Gas Diffusion Layers (GDLs) are key components in various types of fuel cells, including Proton Exchange Membrane (PEM), Direct Methanol (DMFC) and Phosphoric Acid (PAFC) stacks as well as in other electrochemical devices such as electrolyzers. In fuel cells, this thin, porous sheet must provide high electrical and thermal conductivity and chemical/corrosion resistance, in addition to controlling the proper flow of reactant gases (hydrogen and air) and managing the water transport out of the membrane electrode assembly (MEA). This layer must also have controlled compressibility to support the external forces from the assembly, and not deform into the bicomponent plate channels to restrict flow. Other uses require different criteria, for example, electrolyzers require thicker, higher density porous plates, while humidifiers have most of the same requirements as fuel cell stacks, but the GDLs do not need to be electrically conductive.

From 1991-2005, SpectraCorp, Ltd. was a leading producer of GDL products for commercial applications, with Spectracarb™ GDL as well as a leader in the development of new GDL materials. In 2005, Engineered Fibers Technology (EFT) acquired the Spectracarb GDL commercial series of carbonized and graphitized products, as well as technology, from SpectraCorp. EFT now manufactures all of the GDL papers and products that were developed by SpectraCorp.

Since 2005 EFT has grown Spectracarb GDL based on our foundation of engineered materials research, wet-laid paper development and specialty short-cut fibers combined with the Spectracarb technology to better serve the electrochemical device market and is now a source for technology, materials and service that brings together unique, but complementary, technologies from both companies and allows EFT to offer a broad base of technology products and services.

Customer Driven GDL Development is the focus of our technology, and has been defined by our customers who have found that larger GDL producers, who have concentrated on larger volume applications with a limited line of standard products, cannot economically, or do not wish to, participate in such developments.

Spectracarb GDL Technology Focus:

1) Providing lower cost products that are interchangeable with other existing standard industry grades;

2) Development and commercial production of specific GDL products meeting the requirements of customers;

3) Creation of “second / future generation” GDL products through both independent and contract research / joint development / engineering programs.
Spectracarb GDL Commercial Products

EFT currently manufactures the widest range of GDL products available in the Industry. Spectracarb commercial grade GDL’s consist of a graphitized network of resin-bonded carbon fiber nonwoven paper. EFT has built on this technology with expanded research and manufacturing efforts. Spectracarb GDL can now be supplied for all standard and special applications, including niche applications, in several grades, densities and thicknesses. A full product description is shown on our GDL Products Technical Data Sheet. All products are made in the USA. Manufacturing is done on a commercial scale.

Our Spectracarb production efforts have focused mainly on specialty processed thin papers and laminated multi-ply panels, with a wide range of densities and thicknesses ranging from 0.25 g/cm³ and one-tenth of a millimeter to 0.90 g/cm³ and four-millimeters, respectively. Standard thin sheets are supplied as 400x400 mm sheets, and up to 550 x 550 mm for thicker panels, discs cut to size, special machining or other customer specific dimensions.

Commercial grades of GDL have been specifically developed and produced for a wide range of customer applications including:

a) the China City Bus Programs for the Beijing 2008 Summer Olympics and Shanghai 2010 World Expo; b) specialty high density panels for electrolyzer applications; and c) high flow panels for electrochemical processing, to name a few.

Spectracarb GDL R&D /Contract Research

EFT has R&D capabilities and facilities to investigate customer specific GDL issues. In addition to EFT sponsored R&D, EFT seeks contract research/ joint development programs related to customer specific GDL, and to the investigation of new materials, constructions and processing related to next generation / lower cost GDL. This type of contract research, normally conducted under confidenctially agreement, can range from starting with specific fibers and / or other components in the laboratory to fabricate special wet-laid or other paper constructions resulting in up to 200 x 200 mm test plaques through full scale processing and manufacturing.

Joint Development Programs have demonstrated technical success. Out-sourcing projects to EFT also results in much lower costs because of our lower overhead burdens. Past programs in collaboration with a major OE automotive producer have resulted in several paths to lower cost, including a low cost humidifier paper and a higher performance water management cathode (patent applications filed). Other projects have included preparation and evaluation of GDL papers with controlled conductivity; comparison of various grades / manufacturers of carbon fibers in GDL paper, with focus on lower cost, on fuel cell performance; design of hybrid constructions for improved water management; preparation of sheet constructions to verify numerical models; and alternative resin processing, among others.

EFT Laboratory Facilities permit complete design, processing and materials property evaluations of GDL sheets. Combined with our fiber cutting capabilities, starting fibers can be cut, uniquely formulated with other conductive and /or binder components and formed into paper handsheets, molded and graphitized at over 2000º C to provide 200 x 200 mm test sheets for materials characterization, or for fuel cell evaluation. Evaluation equipment including TGA / DSC, PC controlled Instron is also available for a complete range of physical, thermal, mechanical, and electrical characterizations.

EFT is a source for technology, materials and service. We continue to build our Spectracarb GDL business on our foundation of engineered materials production and contract research, wet-laid paper development and specialty short-cut fibers to better serve the electrochemical device market.

We would be happy to discuss your specific requirements both for development and production of our various grades of Spectracarb GDL as well as discuss applications where special constructions that are not currently available could be investigated.

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