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Selected Patents Related to Thermal Spraying

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CA denotes Canadian patent, EP denotes European patent, RU denotes Russian patent, US denotes United States patent, WO denotes World Intellectual Property Organization application. Due to differences in databases, not all data are available for each patent. The information has the following format: Subject, Full title, Abstract, Patent number, Inventors, Company, Issued/Filed dates.

Applications

Bipolar Plate with Metal Core and Corrosion-Resistant Layer for PEM Fuel Cells. A bipolar plate has a multilayered structure including an inner metallic layer and at least one outer metallic, corrosion-resistant layer splatted, embedded, diffused, and interlocked into the inner metallic layer. The corrosion-resistant layer is deposited by thermal spray techniques such as high-velocity oxygen fuel (HVOF) technology. Said layer is composed of nickel-based alloys, chromium-based alloys, carbide-based alloys, or combinations thereof, whereas the inner metallic layer comprises stainless steel, aluminum, zinc, magnesium, the corresponding alloys, and combinations thereof.

WO 4049485. H. Tawfik and Y. Hung. Company: The Research Foundation of State University of New York. Issued/Filed: June 10, 2004/Nov 24, 2003.

Ceramic Material, Method for the Production Thereof, Use of the Ceramic Material, and Layer of the Ceramic Material on a Metallic or Ceramic Body. Disclosed is a ceramic material that is suitable for coating a body by way of a thermal spraying method and that has a coefficient of longitudinal thermal expansion that may be matched to that of a metal. The ceramic material includes 10-95 wt.% of $MgAl_2O_4$, 5-90 wt.% MgO, up to 20 wt.% Al_2O_3, remainder standard impurities, and has grains of MgO, which are embedded in a matrix of $MgAl_2O_4$.
US 6723442. J. Decker, T. Jansing, and G. Schurholt. Company: Siemens AG. Issued/Filed: April 20, 2004/April 9, 2002.

Coated Vehicle Wheel and Method. A method of coating a vehicle wheel to increase wear and corrosion resistance of the vehicle wheel, includes the steps of providing a vehicle wheel and applying a wear- and corrosion-resistant coating onto a surface of the vehicle wheel. The coating is applied to at least a tire bead retaining flange of the vehicle wheel. The coating is of particular use with vehicle wheels made of forged aluminum. The coating is selected from tungsten carbide, optionally including cobalt or chrome, a nickel-based superalloy, aluminum and silicon carbide, or stainless steel. The coating is typically applied to a thickness of about 0.004-0.01 in. The surface of the vehicle wheel may be prepared by mechanically abrading the surface or chemically etching the surface of the vehicle wheel. The coating may be applied by cold spraying, thermal spraying, or triboelectric discharge kinetic spraying and other similar processes.

WO 4028833. R.W. Kaufold, N.C. Whittle, E.P. Patrick, and A.V. Pajerski. Company: Alcoa Inc. Issued/Filed: April 8, 2004/Sept 25, 2003.

Corrosion-Resistant Coatings for Steel Tubes. A method of providing a protective, corrosion-resistant thin coating of a MCrX alloy on a carbon or low-alloy steel pipe or tube where M is one of nickel, cobalt, iron, or combination thereof and X is one of molybdenum, silicon, tungsten, or combination thereof, and heat treating the coating to metallurgically bond the coating onto a steel substrate of the pipe or tube. The coating may be deposited in one or two layers by plasma transferred arc deposition or may be deposited as a slurry coating or thermal spray coating with sintering of the coating. The steel substrate is prepared for coating by at least one of boring, honing, bright finishing, grit blasting, grinding, chemical pickling, or electropolishing of the substrate.

US 6749894. C.G. Subramanian, D.A. Easton, K.K. Tzatzov, A.S. Gorodetsky, and A.G. Wysiekierski. Company: Surface Engineered Products Corporation. Issued/Filed: June 15, 2004/June 28, 2002.

Electrical Transmission System. A system for the transmission of electrical energy between different parts of an electrically conductive structure, and in particular for transmission of power and/or data signals to/from downhole equipment or instrumentation in oil and gas wells. A first layer of electrically insulative ceramic material is deposited on the structure (e.g., oil pipe string), followed by a series of electrically conductive tracks and a second layer of electrically insulative ceramic material. The tracks, which serve for the transmission of power and/or data signals, are thus sandwiched between the layers, insulated from the structure and the external environment and protected from damage. Each layer is deposited by a thermal spray process such as plasma spraying or high-velocity oxy-fuel spraying.

WO 4047123. J.L.C. Ludlow, M.G. Maylin, and M.C. Rogers. Company: Qinetiq Ltd. Issued/Filed: June 3, 2004/Nov 18, 2003.

High-Temperature Abradable Coatings. Method of producing a profiled abradable coating on a substrate in which an abradable ceramic coating composition is applied to a substrate using direct-write technology, or plasma sprayed onto the substrate through a mask or by use of a narrow foot-print plasma gun. These methods of producing abradable coatings are performed in the absence of a grid.

US 24115351. Y.-C. Lau, F. Ghasripoor, R.A. Fusaro, R.E. Chupp, D.J. Baldwin, and C.U. Hardwicke. Issued/Filed: June 17, 2004/Dec 17, 2002.

Improved Hydrogen Storage Materials. Improved hydrogen storage materials are disclosed. A first material comprises a hydrogen storage nanomaterials that contains nanoparticles or nanoparticle clusters of a metal that is capable of combining with hydrogen to form a metal hydride. The nanomaterials may be formed using a thermal spray process. A second material comprises a microsized support that contains a hydrogen storage material deposited thereon. The hydrogen storage material may comprise a thermal spray deposit formed on a fly ash particle. A third material comprises a hydrogen permeable container having a hydrogen storage material therein. The container may comprise a microparticle having an internal void (e.g., a fly ash cenosphere or glass microspheres) containing a hydrogen storage material that has been permeated therein. Alternatively, the container may comprise an enclosing layer formed over a hydrogen storage material. The enclosing layer may be a deposited protective layer formed over a particle of a hydrogen storage material.

WO 4031642. A.K. Hearley and S.D. Redmond. Company: Fuelsell Technologies, Inc. Issued/Filed: April 15, 2004/Sept 29, 2003.

A Method for Obtaining a Good Contact Surface on an Electrode Support Bar and a Support Bar. The invention relates to a method for forming a good contact surface on an electrode support bar used in electrolysis, where at least part of the bar is made of copper. In the method a highly electroconductive layer is formed on at least one end of the copper section. The highly electroconductive layer forms a metallic bond with the copper of the support bar, which can be achieved preferably with either thermal spray coating or soldering technique. The invention also relates to an electrode support bar either partially or wholly made of copper, of which at least one end is coated with a highly electroconductive material.

WO 4042119. K. Osara and V. Polvi. Company: Outokumpu OYJ. Issued/Filed: May 21, 2004/Nov 6, 2003. Similar patent: WO 4042121.

Method for Preparing a Coating for Metallurgical Furnace Cooling Element. The invention relates to a method for preparing a coating for pyrometallurgical furnace-cooling elements. The purpose of the invention is to attain a method for the formation of a coating on a metallurgical furnace-cooling element in a simple way. This is done by using thermal spraying technology. Said cooling element comprises mainly a frame section of copper and a channel network made in the frame section for the circulation of the cooling medium. A corrosion-resistant coating is arranged on at least part of the element surface; the coating forms a metallurgical bond together with the element, and the basic structure of the coating forms of substantially iron and/or nickel based materials.

WO 4042105. K. Osara and V. Polvi. Company: Outokumpu OYJ. Issued/Filed: May 21, 2004/Nov 6, 2003.

Method for Thermal Spray Coating and Rare Earth Oxide Powder Used Therefor. The invention discloses an efficient method for the formation of a highly corrosion- or etching-resistant thermal spray coating layer of a rare earth oxide or rare-earth-based composite oxide by a process of plasma thermal spray method by using a unique thermal spray powder consisting of granules of the oxide. The thermal spray granules are characterized by a specified average particle diameter of 5-80 μm with a specified dispersion index of 0.1-0.7 and a specified BET specific surface area of 1-5 m^2/g as well as a very low content of impurity iron not exceeding 5 ppm by weight as oxide. The flame splat powder used here is characterized by several other granulometric parameters including globular particle configuration, particle diameter D_{90}, bulk density, and cumulative pore volume.

US 6733843. T. Tsukatani, Y. Takai, and T. Maeda. Company: Shin-Etsu Chemical Co., Ltd. Issued/Filed: May 11, 2004/April 28, 2003.

Multimodal Structured Hardcoatings Made from Micro-Nanocomposite Materials. A thermal spray method for the fabrication of ceramic/metal and ceramic/ceramic hardcoating for wear applications. The method makes use of feedstock powder, composed of micron-scale aggregates of hard phase material particles that are either mixed or coated with a readily fusible nanoscale binder phase material. Thus, during thermal spraying, the nanostructured material undergoes rapid melting while the aggregated material is heated but not necessarily melted. A dense coating is formed when the molten nanomaterial fills the available pore spaces between the heated and softened aggregates, providing a strong and tough matrix for the consolidated material. Optimal wear properties are achieved when the volume fraction of aggregated particles is high, typically in the range of 0.5-0.9. Aggregated material may be composed of one, two, or more particles of difference sizes and/or compositions, with particle size distribution that gives high packing density for the hard phase.

US 6723387. B.H. Kear and G. Skandan. Company: Rutgers University. Issued/Filed: April 20, 2004/Sept 19, 2002.

Piston Ring and Thermal Sprayed Coating for Use Therein, and Method for Manufacture Thereof. A sprayed coating that comprises chromium carbide particles having an average particle diameter of 5 μm or less and a matrix metal of a Ni-Cr alloy or a Ni-Cr alloy and Ni, wherein the sprayed coating has pores having an average diameter of 10 μm or less and a porosity of 8 vol.% or less; and a piston ring having the sprayed coating at least on the sliding surface of the perimeter thereof. The sprayed coating has a markedly fine structure and is homogeneous, and thus the piston ring is excellent in the resistance to wear, seizure, and exfoliation and also is reduced in the attack against a mating material.

WO 4035852. R. Obara, K. Takiguchi, and Y. Hosotsubo. Company: Kabushiki Kaisha Riken. Issued/Filed: April 29, 2004/Oct 15, 2003.

Plasma Sprayed Layer on Cylinder Bores of Engine Blocks. Iron-containing layer applied by plasma spraying contains 1-4 wt.% bound oxygen. An independent claim is also included for a process for the production of layers comprising injecting an amount of air of 200-1000 NLPM during plasma spraying.

EP 1022351. G. Barbezat. Company: Sulzer Metco AG. Issued/Filed: May 19, 2004/Dec 8, 1999.

Process for the Manufacturing of Ceramic-Matrix Composite Layers and Related Composite Material. Process for the manufacturing of ceramic-matrix composite layers resistant to very high temperatures, comprising the steps of: preparing the powders for the feeding of the deposition plant by wet mixing of the ceramics constituting the material in form of fine powders and atomizing the suspension in the presence of a hot air jet; and depositing by plasma thermal spraying with an inert gas flow and with a >30 kPa pressure in a deposition chamber. This process forms composite layers having a very high resistance, apt to be employed as coatings for vehicles, of the type destined to reenter Earth's atmosphere from outer space and to be launched again therein.

EP 1241278. M. Tului and T. Valente. Company: Centro Sviluppo Materiali S.p.A. Issued/Filed: June 2, 2004/March 12, 2002.

Process for the Manufacture of Low-Density Components, Having a Polymer or Metal-Matrix Substrate and Ceramics and/or Metal-Ceramics Coating and Low-Density Components of High Surface Strength Thus Obtained. Manufacturing low-density components of high surface strength having a polymer or metal-matrix substrate and ceramics and/or metal-ceramics coating, wherein the low-density substrate to be coated is subjected to: optionally, machining the surface in order to generate residual compressive stress in the outer layers; optionally, thermal stabilizing at a temperature lower than 350 °C; depositing onto the outer surface, with hot spraying techniques at a temperature ranging from 70-350 °C, of a coating layer in ceramics and/or metal-ceramics material of a surface strength higher than that of the component to be coated, the surface of the coating layer being optionally subjected to a finishing treatment. The disclosure also relates to the product thus obtained.

US 6727005. P. Gimondo and C. Costa. Company: Centro Sviluppo Materiali S.p.A. Issued/Filed: April 27, 2004/Oct 22, 2002.

Thermal Spray Coating for Gates and Seats. A thermal spray powder composition, a coating made using a powder of this composition, and a process for applying the coating. The chemical composition of the powders of the invention comprise a blend of a tungsten carbide-cobalt-chromium material and a metallic cobalt alloy.

CA 2297018. J. Quets. Company: Praxair S.T. Technology, Inc. Issued/Filed: April 6, 2004/Jan 26 2000.

Thermal Sprayed Metallic Conformal Coatings Used as Heat Spreaders. Heat dissipation and electromagnetic interference (EMI) shielding for an electronic device having an enclosure. An interior surface of the enclosure is covered with a conformal metallic layer that, as disposed in thermal adjacency with one or more heat-generating electronic components or other sources contained within the enclosure, may provide both thermal dissipation and EMI shielding for the device. The layer may be sprayed onto the interior surface in a molten state and solidified to form a self-adherent coating.

WO 4043123. G.R. Watchko, C.V. Rodriguez, M.T. Gagnon, P.W. Liu, M. De Sorgo, W.G. Lionetta, and S.M. Oppenheim. Company: Parker-Hannifin Corp. Issued/Filed: May 21, 2004/Sept 15, 2003.

Tube, Method of Coating and Use of Same. This invention concerns tubes for the use at high temperatures or any other aggressive environment. Tubes according to the invention have a coating consisting of a layer of aluminum and aluminum oxide with a thickness of at least 0.3 mm on the outside of the tubes. The coating can consist of many layers and preferably be put on using flame spraying, high-velocity spraying, plasma spraying, or any other thermal spraying technique or a combination of these methods. After the coating has been put on, it is oxidized by heating to ~1050 °C during at least 4 h.

WO 3012168. J.O. Olsson. Company: Thermalloys AB. Issued/Filed: April 8, 2004/July 26, 2002.

Vessel for Holding Silicon and Method of Producing the Same. The invention relates to a vessel for holding a silicon molten bath that can effectively prevent contamination of a silicon melt solution and have excellent sinterability, mechanical strength, and productivity. The interior of the vessel is formed with a sprayed coating by spraying a silicon composite thermet consisting of metal silicon (MSi), silicon nitride (Si_3N_4), and silicon oxide (SiO_2).

WO 4053207. K. Shimizu, F. Caillaud, K. Tani, and Y. Kobayashi. Company: Vesuvius France S.A. Issued/Filed: June 24, 2004/Dec 6, 2002.

X-Ray Tube and Method of Manufacture. The present invention is directed to a radiographic apparatus, and its method of manufacture, which utilizes a single integral housing for providing an evacuated envelope for an anode and cathode assembly. The integral housing is preferably formed from a substrate material, such as Kovar, that has a radiation-shielding layer comprised of a powder metal deposited with a plasma spray process. The powder metal includes, for example, tungsten and iron, so that the radiation shield layer provides sufficient radiation blocking and heat transfer characteristics such that an additional external housing is not required. In an alternative embodiment, the integral housing is composed of a solidified integrated mixture of metallic powders that function together as both the integral housing wall and the radiation shielding. The integral housing is air cooled and thus does not utilize any liquid coolant. In addition, the assembly utilizes a dielectric gel polymer material to electrically insulate electrical connections on the housing.

US 6749337. C.F. Artig and D.L. Salmon. Company: Varian Medical Systems, Inc. Issued/Filed: June 15, 2004/Oct 23, 2000.

Feedstock

Improved Fluorocarbon Polymer Coating Powders. Coating properties such as corrosion resistance and mechanical properties including flexibility, impact resistance, hardness, and adhesion, are improved through the use of the thermosetting fluorocarbon polymer coating powders of the invention.

CA 2444302. Y.J. Kim. Company: Spraylat Corp. Issued/Filed: May 20, 2004/Oct 6, 2003.

Method of Coating Substrate with Thermal Sprayed Metal Powder. Methods for applying thermal coatings on substrates using a diffusion alloyed metal powder are provided. The powder comprises prealloyed iron-base powder particles having molybdenum particles diffusion alloyed to the base powder particles.

US 6756083. U. Holmqvist and H. Hallen. Company: Hoganas AB. Issued/Filed: June 29, 2004/Oct 16, 2002.

Powder of Chromium Carbide and Nickel Chromium. A thermal spray powder consists of nickel, chromium, and carbon. The chromium consists of a first portion and a second portion, the nickel being alloyed with the first portion in an alloy matrix. The second portion and the carbon are combined into chromium carbide substantially as Cr_3C_2 or Cr_7C_3 or a combination thereof, with the chromium carbide being in the form of precipitates between 0.1 and 5 μm distributed uniformly in the alloy matrix.

EP 960954. K.. Laul, M.R. Dorfman, and R.E. Jr. Somoskey. Company: Sulzer Metco (US) Inc. Issued/Filed: June 9, 2004/April 21, 1999.

A Spray Powder for the Manufacture of a Thermally Insulating Layer Which Remains Resistant at High Temperatures. The spray powder can be used for the manufacture of a thermally insulating layer that is resistant to high temperatures. A coating of this kind, a so-called TBC, can be produced on a substrate by means of a thermal spraying process. The substrate can already be coated with a single or multilayered part coating, in particular a primer. At least one thermally insulating functional material is used, which on the one hand has a lower thermal conductivity than the substrate and on the other hand forms a chemically and thermally stable phase at high temperatures. The spray powder comprises particles that, respectively, have an agglomeratelike microstructure that is formed by a plurality of granules adhering to each other. These granules are made up of the functional material or the functional materials. At least one further component is present made of an additive or a plurality of additives. This further component is distributed finely dispersed on the surfaces of the functional material granules, i.e., primarily in the boundary zones. The further component in the given form or in a transformed form exerts a retarding or eliminating effect with regard to sintering compounds, which can form at high temperatures between the functional material granules.

CA 2448016. R.J. Damani and K. Honegger. Company: Sulzer Markets and Technology AG. Issued/Filed: May 22, 2004/Nov 3, 2003.

Spray Powder, Thermal Spraying Process Using It, and Sprayed Coating. A spray powder that has a particle size of from 6-63 μm and which comprises from 75-95 wt.% of a ceramic phase made of a WC powder and at least one chromium carbide powder selected from the group consisting of Cr_3C_2, Cr_7C_3, and $Cr_{23}C_6$, and from 5-25 wt.% of a metal phase made of a Ni or Ni-based alloy powder, wherein the mean particle size of primary particles of the WC powder constituting the ceramic phase is from 5-20 μm, and the mean particle size of primary particles of the chromium carbide powder is from 1-0 μm.

EP 1126043. T. Itsukaichi and S. Osawa. Company: Fujimi Inc. Issued/Filed: June 16, 2004/Feb 16, 2001.

Spraying Methods, Pretreatment and Posttreatment

Method for Coating a Workpiece. The invention relates to a method for coating a workpiece. A material is applied to the workpiece by means of thermal spraying. According to the invention, the spraying step is monitored and evaluated.

WO 4029319. E. Fischhaber, M. Hertter, and K. Schweitzer. Company: MTU Aero Engines. Issued/Filed: April 8, 2004/Sept 18, 2003.

Method for Removing a Portion of a Coating by Liquid Jets. Method for removing a portion of a coating of a plate. A nozzle with a wide jet is used that removes most of the material concurrently with at least one nozzle with a fine jet that corrects the contour of the material removed. Application for the removal of deposits deposited with plasma and in particular deposits resisting the diffusion welding or soldering of the plate with another one.

CA 2112657. P.M.S. Lechervy and P.L. Silva. Issued/Filed: April 6, 2004/Dec 30, 1993.

Method for Repairing Spray-Formed Steel Tooling. A machine tool or die that is fabricated from thermally spray-formed steel is easily repaired by cleaning, roughing, and covering the surface to be repaired by a cold-spray layer of metal and then forming a weldment by conventional electric welding processes. The repaired surface is then finished by conventional machining, grinding, and polishing, and then the tool is put back into service.

EP 1092497. R.C. McCune, N. Hussary, and P.E. Pergrande. Company: Ford Global Technologies, LLC. Issued/Filed: April 14, 2004/Sept 28, 2000.

Method of Staggering Reversal of Thermal Spray Inside a Cylinder Bore. A method of staggering reversal of thermal spray inside a cylinder bore of an internal combustion engine. The method includes the steps of thermally spraying a surface of the cylinder bore by moving a thermal spray gun along a length of the surface. The method also includes the steps of reversing a direction of travel of the thermal spray gun inside the cylinder bore at different points along the length of the surface to provide a multilayered coating on the surface.

EP 978320. D.J. Cook and J.R. Baughman. Company: Ford Global Technologies, Inc. Issued/Filed: April 28, 2004/July 12, 1999.

Spraying Systems

Apparatus and Method for Coating Delicate Circuits by Thermal Spraying. Protective and security coatings are applied to an integrated circuit by periodically passing the integrated circuit through a flame spray containing molten particles of the coating composition. The integrated circuit is attached to a fixture that is cooled with a coolant that is applied to the integrated circuit. The distance between the flame spray gun and the integrated circuit is controlled so that the particles are molten when they strike the circuit, but the circuit heating is minimized. A flame-resistant mask retains the integrated circuit on the fixture. The mask is constructed of a low thermally conductive material and the fixture is constructed of a high thermally conducive material.

EP 842707. K.H. Heffner and C.W. Anderson. Company: Honeywell Inc. Issued/Filed: April 7, 2004/Nov 11, 1997.

High-Frequency Pulse Rate and High-Productivity Detonation Spray Gun. A detonation gun for thermal spraying formed by a combustion chamber and a barrel, with entrances for fuel and for oxidizer, one or more spark plugs for detonating the fuel-oxidizer mixture and one or more injectors for the introduction of the product into the barrel, the gun in the invention centers its characteristics on the incorporation of a direct-injection system of the fuel and oxidizer gases into the explosion chamber, producing explosive mixtures of different compositions according to the various zones in the explosion chamber, with a constrained volume existing in this explosion chamber in which only fuel is injected in such a way that it can generate high-energy explosions, maintaining the cyclic operation of the gun. The gun also incorporates in the barrel, one or more annular injectors, which allow the feeding of various products, and especially coating powder, so that it is possible to increase the number of kilograms deposited on the substrate per unit of time and, in consequence, the gun's productivity.

US 6745951. G.Y. Barykin and I.F. Altuna. Company: Aerostar Coatings, S.L. Issued/Filed: June 8, 2004/April 23, 2002.

High-Temperature Powder Deposition Apparatus and Method Utilizing Feedback Control. A deposit is formed on a deposition substrate using a deposition gun that burns a mixture of a fuel and an oxidizer to form a deposition gas flow, mixes a powder into the deposition gas flow to form a deposition mixture flow, and projects the deposition mixture flow therefrom. The deposition gun is provided with a flowing coolant. A flow rate of the fuel to the deposition gun, a flow rate of the oxidizer to the deposition gun, a flow rate of the powder to the deposition gun, and a cooling capacity of the coolant flow are all measured. The flow rate of the fuel, the flow rate of the oxidizer, the flow rate of the powder, and the cooling capacity of the coolant flow are all controlled responsive to the step of measurements.

US 6736902. S.W. Tefft, P.C. Madix, J.R. Reinhardt, and T.A. Koenig. Company: General Electric Company. Issued/Filed: May 18, 2004/June 20, 2002.

Low-Temperature High-Velocity Flame Spraying System. The invention relates to a low-temperature high-velocity flame spraying system for thermally spraying powdery spray additional materials, comprising at least one connection for introducing operating media consisting of gaseous and liquid fuels into a combustion chamber, and comprising an expansion nozzle. An additional chamber serving as a mixing chamber with an injection system for noncombustible gases and/or for water is provided downstream from the combustion chamber. This additional chamber variably lowers the temperature of the hypersonic flame jet exiting the combustion chamber and entering the mixing chamber. At least two injectors for introducing powdery spray additional materials and the expansion nozzle are connected downstream from the mixing chamber.

WO 4045777. E.D. Huehne. Issued/Filed: June 3, 2004/Nov 3, 2003.

Method of Coating with Combined Kinetic Spray and Thermal Spray. Disclosed is a system and a method for applying both a kinetic spray applied coating layer and a thermal spray applied layer onto a substrate using a single-application nozzle. The system includes a higher heat capacity gas heater to permit oscillation between a kinetic spray mode wherein the particles being applied are not thermally softened and a thermal spray mode wherein the particles being applied are thermally softened prior to application. The system increases the versatility of the spray nozzle and addresses several problems inherent in kinetic spray applied coatings.

US 6743468. B.K. Fuller and T.H. Van Steenkiste. Company: Delphi Technologies, Inc. Issued/Filed: June 1, 2004/April 17, 2003.

Plasma-Spraying Device. The invention relates to a plasma-spraying device for spraying a powdered material, comprising electrodes, which form a plasma channel having an inlet end and an outlet end, and a means for supplying said powdered material to said plasma channel. The powder supply means is arranged between a first section of said electrodes located upstream of the means and a second section of said electrodes located downstream of the means, as seen in the direction of plasma flow of the plasma channel.

WO 4028221. N. Suslov. Company: Smatri AB. Issued/Filed: April 1, 2004/Sept 17, 2003.

A Thermal Spraying Device. A thermal spraying device, comprising a means for generating a flame and a means for injecting a powder into the flame, said flame-generating means comprising an end piece out of which the flame is directed toward a substrate subjected to spraying. The powder-injection means comprises a frame element that is adapted to be attached to the end piece and to project in the flame ejection direction from the end piece.

WO 4028222. P. Nylen, A. Boussagol, R. Svensson, G. Mora, M.-O. Hansson, J. Wigren, and J. Johansson. Company: Volvo Aero Corp. Issued/Filed: April 1, 2004/Sept 17, 2003.

Thermal Barrier Coatings and Bondcoats

Dual Microstructure Thermal Barrier Coating. A multilayer thermal barrier coating having a porous first layer of ceramic insulating material and a second relatively dense layer of ceramic insulating material having a plurality generally vertical gaps formed therein. The porous conventional as-deposited APS microstructure of the first layer provides thermal and chemical protection for the substrate, while the gaps of the columnar-grained second layer provide thermal shock resistance for the coating. An air plasma spray process may be used to deposit both the first and the second layers of material, as well as any underlying bond coat layer. The gaps of the columnar-grained second layer do not extend into the first layer. The pores of the first layer function as crack arrestors for cracks initiating at the gaps of the second layer.

US 6716539. R. Subramanian. Company: Siemens Westinghouse Power Corp. Issued/Filed: April 6, 2004/Sept 24, 2001.

Method of Depositing a Compositionally Graded Coating System. A process for depositing a ceramic coating system for Si-containing materials, particularly those for articles exposed to high temperatures. The process is particularly applicable to depositing a compositionally graded coating system comprising multiple ceramic layers with differing compositions, including a dense, strain-tolerant, vertically cracked YSZ-containing ceramic layer deposited on a ceramic layer having a composition that is a mixture of YSZ and either mullite or BSAS. The process entails depositing the YSZ-containing ceramic layer using a plasma spraying technique while maintaining the substrate at a temperature so as not to form horizontal cracks in the coating system, but still maintain the dense vertically cracked structure of the YSZ-containing ceramic layer for strain tolerance.

US 6740364. Y.-C. Lau, H. Wang, and D.J. Mitchell. Company: General Electric Co. Issued/Filed: May 25, 2004/May 30, 2002.

Method of Thermal Protection and Metal Article with Ceramic Coat. Proposed metal article has ceramic coat containing gadolinium and zirconium and ensuring thermal barrier. Material may have structure of fluorite or pyrochlore. Proposed method includes application of ceramic primer before application of ceramic coat. Primer contains zirconium oxide stabilized with yttrium oxide located between metal matrix and ceramic coat. Ceramic coat is applied by method selected from group consisting of thermal spraying, precipitation and vacuum deposition.

RU 2228389. M.G. Maloney. Issued/Filed: May 10, 2004/Sept 30, 1999.

A Thermal Barrier Coating and a Method of Applying Such a Coating. A ceramic thermal barrier coating, TBC, deposited and attached directly to a metallic substrate itself or an intermediate bond coating deposited on such a substrate. The TBC comprises at least two layers, wherein a first, inner TBC layer that is directly attached to the substrate or bond coating presents a different microstructure than a second, outer TBC layer.

WO 4029330. J. Wigren and M.-O. Hansson. Company: Volvo Aero Corp. Issued/Filed: April 8, 2004/Sept 17, 2003.

Thermal Barrier Coating Material and Method for Production Thereof, Gas Turbine Member Using the Thermal Barrier Coating Material, and Gas Turbine. A thermal barrier coating material, characterized in that it comprises a metal binder layer and a porous ceramic layer comprising a partially stabilized ZrO_2 that are laminated on a base material in this order, and the ceramic layer has microcracks extending in the thickness direction; and a method for producing the thermal barrier coating material that comprises, after the lamination of the ceramic layer, heating the front surface of the ceramic layer by the irradiation with a laser beam while cooling the back face of the base material, to thereby form the microcracks. Another thermal barrier coating material, characterized in that it comprises a metal binder layer and, laminated thereon, a partially stabilized ZrO_2 which is partially stabilized by the addition of Dy_2O_2 and Yb_2O_2. A thermal spray material for TBC, characterized in that it comprises a zirconia powder and a rare earth oxide powder added thereto, both having a specific surface area of 10 m^2/g; and a method for producing the thermal spray material that comprises mixing these powders and a binder to form a slurry, granulating the slurry, and heat treating the resultant granules.

WO 2103074. T. Torigoe, K. Mori, I. Okada, S. Aoki, K. Takahashi, M. Ohara, T. Hirata, and H. Kaneko. Company: Mitsubishi Heavy Industries, Ltd. Issued/Filed: May 21, 2004/June 14, 2002.

Thermal Coating Composition. An abrasive coating is prepared by plasma spraying a top coating over a bond coating medium. The resultant structure has an improved resistance to corrosion and a lower thermal conductivity. The coating provides substantially enhanced engine efficiency and improved durability. The coating consists of from 11-14 wt.% yttria and the balance essentially zirconia.

EP 926254. M. Freling, K.R. Lagueux, and P.H. Zajchowski. Company: United Technologies Corp. Issued/Filed: April 4, 2004/Dec 18, 1998.