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Fuel cell stack

Abstract

The fuel cell stack FS includes a stacked plurality of single cells C each including a frame 1 of a membrane electrode assembly 2 and a pair of separators 3, 4, and a sealing member 6 disposed between the plurality of single cells C. The pair of separators 3, 4 include respective supporting portions 9, 10 that are in contact with the frame 1, and the sealing member 6 is disposed on one supporting member 10. Further, the supporting portions 9, 10 of the separators 3, 4 have different sizes so that an overlapped portion W is formed in which a base surface 7 where the supporting portion 9 of one separator 3 is in contact with the frame 1 is overlapped with a top surface 8 where the supporting portion 10 of the other separator 4 is in contact with the frame 1 in the stacking direction. The overlapped portion W receives and transmits reaction force of the sealing member 6 between the single cells, which prevents narrowing of gas channels or decrease of the sealing surface pressure.

Fuel cell system and operating method therefor

Abstract

A fuel cell system and method that enables warm-up power generation corresponding to the residual water volume in the fuel cell stack without using auxiliary devices for measuring the residual water volume in the fuel cell stack. A controller computes total generated electrical energy Q by integrating of the generated current detected by current sensor during the period from start-up to shutting down of the fuel cell system, and stores the result in total generated electrical energy storage part. Also, controller measures fuel cell temperature Ts at the last shutting down cycle with temperature sensor, and stores it in power generation shutting down temperature storage part. When the fuel cell system is started, controller estimates residual water volume WR that remains in fuel cell stack 2 on the basis of fuel cell temperature Ts when power generation is shut down, total generated electrical energy Q, and fuel cell start-up temperature Tn, and sets the generated electrical power for warm-up at start-up on the basis of said residual water volume WR.
System and method for production of ultra-pure hydrogen from biomass

Abstract

The disclosure provides a system and method for synthesizing ultra-pure hydrogen from biomass waste. The present invention comprises a gasifier, an oil drum filter, a steam generator, a water gas shift reactor ("WGS"), a heat-exchange two-phase water separator, a scrubber, a hydrogen separator, and fluid conduits in fluid communication with the various system components, which together convert hydrocarbon-based biomass, e.g., woodchips, into ultra-pure hydrogen gas. Fluid conduits connect the gasifier and the steam generator, separately, to the WGS, the WGS to the two-phase separator, the two-phase separator to the scrubber, and the scrubber to the hydrogen separator, which further comprises an outlet port through which hydrogen gas may flow free of carbon monoxide. The hydrogen may flow to a device that utilizes hydrogen to generate energy, such as a hydrogen fuel cell or to an internal combustion engine.

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Family ID: 100003785724
Appl. No.: 15/143,577
Filed: April 30, 2016

Process for supplying a fuel cell having alternate supply and purge phases

Abstract

A process for supplying a fuel cell with reactive species, including a stack of electrochemical cells divided into N different groups, wherein a plurality of steps of selectively supplying the N groups of cells with reactive species are carried out, following each of the supply steps, a step of purging the N groups of cells is carried out.

Inventors: Poirier-Crouvezier, Jean-Philippe (Saint Georges de Commiers, FR), Buzon; Didier (Grenoble, FR), Micoud; Fabrice (La Burse, FR), Vincent; Remi (Grenoble, FR)
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Family ID: 1000003785723
Appl. No.: 15/192,436
Filed: June 24, 2016
Fuel cell internal state detection system and state detection method

Abstract

A fuel cell internal state detection system includes an estimation object state quantity setting unit for setting a suitable estimation object state quantity as an index of an internal state, an impedance value acquisition unit configured to obtain an impedance value of a fuel cell, an impedance usability judging unit configured to judge whether or not the obtained impedance value is usable for the calculation of the estimation object state quantity, estimation object state quantity calculation unit for calculating the estimation object state quantity set by the estimation object state quantity setting unit on the basis of the obtained impedance value when the impedance value is judged to be usable for the calculation of the estimation object state quantity by the impedance usability judging unit, and an unusable-scene process execution unit configured to perform an unusable-scene process when the impedance value is judged not to be usable for the calculation of the estimation object state quantity by the impedance usability judging unit.

Inventors: Kotaka; Toshikazu (Kanagawa, JP); Aoki; Tetsuya (Kanagawa, JP)
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Family ID: 1000003788722
Appl. No.: 15/554,497
Filed: March 3, 2015
PCT Filed: March 03, 2015
PCT No.: PCT/JP2015/056266
PCT Date: August 30, 2017
PCT Pub. No.: WO2016/139761
PCT Pub. Date: September 09, 2016

Electrochemical hydrogen sensor for global/local hydrogen starvation detection in PEM fuel cells

Abstract

A fuel cell stack hydrogen starvation detection device, a fuel cell system and a method of operating a fuel cell stack to protect it from hydrogen starvation conditions. In one particular form, the fuel cell system includes a stack of fuel cells, a controller and a detection device made up of one or more sensors that can compare a reference signal corresponding to the presence of substantially pure hydrogen to a signal that corresponds to a local hydrogen value within a single fuel cell within the stack or across multiple fuel cells within the stack. In this way, the detection device promptly provides indication of a hydrogen starvation condition within the cell or stack without the need for conventional cell voltage monitoring. The detected hydrogen starvation condition may be presented as a warning signal to alert a user that such a condition may be present, as well as to the controller for modification of the stack operation.

Inventors: Zhang; Jingxin (Nevi, MI); Lakshmanan; Balasubramanian (Rochester Hills, MI); Sinha; Manish (Rochester Hills, MI)
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Family ID: 1000003788721
Appl. No.: 14/504,706
Filed: July 21, 2015
Method for starting up a fuel cell

Abstract

The invention relates to a method (40) for starting up a fuel cell (11), wherein hydrogen is introduced into an anode chamber (15) of the fuel cell (11), and at the beginning of the start-up process oxygen is present in the anode chamber (15) of the fuel cell (11). According to the invention, at the beginning of the hydrogen introduction stage enough hydrogen is introduced to ensure that upon entry into the anode chamber (15) hydrogen and oxygen are present in no more than a stoichiometric ratio.

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Family ID: 1000003785720
Appl. No.: 14/902,390
Filed: June 26, 2014
PCT Filed: June 26, 2014
PCT No.: PCT/EP2014/063545
Date: December 31, 2015
PCT Pub. No.: WO2015/000789
PCT Pub. Date: January 08, 2015

Fuel cell with integrated water management layer and fabrication method thereof

Abstract

Fabrication method of a fuel cell comprising the following successive steps: providing a substrate comprising at least one membrane-electrode assembly, formed by an electrolytic membrane arranged between a first electrode and a second electrode, a first current collector arranged on the first electrode, depositing a fluoropolymer solution on the first current collector, making the solvent of the solution evaporate so as to form a porous thin layer of fluoropolymer.

Inventors: Coz; Erwan (Grenoble, FR), Thery; Jessica (Saint Jean de Moirans, FR), Faucheux; Vincent (Lans en Vercors, FR), Capron; Philippe (Varieu sur Bourbre, FR)
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Family ID: 1000003785719
Appl. No.: 15/241,251
Filed: August 19, 2016
Fuel cell module

Abstract

A fuel cell unit of a fuel cell module includes a fuel cell stack, a reformer, an evaporator, an exhaust gas combustor, a start-up combustor, and an air preheater. The fuel cell module further includes an air supply channel, a first fuel supply channel, a second fuel supply channel, a switching valve, and an exhaust gas channel. In the exhaust gas channel, the start-up combustor and the air preheater are arranged in the order recited toward the downstream side in a flow direction of a combustion exhaust gas.

Inventors: Yamada, Takayuki (Wako, JP)
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Assignee: HONDA MOTOR CO., LTD. (Tokyo, JP)
Family ID: 1000003788718
Appl. No.: 15/059,744
Filed: March 3, 2016

Fluidic interface module for a fuel cell system

Abstract

Purge valves (109, 109, 200) that are manually turned ON but are automatically or electrically turned OFF as the fuel cell (108)’s production of electricity reaches a predetermined level, e.g., steady state or thereabout are disclosed. The purge valve may be opened at system start-up, or may be opened at system shut down so that the purge valve is armed and the fuel cell system is purged at the next start-up. Also disclosed is an integrated fluidic interface module (10) that contains various fluidic components including one of these purge valves. The integrated fluidic interface module (10) can operate passively or without being actively controlled by a processor. Methods of operating a fuel cell system, wherein the fuel cell system is purged at system start-up, are also disclosed. The purging automatically stops when the anode plenum is fully purged and replaced with fuel.

Inventors: Iaconis, Jean-Louis (Burnaby, CA), MacDonald, Aaron (Vancouver, CA), Tam, Benjamin (New York, NY)
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Assignee: Intelligent Energy Limited (Loughborough, GB)
Family ID: 1000003788717
Appl. No.: 14/853,532
Filed: September 14, 2015
Fuel cell system

Abstract

A fuel cell system that generates electric power by supplying anode gas and cathode gas to a fuel cell includes a control valve adapted to control the pressure of the anode gas to be supplied to the fuel cell, a buffer unit adapted to store the anode-off gas to be discharged from the fuel cell, a pulsation operation unit adapted to control the control valve in order to periodically increase and decrease the pressure of the anode gas at a specific width of the pulsation; and a pulsation width correcting unit adapted to correct the width of the pulsation on the basis of the temperature of the buffer unit.

Inventors: Nishimura; Hideyuki (Kanagawa, JP); Ichikawa; Yasushi (Kanagawa, JP)
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Family ID: 100003176816
Appl. No.: 15/704,455
Filed: September 14, 2017

Power conditioning system and control method therefor

Abstract

A power conditioning system includes a fuel cell connected to a load, a fuel cell converter connected between the fuel cell and the load and converting an output voltage of the fuel cell at a predetermined required voltage ratio, and a battery connected to the load in parallel to the fuel cell and serving as a power supply source different from the fuel cell. The power conditioning system includes an impedance measuring device configured to measure an impedance of the fuel cell by outputting alternating currents between a positive electrode and an intermediate point of the fuel cell and between the intermediate point and a negative electrode of the fuel cell, and a current bypass path configured to couple the fuel cell and the load while bypassing the fuel cell converter. The power conditioning system includes a current cut-off unit configured to provide on the current bypass path, the current cut-off unit electrically cutting off the current bypass path when the impedance of the fuel cell is measured by the impedance measuring device.

Inventors: Matsumoto; Michihiko (Kanagawa, JP)
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Family ID: 100003176816
Appl. No.: 15/575,020
Filed: May 21, 2015
PCT Filed: May 21, 2015
PCT No.: PCT/JP2015/064629
371(c)(1),(2),(4) Date: November 17, 2017
PCT Pub. No.: WO2016/185809
PCT Pub. Date: November 24, 2016
Fuel cells

Abstract

A fuel cell system (1) includes a reformer (2), for generating a reformate gas, a fuel cell (3) for generating electric current from cathode air and reformate gas, an air supply (4), which draws in ambient air and splits this at least into reformer air and cathode air, sends the reformer air via a reformer air line (15) in the direction of the reformer and sends the cathode air via a cathode air line (16) in the direction of a cathode side (11). A recirculating line (20) connects an anode side (10) to the reformer (2). A hot gas delivery (24), which contains a hot gas path (26), is arranged in the recirculating line for driving the anode waste. A cooling air path (27), which is integrated into the cathode air line, through which the reformer air or cathode air flows, reduces thermal load of the hot gas delivery.

Inventors:

Dering, Oleg (Stuttgart, DE), Stute, Manfred (Esslingen, DE)

Applicant:

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Assignee:

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Family ID: 1000003788714
Appl. No.: 14/200,673
Filed: March 7, 2014

Separator and fuel cell

Abstract

A separator has a recess-projection shape formed by press working. The separator has one surface as a gas circulation surface and an opposite surface as a cooling surface, the gas circulation surface having a reactive gas flow path including a plurality of reactive gas flow path grooves resulting from the recess-projection shape, the cooling surface having a cooling water flow path including a plurality of cooling water flow path grooves resulting from the recess-projection shape. The cooling water flow path includes an intersection flow path portion including cooling water flow path grooves adjacent to each other with a reactive gas flow path groove of the reactive gas flow path therebetween, and a communication flow path groove formed at the cooling surface side of the reactive gas flow path groove between the adjacent cooling water flow path grooves, the communication flow path groove being shallower than the cooling water flow path grooves; and a cooling water turn portion where a direction of the cooling water flow path grooves changes. A reactive gas turn portion is formed at the gas circulation surface in a position on the rear side of the cooling water turn portion, and the reactive gas turn portion is formed of a groove portion having a constant depth.

Inventors:

Konno, Norishige (Toyota, JP)

Applicant:

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Assignee:

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Family ID: 1000003788713
Appl. No.: 15/022,083
Filed: October 1, 2014
PCT Filed: October 01, 2014
PCT No.: PCT/JP2014/005013
371(c)(1),(2),(4) Date: March 15, 2016
PCT Pub. No.: WO2015/049864
PCT Pub. Date: April 09, 2015
Fuel cell

Abstract

A fuel cell comprises an anode, a cathode, and a solid electrolyte layer disposed between the anode and the cathode. The cathode includes a perovskite oxide as a main component. The perovskite oxide is expressed by the general formula ABO₃ and includes at least one of La and Sr at the A site. The cathode includes a surface region that is within 5 micrometers from the surface opposite the solid electrolyte layer. The surface region contains a main phase configured by the perovskite oxide and a secondary phase that is configured by strontium oxide. The occupied surface area ratio of the secondary phase in a cross section of the surface region is greater than or equal to 0.05% to less than or equal to 5%.

Inventors: Ohmori; Masato (Nagoya, JP); Fujisaki; Shinji (Kuwana, JP); Yamamura; Yoshihiko (Nagoya, JP); Ryu; Takashi (Nagoya, JP)
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Family ID: 1000003788711
Appl. No.: 15/350,551
Filed: November 14, 2016

Anode for solid oxide fuel cell and production method therefor, and method for producing electrolyte layer-electrode assembly for fuel cell

Abstract

A method for producing an anode capable of increasing output of a solid oxide fuel cell is provided. The method for producing an anode for a solid oxide fuel cell includes a first step of shaping a mixture that contains a perovskite oxide having proton conductivity and a nickel compound and a second step of firing a shaped product, which has been obtained in the first step, in an atmosphere containing 50% by volume or more of oxygen at 1100 degree C to 1350 degree C so as to generate an anode.

Inventors: Noda; Yohei (Itami, JP); Majima; Masatoshii (Itami, JP); Tawarayama; Hiromasa (Itami, JP); Mizuhara; Naho (Itami, JP); Hiraiva; Chihito (Itami, JP); Higashino; Takahiro (Itami, JP)
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Family ID: 1000003788709
Appl. No.: 15/526,851
Filed: July 21, 2015
PCT Filed: July 21, 2015
PCT No.: PCT/JP2015/070647
371(c)(1),2,(4) Date: May 15, 2017
PCT Pub. No.: WO2016/080019
PCT Pub. Date: May 26, 2016
**Fuel cell range extender**

**Abstract**

A hybrid vehicle having an electric drive with a power accumulator, a fuel cell, and a control unit configured to control the operation of the fuel cell. The control unit has logic, at least partially including hardware configured to activate and deactivate the fuel cell as a function of a first characteristic map having a first input variable representing a present power demand of the hybrid vehicle which exists over a first defined observation time range.

**Inventors:** Gutruf, Philipp (Munich, DE), Goellner, Julian (Graz, AT), Martin, Michael (Graz, AT)

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**Assignee:** MAGNA STEYR Fahrzeugtechnik AG & Co KG (Graz, AT)

**Family ID:** 1000003785528

**Appl. No.:** 15/346,056

**Filed:** November 8, 2016

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**Fuel cell stack**

**Abstract**

A fuel cell stack includes a first knock pin and a second knock pin. A separator has an outer peripheral shape having first and second short sides. The separator has a first knock pin insertion hole adjacent to the first side and a second knock pin insertion hole adjacent to the second side. The first and second knock pin insertion holes have a circular shape. The first insulating plate has third and fourth knock pin insertion holes. The second insulating plate has fifth and sixth knock pin insertion holes. The first knock pin is inserted into the third and fifth knock pin insertion holes to be movable in the third and fifth knock pin insertion holes. The second knock pin is inserted into the fourth and sixth knock pin insertion holes to be movable in the fourth and sixth knock pin insertion holes.

**Inventors:** Yamano, Naoki (Wako, JP), Ikeda, Yuta (Wako, JP)

**Applicant:** HONDA MOTOR CO., LTD. Tokyo N/A JP

**Assignee:** HONDA MOTOR CO., LTD. (Tokyo, JP)

**Family ID:** 1000003773083

**Appl. No.:** 15/445,984

**Filed:** March 1, 2017
Polymer electrolyte composition and polymer electrolyte membrane, polymer electrolyte membrane with catalyst layer, membrane electrode assembly, and polymer electrolyte fuel cell each using the same

Abstract

An excellent polymer electrolyte composition has excellent chemical stability of being resistant to strong oxidizing atmosphere during operation of fuel cell, and achieves excellent proton conductivity under low-humidification conditions, excellent mechanical strength and physical durability. A polymer electrolyte membrane, a membrane electrode assembly, and a polymer electrolyte fuel cell each use the same. The polymer electrolyte composition contains an ionic group-containing polymer (A), a phosphorus-containing additive (B), and a nitrogen-containing aromatic additive (C), the phosphorus-containing additive (B) and the nitrogen-containing aromatic additive (C) being a compound represented by specific structural formulae.

Inventors: Umeda; Hiroaki (Otsu, JP), Izuhara; Daisuke (Otsu, JP), Fujieda; Yuka (Otsu, JP), Li; Jing (Surrey, CA), Yang; Yunsong (Richmond, CA), Wang; Koping (Surrey, CA)

Applicant: Toray Industries, Inc. (Tokyo, JP)

Assignee: Toray Industries, Inc. (JP)

Family ID: 1000003773081

United States Patent

Gasda, et al.

Abstract

Carbon dioxide separator, fuel cell system including same, and method of operating the fuel cell system

A system and method in which a high temperature fuel cell stack exhaust stream is recycled back into the fuel inlet stream of the high temperature fuel cell stack. The recycled stream may be sent to a carbon dioxide separator that separates carbon dioxide from the fuel exhaust stream. The carbon dioxide separator may include a carbon dioxide separation membrane, an oxygen blocking membrane, and a water blocking membrane.

Inventors: Gasda; Michael (Mountain View, CA), Ballantine; Arne (Palo Alto, CA), Karuppaiah; Chekkalingam (Cupertino, CA), Ho; W. S. Winston (Columbus, OH)

Applicant: BLOOM ENERGY CORPORATION Sunnyvale CA US

Assignee: BLOOM ENERGY CORPORATION (Sunnyvale, CA)

Family ID: 1000003773080

United States Patent
Fuel cell system, movable body, and control method

Abstract

Disclosed is a technology for ensuring the safety of a vehicle on which a fuel cell is mounted and the convenience of a user. In a fuel cell system which is able to be mounted on a movable body, it is determined whether or not the movement of the movable body is stopped and the fuel cell system is operated when an opening instruction for opening a filling port for filling a fuel gas storage portion with fuel gas is received. When it is determined that the movement of the movable body is stopped and the fuel cell system is operated, a main stop valve controlling the supply of the fuel gas to the cell stack from the fuel gas storage portion is closed, and then the filling port is opened.

Inventors: Imanishi; Hiroyuki (Toyota, JP); Ogawa; Tomohiro (Miyoshi, JP)
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Family ID: 100000373078
Appl. No.: 14/940,426
Filed: November 13, 2015

Fuel cell system

Abstract

There is provided a fuel cell system. The fuel cell system comprises a fuel cell configured to generate electric power using a reactive gas, a compressor configured to compress the reactive gas and feed the compressed reactive gas to the fuel cell, a flow rate measurement unit configured to measure a flow rate of the reactive gas, a pressure measurement unit configured to measure a pressure of the compressed reactive gas, a power value acquirer configured to acquire a value of electric power consumed by the compressor, and a determiner configured to perform determination with regard to an abnormality of the fuel cell system and to provide an output indicating that an abnormality occurs. When the value of electric power corresponding to a value indicating the flow rate measured by the flow rate measurement unit exceeds a first set value, the determiner provides an output indicating that an abnormality occurs in the compressor in a case of (a1) where a value of the pressure measured by the pressure measurement unit corresponding to the value indicating the flow rate measured by the flow rate measurement unit is within a set range. The determiner is also configured to provide an output indicating that an abnormality occurs on a downstream side of the compressor in a case of (a2) where a value of the pressure corresponding to the value indicating the flow rate is out of the set range. This configuration allows for discrimination between an abnormality occurring in the compressor and an abnormality occurring on the downstream side of the compressor.

Inventors: Yamanaka; Tomio (Nagoya, JP); Ishikawa; Tomotaka (Nagoya, JP)
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Assignee: TOYOTA JIDOSHA KABUSHIKI KAISHA Toyota-shi, Aichi-ken N/A JP
Family ID: 100000373077
Appl. No.: 15/643,698
Filed: July 7, 2017
Membrane-seal assembly

Abstract

Disclosed is a reinforced membrane-seal assembly, the reinforced membrane-seal assembly including: an inner region and a border region and wherein the inner region includes ion-conducting component and the border region includes seal component; wherein first and second planar porous reinforcing components each extend across the inner region into the border region and wherein the pores of each of the first and second planar porous reinforcing components in the inner region are impregnated with ion-conducting component and the pores of each of the first and second planar porous reinforcing components in the border region are impregnated with seal component is disclosed. Also disclosed is a catalyst-coated reinforced membrane-seal assembly, a reinforced membrane-seal electrode assembly and an electrochemical device including the reinforced membrane-seal assembly.

Inventors: Barnwell; David Edward (Wiltshire, GB), Coleman; Robert Jeffrey (Wiltshire, GB), Dickinson; Angus (Wiltshire, GB), Gray; Peter Geoffrey (Wiltshire, GB), Soares; Jorge Manuel Caramelo (Wiltshire, GB)

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Family ID: 100000373076

Appl. No.: 15/128,065

Filed: March 24, 2015

PCT Filed: March 24, 2015

PCT No.: PCT/GB2015/050865

371(c)(1),(2),(4) Date: September 21, 2016

PCT Pub. No.: WO2015/145129

PCT Pub. Date: October 01, 2015

Connector system for a fuel cell stack assembly

Abstract

A fuel cell stack assembly comprises fuel cells disposed in a stacked configuration, each cell substantially parallel to an x-y plane and including a tab extending laterally from an edge of a plate in the cell in the x-direction to form an array of tabs extending along a side face of the fuel cell stack in a z-direction orthogonal to the x-y plane. A connector engages with the tabs of the fuel cell stack. The connector comprises a support region and engagement regions, each engagement region bounded by the support region and configured to receive one of the array of tabs by engagement in the x-direction. The connector has flexible conductors, each of the flexible conductors laterally extending from the support region over at least a portion of one of the engagement regions and configured to be deflected away from the support region by a received tab.

Inventors: Adcock; Paul Leonard (Loughborough, GB)

Applicant: Intelligent Energy Limited Loughborough N/A GB

Assignee: Intelligent Energy Limited (Loughborough, GB)

Family ID: 100000373075

Appl. No.: 15/102,794

Filed: December 16, 2014

PCT Filed: December 16, 2014

PCT No.: PCT/GB2014/053716

371(c)(1),(2),(4) Date: June 08, 2016

PCT Pub. No.: WO2015/092381

PCT Pub. Date: June 25, 2015
**Fuel cell**

**Abstract**

A fuel cell includes a membrane electrode assembly, a first metal separator, a second metal separator, linear protrusions, and embossed protrusions. The first metal separator is stacked on the membrane electrode assembly. The second metal separator is stacked on the first metal separator to define a coolant channel between the metal separators. The first metal separator includes wave-shaped protrusions projecting from the first metal separator by a first height to define to form the coolant channel. The linear protrusions are connected to both distal ends of each of the wave-shaped protrusions. The linear protrusions project from the first metal separator by a second height smaller than the first height. The embossed protrusions are connected to tip ends of the linear protrusions. The embossed protrusions project from the first metal separator by a third height larger than the second height to be in contact with the second metal separator.

**Inventors:** Yamano; Naoki (Walco, JP); Kawamura; Toshiki (Walco, JP); Goto; Shuhei (Walco, JP); Sugita; Narutoshi (Walco, JP)

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**Assignee:** HONDA MOTOR CO., LTD. (Tokyo, JP)

**Family ID:** 1000003773074

**Appl. No.:** 15/299,468

**Filed:** October 21, 2016

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**Metal separation plate for fuel cell stack and fuel cell stack having the same**

**Abstract**

Disclosed are a metal separation plate for a fuel cell stack, which includes protrusion patterns each having an air path opened in a short-side direction or protrusion patterns each having an air path of which one side is opened and the other side is closed, and can not only improve cooling performance and stack performance without a separate cooling plate mounted therein, and but also improve humidification performance of a membrane electrode assembly (MEA) by blocking moisture leaking from the inside of the closed air paths, and a fuel cell stack having the same.

**Inventors:** Park; Ji-Young (Seoul, KR); Kim; Ki-Jung (Gyeonggi-do, KR); Jeon; Yoo-Taek (Gyeonggi-do, KR)

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**Assignee:** Hyundai Steel Company Inc (Incheon, KR)

**Family ID:** 1000003773073

**Appl. No.:** 15/031,195

**Filed:** July 24, 2014

**PCT Filed:** July 24, 2014

**PCT No.:** PCT/KR2014/006750

**Date:** August 02, 2016

**PCT Pub. No.:** WO2015/060517

**PCT Pub. Date:** April 30, 2015
Single cell with metal plate, fuel cell stack, and method for producing single cell with metal plate

Abstract

A metal plate-bonded single fuel cell unit according to one aspect of the present invention includes a single cell element having a solid electrolyte and fuel and air electrodes disposed on opposite sides of the solid electrolyte and a metal plate bonded by a brazing material to the single cell element. The metal plate contains Ti and Al and has an Al–Ti-containing oxide layer present on a surface of the metal plate, an Al oxide film present on a surface of the Al–Ti-containing oxide layer and a Ti-containing phase apart from a part of a surface of the Al oxide film in contact with the brazing material while being present on a remaining part of the surface of the Al oxide film. The metal plate-bonded single fuel cell unit has a Ti reaction phase formed at an interface between the solid electrolyte and the brazing material.

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Methods of fabricating solid oxide fuel cells

Abstract

In various embodiments, a solid oxide fuel cell is fabricated in part by disposing a functional layer between the cathode and the solid electrolyte.

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Photocatalytic methods for preparation of electrocatalyst materials

Abstract

The invention relates to methods of preparing metal particles on a support material, including platinum-containing nanoparticles on a carbon support. Such materials can be used as electrocatalysts, for example as improved electrocatalysts in proton exchange membrane fuel cells (PEM-FCs).

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