

Sigracet 29 BC

| Property | | Unit | Value |
|---|-----------------------------|----------------------|----------|
| Ash Content (1) | | % | < 0.25 |
| Areal Weight (2) | | g/m ² | 90 ± 10 |
| Thickness At | 5 psi [0.0345 Mpa] Load (3) | um (microns) | 235 ± 20 |
| | 1 MPa Load (4) | | 190 ± 20 |
| | 2 MPa Load (3) | | 170 ± 20 |
| Compressibility at 1 MPa (5) | | % | ca. 19 |
| Through Plane El. Resistance at 1 MPa (6) | | mΩ x cm ² | < 12 |
| In Plane Pressure Drop at 1 MPa | | bar | 0.8 |

Specified Material Properties:

- (2) Internal, based on DIN EN ISO 536
- (4) Internal based on DIN EN ISO 9073
- (6) Internal, based on DIN 51911

Additional Data:

- (1) DIN 51903
- (3) Internal, based on DIN EN ISO 9073
- (5) Internal based on DIN 53885

Gas Diffusion Layers

Gas Diffusion Layers (GDL) 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 bi-component 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. The GDL serves as a connection bridge between the MEA and graphite plate.

The main functions of GDL include the following:

- A gas diffused pathway from flow channels to the catalyst layer
- Help removes by-produced water outside of the catalyst layer and prevent flooding
- Keep some water on surface for conductivity through the membrane
- Heat transfer during cell operation
- Helps provide enough mechanical strength to hold the MEA from extension caused by water absorbency

What is the purpose of a Hydrophobic Treatment (AKA Wet Proofing)?

A hydrophobic treatment to GDL enables improved water transport. In PEM fuel cells, specifically water retention can result in lower power generation. These GDLs are treated with Teflon in order to make the material hydrophobic and improve water transport.

What is the purpose of a Micro-porous Layer (MPL)?

The purpose of the carbon Microporous Layer (MPL) is to minimize the contact resistance between the GDL and catalyst layer, limit the loss of catalyst to the GDL interior and help to improve water management as it provides effective water transport. MPL treatment is especially recommended for use with CCM (Catalyst Coated Membrane).

Gas Diffusion Layer Comparison Table

| Gas Diffusion Layer (GDL) | Type | Thickness (um) | Density (g/cm ³) | Basic Weight (g/m ²) | Air Permeability (s) | Through Plane Resistance (mΩcm ²) | Tensile Strength (N/cm) | Flexural Modulus (MPa) | Porosity | MPL* |
|---------------------------|-------|----------------|------------------------------|----------------------------------|---|---|-------------------------|------------------------|----------|------|
| Plain Carbon Cloth | Cloth | 356 | 1.5 | 132 | - | - | 19.25 | 7.5 | - | No |
| Carbon Cloth W1S1005 | Cloth | 410 | - | 180 | < 8 | < 13 | >10 MD & >5 XMD | - | - | Yes |
| Sigracet 29 BC | Paper | 235 | - | 90 | 1 cm ³ /(cm ² *s) | < 12 | - | - | 80% | Yes |
| AvCarb EP40 | Paper | 200 | 0.2 | 36 | 4.5 | 8 | - | - | - | No |
| AvCarb P50 | Paper | 170 | 0.31 | 50 | 35 | 6.7 | - | - | - | No |
| AvCarb P75 | Paper | 245 | 0.29 | 75 | 15 | 7.8 | - | - | - | No |
| AvCarb GDS1120 P50 | Paper | 184 | 0.4 | 79 | - | < 14.5 | - | - | - | Yes |
| AvCarb GDS3250 EP40 | Paper | 225 | 0.33 | 75 | - | < 14 | - | - | - | Yes |
| AvCarb GDS3260 EP40 | Paper | 210 | 0.38 | 80 | - | < 14 | - | - | - | Yes |
| AvCarb GDS2120 P75 | Paper | 248 | 0.4 | 101 | - | < 14 | - | - | - | Yes |
| AvCarb GDS2230 P75 | Paper | 275 | 0.4 | 98 | - | < 14 | - | - | - | Yes |
| AvCarb MGL 190 | Paper | 190 | 0.44 | - | 2.2 | - | 65 | 45 | 78% | No |
| AvCarb MGL 280 | Paper | 280 | 0.44 | - | 3.3 | - | 85 | 45 | 78% | No |
| AvCarb MGL 370 | Paper | 370 | 0.46 | - | 4.4 | - | 120 | 45 | 78% | No |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Spectracarb 2050A - 0550 | Paper | 127 | 0.5 | 88 | 35 | 18 | 4.2 MD & 2.6 XMD | 37 | - | No |
| Spectracarb 2050A-0850 | Paper | 203 | 0.5 | 88 | 35 cfm/ft ² | 18 | 4.2 MD & 2.6 XMD | 37 | - | No |
| Spectracarb 2050A - 1050 | Paper | 254 | 0.5 | 88 | 35 | 18 | 4.2 MD & 2.6 XMD | 37 | - | No |
| Spectracarb 2050A - 1535 | Paper | 381 | 0.35 | 175 | 35 | 15 | - | 40 | - | No |
| Spectracarb 2050A-1550 | Paper | 381 | 0.5 | 175 | 35 cfm/ft ² | 15 | - | 40 | 78% | No |
| Toray 030 | Paper | 110 | 0.4 | - | - | 80 mΩcm | - | 40 | 80% | No |
| Toray 060 | Paper | 190 | 0.44 | - | - | 80 mΩcm | 50 | 40 | 78% | No |
| Toray 090 | Paper | 280 | 0.44 | - | - | 80 mΩcm | 70 | 40 | 78% | No |
| Toray 120 | Paper | 370 | 0.45 | - | - | 80 mΩcm | 90 | 40 | 78% | No |

* MPL stands for Microporous Layer