated neutral metallocene as defined above and of an organoaluminium compound is prepared, the olefin is brought into contact with this mixture and an ionising agent is added thereto.

**5817745****Catalyst compositions**

Cooley Neil Andrew; Ditzel Evert Jan, Teddington, United Kingdom, BP Chemicals Limited

A process for the manufacture of polyketones wherein carbon monoxide and at least one olefin are polymerized in the presence of a catalyst. The catalyst is prepared by reacting together a promoter; a source of a Group VIII metal; and a compound of the formula A<sub>2</sub>PR<sub>1</sub>PA<sub>2</sub> wherein each A is independently a hydrocarbyl group or a Group B bonded to the phosphorous of the PA<sub>2</sub> moiety directly through a nitrogen, sulphur or oxygen and R<sub>1</sub> is a divalent organic group, with the proviso that at least one of the two A groups bonded to each phosphorous is a Group B.

**5817849****Metal complexes containing bridged non-aromatic, anionic, dienyl groups and addition polymerization catalysts therefrom**

Wilson David R; Nickias Peter; Neithamer David; Ernst Richard D, Midland, MI, United States, The Dow Chemical Company

Novel Group 4 metal complexes wherein the metal is in the +2, +3, or +4 formal oxidation state containing two ligand groups bound by n-electrons, at least one of which is a cyclic or noncyclic, non-aromatic, anionic, dienyl ligand group and having a bridged ligand structure, catalytic derivatives of such complexes; and the use thereof as catalysts for polymerizing addition polymerizable monomers are disclosed.

**5817850****Ferrocene bis(phosphonite) ligands and complexes for transition-metal-catalyzed reactions**

Pastor Stephen; Shum Sai P, Danbury, CT, United States, Ciba Specialty Chemicals Corporation

The synthesis of new sterically hindered ferrocene bis(phosphonites) of formula I (\*See Patent for Chemical Structure\*) (I) the synthesis of the corresponding transition-metal complexes and the use of these complexes in transition-metal-catalyzed reactions are described.

**5821189****Catalyst for the homopolymerization or copolymerization of ethylene and process for its preparation**

Calderazzo Fausto; Pampaloni Guido; Masi Francesco; Vallieri Andrea, Ghezzeno, Italy, Enichem S p A

A catalyst for the (co)polymerization of ethylene is obtained by a process comprising the contact of the following components (A), (B), (C) and (D) in the respective molar ratios (1):(0.5–2):(0–25):(0–15): (A): a bivalent arene of titanium having the formula(\*See Patent for Tabular Presentation\*) PS wherein: arene indicates benzene, or benzene substituted with from 1 to 6 C<sub>1</sub>–C<sub>10</sub> alkyl groups; each X independently represents a chlorine, bromine or fluorine atom; R is a C<sub>1</sub>–C<sub>10</sub> alkyl group, linear or branched; x is a number varying from 0.5 to 2.5; (B): a compound or a mixture of compounds selected from the group consisting of the chlorides or bromides of the metals titanium, zirconium, vanadium, hafnium, tin, germanium, cerium or osmium, in the oxidation state (+4), and antimony or vanadium in the oxidation state (+5), and the derivatives of these metals in said oxidation state with oxygenated binders wherein at least one oxygen atom is bound or co-ordinated to the metal; (C): an aluminum alkyl or halide of aluminum alkyl (D): an organic chloroderivative selected from: (a) di- or poly-chloroalkanes; (b) alkyl esters of aliphatic carboxylic acids di- or tri-chlorosubstituted on the carbon in the alpha position with respect to the carboxyl; and (c) derivatives of chlorotriphenylmethane or dichlorodiphenylmethane having a carboxyalkyl group in the para position of at least one of the phenyl rings.

**5821310****Organometallic compounds and catalyst compositions**

De Boer Eric Johannes Maria; Ruisch Bart Johan; Schoon Lodewijk, Amsterdam, Netherlands, Shell Oil Company

There is provided an organometallic compound comprising a metal M of Group 3 to 6 of the Periodic Table or the Lanthanide series and at least one (hetero)cyclohexadienyl ligand of the general formula (I) (\*See Patent for Tabular Presentation\*) PS wherein A is an element chosen from Group 13 to 16 of the Periodic Table, R which can be connected to C or to A and

which may form a bridge is independently hydrogen or an organic substituent which may contain one or more hetero-atoms and  $n$  is 3 plus the number of valencies of A. There is further provided the use of this compound as a catalyst, with a co-catalyst, in a process for the (co)oligomerisation or (co)polymerisation of olefinically unsaturated hydrocarbons.

## REFINERY AND CATALYSIS PROCESSES

### 5811612

#### **Catalytic composition and process for the alkylation or transalkylation of aromatic compounds**

Girotti Gianni; Cappellazzo Oscar, Bologna, Italy, Enichem Synthesis S p A

A catalytic composition is described for the alkylation or transalkylation of aromatic compounds consisting of zeolite Beta, as such or modified by the isomorphic substitution of aluminium with boron, iron or gallium or by the introduction of alkaline/earth-alkaline metals following ion exchange processes, and of an inorganic ligand, wherein the extrazeolite porosity, i.e. the porosity obtained by adding the mesoporosity and macroporosity fractions present in the catalytic composition itself, is such as to be composed for a fraction of at least 25% of pores with a radius higher than 100.Å.

### 5811615

#### **Hydrotreating catalyst composition and processes thereof and therewith**

Wu An-hsiang; Drake Charles A, Bartlesville, OK, United States, Phillips Petroleum Company

A catalyst composition and a process for hydrodealkylating a C9 + aromatic compound to a C6 to C8 aromatic hydrocarbon such as a xylene are disclosed. The composition comprises an alumina and hexavalent chromium oxide. The process comprises contacting a fluid which comprises a C9 + aromatic compound with the catalyst composition under a condition sufficient to effect the conversion of a C9 + aromatic compound to a C6 to C8 aromatic hydrocarbon. Also disclosed is a process for producing the composition which comprises: (1) contacting an alumina, which can be optionally calcined before being contacted, with a hexavalent

chromium-containing compound in a liquid medium under a condition sufficient to incorporate the hexavalent chromium-containing compound into the alumina to form a chromium-modified alumina wherein the volume of the liquid medium is larger than the bulk volume of alumina; (2) removing the excess liquid medium containing the hexavalent chromium compound; (3) drying the chromium-modified alumina; and (4) calcining the chromium-modified alumina to a chromium-promoted alumina under a condition sufficient to effect the conversion of the hexavalent chromium compound to corresponding chromium oxide.

### 5814208

#### **Hydrocarbon catalytic cracking process**

Menon Raghu K; Ramachandran Ramakrishna, Medford, NJ, United States

Hydrocarbon fluid catalytic cracking (FCC) plants are debottlenecked by subjecting part or all of the wet gas stream leaving the main fractionator overhead receiver to pressure swing adsorption to remove methane and hydrogen from this gas stream prior to its introduction into the wet gas compressor. This allows debottlenecking of the compressor system. It can allow the reduction in pressure in the system back to the catalyst regenerator. The reduction in pressure in the catalyst regenerator makes it possible to increase the rate of regeneration of catalyst. Consequently, the rate of hydrocarbon throughput in the FCC plant can be increased.

### 5817229

#### **Catalytic hydrocarbon upgrading process requiring no external hydrogen supply**

Sudhakar Chakka; Pellet Regis J; Patel Mahendra Somabhai, Fishkill, NY, United States, Texaco Inc

A hydrocarbon feedstock is brought into contact with activated carbon at a temperature of about 300° to about 650°C. and a pressure of about 0–1000 psig in the absence of added hydrogen to reduce the content of aromatic, sulfur and nitrogen compounds contained therein and to simultaneously lower the specific gravity thereof.

**5817517****Method of characterizing feeds to catalytic cracking process units**

Perry Bruce N; Brown James Milton, Flemington, NJ, United States, Exxon Research and Engineering Company

The present invention is a method to determine the chemical concentration of one or more of a number of the constituent classes of a feed to a catalytic cracking process. These constituent classes which are referred to as lumps, include 14 different molecular types in 4 different boiling range fractions. A specific lump will include all individual molecular components which are expected to react in a similar way in the catalytic cracking unit.

**5817594****Catalyst and hydrotreating process**

McNamara David John; Stork Willem Hartmann Jurriaan, Amsterdam, Netherlands, Shell Oil Company

Catalyst comprising a porous inorganic refractory oxide wherein the catalyst has: (a) a total pore volume in the range of from 0.2 to 0.5 ml/g, (b) a macroporosity of at least 0.1 ml/g, (c) a microporosity of at least 0.05 ml/g, and (d) a surface area of at least 5 m<sup>2</sup>/g. Process for reducing the amount of solid contaminants and the amount of dissolved metallic contaminants, wherein a hydrocarbon oil containing such contaminants is contacted with hydrogen under hydrotreating conditions in the presence of the above catalyst.

**5817595****Catalyst for the hydroisomerization of contaminated hydrocarbon feedstock**

Tejada Jorge Alejandro; Romero Yilda Margot; Reyes Edito José, San Antonio de los Altos, Venezuela, Intevep S A

A catalyst system for treating sulfur and nitrogen contaminated hydrocarbon feedstock includes a matrix, at least one support medium substantially uniformly distributed through said matrix and comprising a silica alumina molecular sieve material having a composition  $x\text{SiO}_2:\text{Al}_2\text{O}_3:y\text{P}_2\text{O}_5$ , wherein  $x$  is at least about 0.1, a first catalytically active metal phase supported on said

support medium, said first catalytically active metal phase comprising a first metal and a second metal each selected from group VIII of the Periodic Table of Elements, said first metal being different from said second metal, a second catalytically active metal phase supported on said matrix, said second catalytically active metal phase comprising a third metal and a fourth metal each selected from group VIII of the Periodic Table of Elements and a fifth metal selected from group VIb of the Periodic Table of Elements, said third metal being different from said fourth metal.

**5817596****Catalyst, and processes for dehydrogenating dehydrogenatable hydrocarbons**

Akporiaye Dunca; Ronnekleiv Morten; Hasselgard Preben, Oslo, Norway, Den norske stats oljeselskap A S

PCT No. PCT/NO94/00102 Sec. 371 Date Dec. 14, 1995 Sec. 102(e) Date Dec. 14, 1995 PCT Filed Jun. 1, 1994 PCT Pub. No. WO94/29021 PCT Pub. Date Dec. 22, 1994. A new catalyst, especially for the dehydrogenation of dehydrogenatable C<sub>2</sub>–30 hydrocarbons. The catalyst comprises a carrier consisting essentially of a mixed oxide of magnesium and alumina Mg(Al)O, and also comprises a Group VIII noble metal, a Group IVA metal and optionally a Group IA alkali metal. The catalyst may be subjected to a pretreatment comprising a reduction, a subsequent oxidation and finally a second reduction. The catalyst is particularly suitable for the dehydrogenation of C<sub>2</sub>–5 paraffins to olefins, with and without simultaneous oxidation of hydrogen.

**5817903****Hydrotreating catalyst composition and processes therefor and therewith**

Wu An-hsiang; Drake Charles A, Bartlesville, OK, United States, Phillips Petroleum Company

A catalyst composition and a process for converting a C<sub>9</sub>+ aromatic compound to C<sub>6</sub> to C<sub>8</sub> aromatic hydrocarbons such as xylenes are disclosed. The catalyst composition comprises a zeolite and a metal. The process comprises contacting a fluid stream containing a C<sub>9</sub>+ aromatic compound with the catalyst composition under a condition sufficient to effect the production



of C6 to C8 aromatic hydrocarbon. Also disclosed is a process for producing the catalyst composition which can comprise: (1) impregnating a zeolite with an effective and coke-reducing amount of a metal compound under a condition sufficient to effect the production of a metal-promoted zeolite and (2) calcining the metal-promoted zeolite.

#### 5817907

##### **Process for skeletal isomerization of linear olefins using a pretreated molecular sieve, and a catalyst containing a pretreated sieve**

Benazzi Eric; Guisnet Michel; Travers Christine; Gnep Ngi Suor; Andy Patricia, Montesson, France, Institut Francais du Petrole

The invention concerns a process for skeletal isomerization of linear olefins using a catalyst containing at least one pre-treated molecular sieve selected from the group formed by SAPO-31, SAPO-11, Theta-1, EU-1, omega zeolite, mordenite, Nu-10, Nu-86, Nu-87, ferrierite, ZSM-12 and ZSM-23. The pre-treatment process consists in bringing the molecular sieve, which has a pore size of 0.4 to 0.8 nm, into contact with at least one hydrocarbon molecule containing 4 to 20 carbon atoms, at a space velocity of 0.1–45 h<sup>-1</sup>, a temperature of 300 degrees–550 degrees C. and at a pressure of 0.1–1 MPa, for 0.5–48 h, to deposit coke in the pores. The process is of particular application to one-dimensional sieves. It is preferably carried out outside the reaction zone. The invention also concerns a catalyst containing a pre-treated sieve, the sieve being selected from SAPO-31, SAPO-11, Theta-1, EU-1, omega zeolite, mordenite, ferrierite, Nu-10, Nu-86 and Nu-87.

#### 5821188

##### **Catalyst for use in the dehydrogenation and isomerization of paraffins and method**

de Agudelo Maria Magdalena; Romero Trino; Guaregua Jose; Gonzalez Marisela, Caracas, Venezuela, Intevp S A

A catalyst comprising a modified mordenite zeolite catalyst modified with Pt and a promoter selected from the group consisting of Group IIB, Group IVA, Group VIB and mixtures thereof is effectively used in a process for the simultaneous dehydrogenation and isomerization of paraffins to isoparaffins and isoolefins under controlled conditions. The catalyst is prepared by de-

positing on the modified mordenite zeolite catalyst sequentially Pt and thereafter the promoter.

#### 5821191

##### **Process for presulfiding hydrocarbon processing catalyst**

sLockemeyer John Robert, Sugar Land, TX, United States, Shell Oil Company

The present invention relates to a process for presulfiding hydrocarbon processing catalysts by impregnating the catalyst with an inorganic polysulfide solution containing at least one water-soluble oxygenated hydrocarbon such that at least a portion of said sulfide or sulfur is incorporated in the pores of said catalyst, and thereafter heating the sulfur-incorporated catalyst under non-oxidizing conditions to fix the incorporated sulfur onto the catalyst.

#### 5821397

##### **Process for the hydrogenation of diolefins in aromatic-rich hydrocarbons using metallic catalysts impregnated with organic sulphur-containing compounds**

Joly Jean-François; Cameron Charles; Cosyns Jean; Leger Gerard; Renard Pierre; Montecot Françoise, Paris, France, Institut Francais du Petrole

A process is described for the high-efficiency selective hydrogenation of an aromatic hydrocarbon cut which also contains monoolefinic hydrocarbons and polyolefinic and/or acetylenic hydrocarbons with a bromine number of 10000 to 100 mg per 100 g of product with an aromatic degree of conversion which is limited to a maximum of 0.15% by weight, the process being characterized in that the cut, which is at least partially in the liquid phase, is passed with hydrogen into a hydrogenation zone in contact with a catalyst containing 0.1% to 1% by weight (with respect to the support) of palladium, the catalyst having been treated before activation with at least one organic sulphur-containing compound to introduce 0.05% to 1% of sulphur (by weight with respect to the weight of the catalyst), the process being carried out at a temperature in the range 20 degrees C. to 25 degrees C., at a pressure of 4–50 bar, a GHSV of 0.2–25 h<sup>-1</sup> and with a H<sub>2</sub>/monoolefin + polyolefin and/or acetylenes ratio in the range 0.3 to 100.