


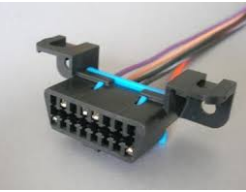



## Fuel Cell Standards

### XIII. Fuel Cell Overview

#### XIII.a Acronyms and Definitions



Name	Acronym	Definition	Image
American National Standards Institute	ANSI	American National Standards Institute is a private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States	
American Society for Testing Materials	ASTM	American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.	
American Society of Mechanical Engineers	ASME	ASME is an engineering society, a standards organization, a research and development organization, an advocacy organization.	
Anode Inlet Unit	AIU	A fuel cell sub-system that controls the flow of hydrogen or other fuel into the system	
Anode Outlet Unit	AOU	A fuel cell sub-system that controls the flow of excess hydrogen or other fuel out of the fuel cell stack to either be exhausted or recirculated to the stack.	
Assembly Line Diagnostic Link	ALDL	ALDL is a proprietary on-board diagnostics system developed by General Motors before the standardization of OBD-2. It was previously called Assembly Line Communications Link or ALCL. The two terms are used interchangeably.	

Asynchronous	ASYN	Asynchrony is the state of not being in synchronization. Commonly used to describe a type of electric motor or communication	
Autothermal Reforming	ATR	A process that meets the energy demand of methane reforming by combining exothermic oxidation and endothermic steam reforming.	
Auxiliary Power Unit	APU	In an EV the APU is an electric unit that takes the place of the generator/alternator system found on ICE's and converts high voltage to 14.4 V DC to run various low voltage components.	
Auxiliary	AUX	A backup or support system.	
Badly Performing Cell	BPC	A Cell in a fuel cell stack that exhibits performance well below the average cell in that stack	
Balance of Plant	BOP	Balance of plant is a term in power engineering to refer to all the supporting components and auxiliary systems of a power plant needed to deliver the energy, other than the generating unit itself.	
Battery Electric Vehicle	BEV	A vehicle using a battery and electric motor to provide primary propulsion	
Battery Management System	BMS	Any electronic system that manages a rechargeable battery (cell or battery pack), such as by protecting the battery from operating outside its safe operating area [clarification needed], monitoring its state, calculating secondary data, reporting that data, controlling its environment, authenticating it and / or balancing it. Wikipedia	
Beginning of Life	BOL	A data point for defining the performance of a new system verses its future capability at some point in time	
BiDirectional Converter	BDC	An electronic system that allows the conversion of a DC voltage to a higher or lower voltage and vice versa	
Bill of Material	BOM	Bill of Materials is a list of the raw materials, sub-assemblies,	


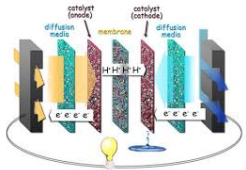
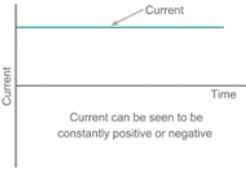



		intermediate assemblies, sub-components, parts, and the quantities of each needed to manufacture an end product.	
Bi-Polar Plate	BPP	Bipolar plates isolate, conduct voltage and current, and contain passages for coolant and reactant/reacted gases.	
Canadian Standards Association (now CSA Group)	CSA	A standards organization which develops standards in 57 areas. CSA publishes standards in print and electronic form and provides training and advisory services.	
Carbon Dioxide	CO2		
Carbon Fiber Re-Enforced Plastic	CFRP	Parts re-enforced with carbon fiber strands or fabric	
Catalyst Coated Membrane	CCM	A PEM where the catalyst where the catalyst is applied directly to the membrane rather than the diffusion media	
Catalyst Coated Substrate (Diffusion Media)	CCS	A substrate used to diffuse the gases across a PEM for even distribution and activation with the catalyst	
Cathode Humidification Unit	CHU	A subsystem that humidifies a PEM fuel cell stack for maximum efficiency and durability.	
Cathode Outlet Manifold	COM	The manifold used to remove the oxygen depleted air from the fuel cell	
Cathode Stoichiometry Sensitivity (test)	CSS	A test to determine how sensitive a material or design is to variations in concentrations of the reactant gases	
Cell Voltage Monitor	CVM	An electronic circuit that monitors the voltage of each cell to determine overall cell and stack health and performance	
Cell Voltage Unit	CVU	A circuit that feed the voltage read out of a cell to the CVUA application process	
Charge Air Cooler	CAC	Charge Air Cooler is a mechanical device used to cool a gas after compression	
Chemical Vapor Deposition	CVD	An application process to deposit a thin film of a material on another surface	




Combined Heat and Power	CHP	A system that while generating power uses the waste heat from the process to generate additional power or for heating buildings or a vehicle thereby increasing thermal efficiency.	
Compressed CAN Data	CCD	CAN transmission data can be compressed up to 76% by use of an algorithm	
Compressed Gas Association	CGA	Compressed Gas Association is dedicated to the development and promotion of safety standards in the industrial, medical, and food gases industry.	
Compressed Gaseous Hydrogen	CGH	Hydrogen compressed from 1 to over 875 bar	
Compressed Natural Gas	CNG	Compressed methane gas CH <sub>4</sub> generally from 1 to 305 bar	
Compression/Expander Machines	CEM	Compression/expander machine consists of two primary components, the radial inflow expansion turbine and a centrifugal compressor integrated as a single assembly.	
Computational Fluid Dynamics	CFD	A computer-based design tool to predict flows and pressures of gases and fluids	
Condenser Radiator Fan Module	CRFM	In ICE and fuel cell vehicles it describes a subassembly composed of heat exchange(s) and fan(s)	
Control Packet Identifier	CPID	Unified Diagnostic Services (UDS) is a diagnostic communication protocol	
Controller Area Network	CAN	Controller Area Network is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other's applications without a host computer.	
Coolant Tank Assembly	CTA	The coolant tank or tanks use to allow for the expansion of coolant as a system warms up, allocation to fill the system and to visually verify coolant level	
Counter Electrode	CE	An electrode that provides a means of applying input potential to the working electrode.	



Crossover	XO	The unwanted movement of unreacted gases across a fuel cell membrane	
Cumulative Incidents Per Vehicle	CIPU	A way to determine or specify the reliability of a vehicle or subsystem	
Data Acquisition	DAQ	A system to collect and store data such as temperature, pressure, flow rates, voltage, current and speed.	
Data Identifier	DID	Each value is associated to a Data Identifier (DID) between 0 and 65535. Normal CAN signals are meant for information that some ECU uses in its functionality.	
Department of Energy	DOE		
Design Failure Modes Effects Analysis	DFMEA	DFMEA is a methodical approach used for identifying potential risks introduced in a new or changed design of a product/service.	
Design of Experiments	DOE	A methodology of applied statistics that deals with planning, conducting, analyzing, and interpreting controlled tests	
Diagnostic Trouble Code	DTC	Is a code recorded by a vehicle OBD system used to diagnose malfunctions in a vehicle	
Diffusion Media also Gas Diffusion Media	DM	Gas diffusion media such as carbon paper or woven carbon fabrics placed on either side of the membrane in a fuel cell. A GDL should allow the flow of reactant gases H <sub>2</sub> , air/oxygen and product gases to pass through it.	
Digital Volt Ohm Meter	DVOM	A multifunction hand held meter to measure voltage, resistance and other electrical properties with a digital display rather than analog.	
Direct Current	DC	Direct current is the unidirectional flow of an electric charge. A vehicle 12V is a prime example of DC power. Direct current may flow through a conductor such as a wire, but can also flow through semiconductors, insulators, or even through a vacuum as in electron or ion beams	

Direct Current-Direct Current	DC-DC	Used in reference to circuits that change DC voltage from one level up or down to another such as 12V to 24V	
Direct Methanol Fuel Cell	DMFC	Direct-methanol fuel cells or DMFCs are a subcategory of proton-exchange fuel cells in which methanol is used as the fuel.	
Distributed Generation	DG	Distributed generation is an approach that employs small-scale technologies to produce electricity close to the end users of power.	
Dry End	DE	The end of a fuel cell stack that is furthest from the anode inlet and moisture introduced for stack humidification	
Efficiency	EFF	A measurement usually in percentage of energy conversion derived by dividing the energy output by the energy input	
Electra Magnetic Interference	EMI	Electromagnetic Interference, EMI is the interference caused by one electrical or electronic device to another by the electromagnetic fields set up by its operation.	
Electric Power Steering	EPS	Electric power steering uses an electric motor(s) either rotational or linear to supply either primary or additional force to the steering gear of a vehicle	
Electric Traction System	ETS	A system in a vehicle that supply the force through the tires to move the vehicle	
Electrochemical Vapor Deposition	EVD	An application process to deposit a thin film of a material on another surface	
Electromagnetic Interference	EMI	Is the disruption of operation of an electronic device when it is in the vicinity of an electromagnetic field	
electron	e-	The negative charged particle that is responsible for the flow of electricity	
Electronic Battery Control Module	EBCM	The electronic module that monitors battery health	
Electronic Brake Control Module	EBCM	The electronic module responsible for antilock brake functions and coordinates friction brakes and regeneration in electric vehicles	



Electronic Control Unit	ECU	An electronic module monitors and controls functions of vehicle subsystems	
Electro-Osmotic Drag	EOD	Movement of water or other electroneutral solvents through a membrane due to an electric field	
End of Life	EOL	End of Life refers to a system reaching a point in its operation where it can no longer function or meet the minimum operational performance required	
End of Service Life	EOSL	EOSL refers to the life of a product after which the manufacturer will no longer supply replacement parts and or support	
Expanded Polytetrafluoroethylene	ePTFE	Membrane material found in PEM fuel cells	
Failure Modes & Effects Analysis	FMEA	Is a structured way to identify and address potential problems, or failures and their resulting effects on the system or process	
Fault Tree Analysis	FTA	Is a graphical tool to explore the causes of system level failures	
Federal Motor Vehicle Safety Standard	FMVSS	Motor vehicle safety standards issued by NHTSA	
Federal Urban Driving Schedule	FUDS	Urban Dynamometer Driving Schedule (UDDS) the UDDS is a speed-trace consisting of 18 profiles	
Finite Element Analysis	FEA	Finite Element Analysis simulates the physical phenomena using mathematical numerical techniques	
Fuel Cell Electric Vehicle	FCEV	Electric vehicle that uses a fuel cell to power an electric traction motor	
Fuel Cell Power Module	FCPM	The fuel cell stack in an FCEV	
Fuel Cell Propulsion System	FCPS	An FCPM in conjunction with an electric traction unit	
Fuel Cell System	FCS	The fuel cell stack and ancillary component in an FCEV	
Gallons of Gasoline Equivalent	GGE	Is the amount of an alternative fuel it takes to equal the energy content of one gallon of liquid gasoline	



Gas Diffusion Layer	GDL	Material such as carbon paper or woven carbon fabrics that are placed on either side of the membrane in a fuel cell	
Gas Diffusion Media	GDM	Fibrous porous medium that has two main functions: to ensure a uniform distribution of reactive gases and the transport of electrons to or from the external electrical circuit.	
Gaseous Hydrogen	GH2	The gaseous form of a colorless, odorless, highly flammable gas, the chemical element of atomic number 1.	
Glass Fiber Re-Enforced Plastic	GFRP	Composite material made of a polymer matrix reinforced with fibers.	
Ground	GND	An electrical path to a real or virtual earth potential	
Heat Exchanger	HEX	Any component that uses high surface area to transfer heat from one medium to another	
Heating Ventilation and Air Conditioning	HVAC	The combination of heat exchangers, compressors and pumps used to heat or cool the interior or batteries in a vehicle	
Helium	He	The chemical element of atomic number 2, an inert gas which is can be used to inert pressure vessels or perform leak tests.	
High Density Polyethylene	HDPE	A thermoplastic polymer produced from the monomer ethylene. It can be used as an impermeable barrier to hydrogen gas a pressure vessel liner	
High Frequency Resistance – testing	HFR	AC Resistance method applies a fixed, single high-frequency sine wave (typically 1 kHz) to the fuel cell to measure the total impedance	
High Voltage	HV	In vehicles any voltage greater than 30V AC, or 60V DC.	
High Voltage Alternating Current	HV-AC	Any voltage greater than 30V AC	
High Voltage Direct Current	HV-DC	Any voltage greater than 60V DC	
High Voltage Interlock	HVIL	An electromechanical safety system used to prevent activation of high	





		voltage if there is a break or loss of isolation in the system	
Higher Heating Value	HHV	A measure of heat content based on the gross energy content of a combustible fuel	
Highway Fuel Economy Test	HWFET	Chassis dynamometer driving schedule developed by the US EPA for the determination of fuel economy	
Hybrid Electric Vehicle	HEV	Vehicles powered by an internal combustion engine in combination with one or more electric motors	
Hybrid Permanent Magnet Synchronous	HPMSyn	An electric motor using a magnet system consisting of various types of magnets on one rotor, for example sintered and bonded magnets.	
Hydrogen	H2	A colorless, odorless, highly flammable gas, the chemical element of atomic number 1. It can be either a gas or a liquid.	
Hydrogen Adsorption Desorption	HAD	The ratio between how fast hydrogen is adsorbed and desorbed on the catalyst surface	
Hydrogen Storage System	HSS	The subsystem including pressure or cryogenic storage vessels, regulators, sensors, fill mechanism and safety mechanisms	
Hydrogen Takeover Test	H2TO	A test performed at the cell level to determine material performance	
Incidents per Thousand Vehicles	IPTV	A statistical measurement value to study existing or projected future failures based on 1000 vehicles	
Induction Machine	IM	Asynchronous motor AC motor in which the electric current in the rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding.	
Insulated Gate Bipolar Transistor	IGBT	Is a three-terminal power semiconductor device primarily used as an electronic switch	
Interior Permanent Magnet	IPM	An electric motor with its permanent magnets buried in the rotor lamination which augment permanent magnet torque with reluctance torque.	



Internal Combustion Engine	ICE	An engine that generates motive power by the burning of gasoline, oil, or other fuel with air inside the engine, the hot gases produced being used to drive a piston or do other work as they expand	
International Organization for Standardization	ISO	An international nongovernmental organization made up of national standards bodies.	
Ion Exchange Capacity	IEC	Measure of the ability of an insoluble material to undergo displacement of ions attached and loosely incorporated into its structure by oppositely charged ions present in the surrounding solution	
kilo-Pascal	kPa	1000 pascal which is equal to a pressure of one thousand newton per square meter	
kilowatt	kW	A measure of 1,000 watts of electrical power.	
kilowatt-hr	kW-hr	Unit of energy equal to one kilowatt of power sustained for one hour or 3600 kilojoules	
Large Area Network	LAN	A LAN is a group of connected computing devices within a localized area that usually share a centralized Internet connection.	
Lead Acid	PbA	The chemistry (lead plates and sulfuric acid electrolyte) in type of rechargeable battery first invented in 1859 by French physicist Gaston Planté	
Life-Cycle Analysis	LCA	A methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product,	
Light Duty Vehicle	LDV	EPA classifies vehicles as Light Duty (GVWR < 8,500lb)	
Liquid Hydrogen	LH2	For hydrogen to be in a fully liquid state at atmospheric pressure, H2 needs to be cooled to 20.28 K (-252.87 °C; -423.17 °F)	
Liquid Natural Gas	LNG	Is natural gas that has been cooled to a liquid state (liquefied), at about -260° Fahrenheit, for shipping and storage.	



Lithium Polymer	LiPo	The chemistry used in rechargeable batteries using a polymer electrolyte instead of a liquid electrolyte.	
Low Cell Voltage	LCV	When a cell exhibits lower voltage than other cells in a battery or fuel cell stack	
Low Performing Cell	LPC	A cell exhibiting lower performance than other cells in a battery or fuel cell stack	
Low Stack Voltage	LSV	When all the cells in a fuel cell stack are below nominal voltages	
Lower Flammability Limit	LFL	That concentration of a combustible material in air below which ignition will not occur	
Lower Heating Value	LHV	The amount of heat released by combusting a specified quantity (initially at 25°C) and returning the temperature of the combustion products to 150°C,	
Material Safety Data Sheet	MSDS	A safety document required by the Occupational Safety and Health Administration (OSHA) that contains data about the physical properties of a particular hazardous substance.	
Mean Time to Failure	MTTF	A maintenance metric that measures the average amount of time a non-repairable component operates before it fails	
Mega-Pascal	MPa	1,000,000 pascal which is equal to a pressure of one million newton per square meter	
Membrane Electrode Assembly	MEA	An assembled stack of proton-exchange membranes (PEM) or alkali anion exchange membrane (AAEM), catalyst and flat plate electrode used in fuel cells and electrolyzers.	
Metal Hydride	MH	Are a class of materials containing metal or metalloid bonded to hydrogen	
Micro Porous Layer	MPL	An additional diffusion layer composed of carbon particles and fluoropolymer	
Molten Carbonate Fuel Cell	MCFC	A type of high temperature fuel cell that uses an electrolyte composed of a molten carbonate salt mixture suspended in a porous, chemically inert ceramic matrix	



Multilayer Adsorption	MLA	The adsorption space accommodates more than one layer of molecules and not all in contact with the surface layer of the adsorbent.	
Nation Highway and Traffic Safety Administration	NHTSA	A federal agency of the United States government tasked with upholding regulatory safety standards in automobile manufacturing and the highway transportation system.	
National Fire Protection Association	NFPA	Delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy	
Natural Gas	NG	A flammable gas, consisting largely of methane and other hydrocarbons	
Negative	-	The electrical charge on body or substance that has an excess of electrons	
New European Drive Cycle	NEDC	Is a driving cycle, last updated in 1997, designed to assess the emission levels of car engines and fuel economy	
Newton-Meter	N-m	Is equal to the torque resulting from a force of one newton applied perpendicularly to the end of a moment arm that is one meter long.	
Nickel Metal Hydride	NiMh	Describes a group of materials used in batteries and hydrogen storage	
Nitrogen	N <sub>2</sub>	The chemical element of atomic number 7, a colorless, odorless unreactive gas that forms about 78 percent of the earth's atmosphere	
Non-Repeating End Unit (Stack End Plate)	NREU	The end plates used to start and terminate a fuel cell stack of repeating units	
Normal Hydrogen Electrode	NHE	A redox electrode which forms the basis of the thermodynamic scale of oxidation-reduction potentials.	
Open Circuit Voltage	OCV	Is the maximum operating voltage (when no current is flowing) of a fuel cell	
Original Equipment Manufacturer	OEM	A term that designates the original manufacturer of a part. Also, a term	



		used to generically refer to automobile manufacturers.	
Overall System Controller	OSC	Master controller of set of multiple controllers	
On Tank Valve	OTV	An assembly that incorporates a high-pressure shutoff valve and sometimes sensors and pressure relief function	
Oxygen	O <sub>2</sub>	A colorless, odorless reactive gas, the chemical element of atomic number 8 and the life-supporting component of the air.	
Oxygen Reduction Reaction	ORR	The oxygen reduction reaction refers to the reduction half reaction whereby O <sub>2</sub> is reduced to water or hydrogen peroxide. In fuel cells	
Partial Oxidation	POX	Is a chemical reaction that occurs when a mixture of a hydrocarbon feedstock and a sub-stoichiometric amount of pure oxygen (O <sub>2</sub> ) are reacted together, producing a syngas	
Perfluorosulfonic Acid	PFSA	Are chemical compounds of the formula C <sub>n</sub> F <sub>(2n+1)</sub> SO <sub>3</sub> H are highly hydrophobic. Commonly found as one of the 2 copolymers in PEMs.	
Permanent Magnet	PM	A magnet that retains its magnetic properties in the absence of an inducing field or current.	
Permanent Magnet Synchronous Motor	PMSM	An AC synchronous motor whose field excitation is provided by permanent magnets	
Phosphoric Acid Fuel Cell	PAFC	A type of fuel cell that uses liquid phosphoric acid as an electrolyte.	
Platinum Group Metals	PGM	Group of metals comprised of ruthenium, rhodium, palladium, osmium, iridium and platinum	
Polarity	POL	The relative orientation of poles; the direction of a magnetic or electric field.	
Polybenzimidazole	PBI	Is a highly stable thermoplastic polymer that is used as a fuel cell membrane material.	
Poly-Arylene-Etheretherketone	PEEK	A colorless organic thermoplastic polymer used in engineering applications.	



Polyethylene	PE	A tough, light, flexible synthetic resin made by polymerizing ethylene	
Polymer Electrolyte Fuel Cell	PEFC	Consists of a gas diffusion layer, an electrode on each side, and a polymer electrolyte membrane in between the electrodes.	
Polymer Electrolyte Membrane	PEM	A solid polymer electrolyte that is responsible for the conduction of protons, separation of product gases, and electrical insulation of the electrodes in a fuel cell or electrolyzer	
Positive	+	The electrical charge on body or substance that has a deficiency of electrons	
Power	PWR	The rate at which electrical energy is converted to another form, such as motion, heat, or an electromagnetic field.	
Power Electronics	PE	Any electronic device capable of converting or inverting high levels of electrical power	
Power Inverter Module	PIM	Takes direct current (DC) power from a vehicle's battery and converts it into alternating current (AC) or AC to DC.	
Power to Heat Ratio	PHR	Determines the proportion of electric power to heat generated in a single cogeneration system	
Preferential Oxidation	PROX	Refers to the preferential oxidation of a carbon monoxide in a gas mixture by a catalyst to remove trace amounts of CO from H <sub>2</sub> /CO/CO <sub>2</sub> mixtures produced by steam reforming and water-gas shift.	
Process FMEA	PFMEA	A step-by-step approach for identifying all possible failures in an assembly process.	
Proportional-Integral-Derivative or Parameter Identifier	PID	OBD-II PIDs are codes used to request data from a vehicle,	
Proton	H+	A single hydrogen ion.	
Proton Exchange Membrane	PEM	Is a semipermeable membrane generally made from ionomers and designed to conduct protons while	



		acting as an electronic insulator and reactant barrier	
Proton Exchange Membrane Fuel Cell	PEMFC	A fuel cell based on a PEM	
Pulse Width Modulation	PWM	A method of reducing the average power delivered by an electrical signal, by effectively chopping it up into discrete pulses.	
Rechargeable Energy Storage System	RESS	A component or system of components that stores energy and for which its supply of energy is rechargeable such as a battery or ultracapacitor.	
Six-Step Mode	SSM	Also known as trapezoidal commutation, is a commutation technique used to control three-phase brushless DC (BLDC) permanent magnet motors.	
Society of Automotive Engineers	SAE	A global association of more than 128,000 engineers and related technical experts in the aerospace, automotive and commercial-vehicle industries.	
Solid Oxide Fuel Cell	SOFC	An electrochemical conversion device that produces electricity directly from oxidizing a fuel using a solid oxide or ceramic electrolyte.	
Solid Polymer Electrolyte	SPE	See PEM	
Solid Polymer Electrolyte Fuel Cell	SPEFC	See PEMFC	
Space Vector Pulse Width Modulation	SVPWM	A modulation scheme used to apply a given voltage vector to a three-phased electric motor (PM or induction) To rotate a motor, a smoothly rotating voltage vector is required	
Stack Manifold Unit	SMU	An integrated subsystem that combines the functions of both cathode and anode manifolds, sensors and control valves.	
Standard Temperature and Pressure	STP	The temperature of 0°C and pressure of 1 atmosphere, usually taken as the conditions when stating properties of gases.	
Steam Reforming	SR	A process in which methane from natural gas is heated, with steam,	



		usually with a catalyst, to produce a mixture of carbon monoxide and hydrogen used in organic synthesis and as a fuel.	
Stoichiometric Ratio (j)	SR	The exact ratio between air and flammable gas or vapor at which complete combustion takes place.	
Surface Permanent Magnet	SPM	A type of permanent magnet motor that has its magnets mounted on the outer edge of the rotor	
Switch Reluctance Motor	SRM	A type of electric motor that induces non-permanent magnetic poles on the ferromagnetic rotor. The rotor does not have any windings. It generates torque through magnetic reluctance.	
Technischer Überwachungsverein (Technical Inspection Association)	TUV	Are independent service companies from Germany and Austria that test, inspect and certify technical systems, facilities and objects of all kinds in order to minimize hazards and prevent damages.	
Traction Power Inverter Module	TPIM	An inverter designed specifically to drive an electric traction motor	
Transmission Electron Microscopy	TEM	A microscope that allow researchers to view samples on a molecular level, making it possible to analyze structure and texture.	
Unified Diagnostic Services	UDS	Unified Diagnostic Services (UDS) is a diagnostic communication protocol used in electronic control units (ECUs) within automotive electronics, which is specified in the ISO 14229-1.	
Unitized Electrode Assembly	UEA	A component that incorporates all the needed functions of an individual fuel cell (i.e. membrane, catalyst, diffusion media and electrodes)	
Universal Controller Input Output	UCIO	A programmable controller that receives sensor inputs, provides control functions, and output control signals.	
Upper Confidence Level	UCL	Refers to the percentage of probability, or certainty, that the confidence interval would contain the true population parameter when you draw a random sample many times.	





Urban Dynamometer Drive Schedule	UDDS	Is commonly called the "LA4" or "the city test" and represents city driving conditions.	
Vehicle to Grid	V2G	Is a technology that enables energy to be pushed back to the power grid from the battery of an electric car.	
Water Vapor Transport	WVT	The transfer of moisture that is formed from fuel cell reactions within the stack from the cathode exhaust to the anode manifold or cells.	
Working Electrode	WE	The electrode in an electrochemical system on which the reaction of interest is occurring.	
X-Ray Diffraction	XRD	The scattering of X-rays by the regularly spaced atoms of a crystal, useful in obtaining information about the structure of the crystal.	
Zero Emissions Vehicle	ZEV	A vehicle that does not emit exhaust gas or other pollutants from the onboard source of power.	

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