

# Halar<sup>®</sup> ECTFE

Ethylene-Chlorotrifluoroethylene  
Typical properties



Solvay  
Solexis



# Halar® ECTFE

## A unique combination of properties

Halar® ECTFE is a melt-processable fluoropolymer manufactured by Solvay Solexis in Orange, Texas. Halar® ECTFE was first introduced to the market by Allied Chemicals in 1974.

- Excellent chemical resistance (pH 1-14),
- Excellent barrier properties,
- Good electrical properties,
- Broad use temperature range from cryogenic to 150°C,
- UL-94 V-0 vertical burn at 0.18mm,
- Low flame spread, low smoke generation,
- Excellent impact strength,
- Good mechanical properties,
- Excellent abrasion resistance,
- Exceptional surface smoothness,
- Good weathering resistance.

Halar® ECTFE is available in a range of viscosities for extrusion and molding applications.

Halar® powders are available in different particle sizes optimized for specific coating processes.

Halar® ECTFE is a thermoplastic resin that can be processed by any technique applicable to polyethylene, including:

- Injection molding,
- Extrusion,
- Blow molding,
- Rotomolding,
- Electrostatic coating.

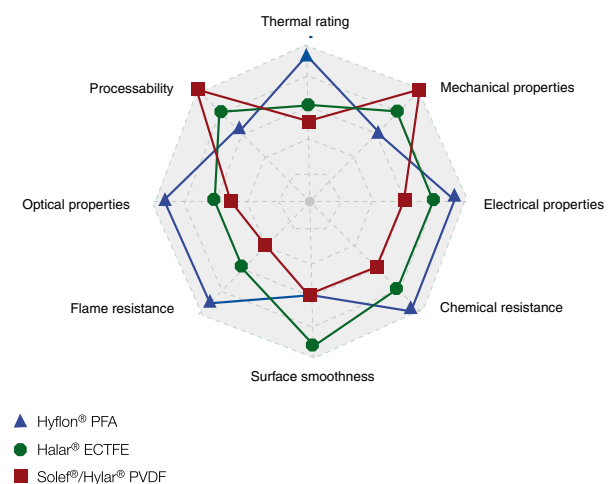
Halar® ECTFE is extensively used in the chemical processing industry (chemical resistance and low permeation), for the high purity semiconductor market, in wire and cable markets, for the pharmaceutical industry and a variety of other demanding filtration and corrosion protection applications in other markets.

Halar® ECTFE forms part of the Solvay Solexis' range of fluoropolymers, all of which are easily processed by injection, extrusion and all conventional processing techniques.

The fluoropolymer range also includes:

- Solef® and Hylar® PVDF (polyvinylidene fluoride),
- Hyflon® PFA (copolymer of tetrafluoroethylene and perfluoroalkylvinylethers).

### Relative performance of Solvay Solexis melt processable fluoropolymers



Assistance in the selection of the most suitable resin and processing conditions is available through Solvay Solexis' commercial and technical teams.

## Halar® ECTFE - Typical properties

| GRADE   |   |  |
|---|---|--|
| Physical properties                                     |   |  |
| Density (23°C / 73°F)                                   | ASTM D 792  | g/cm <sup>3</sup>                          |
| Water absorption (24 h at 23°C)                         | ASTM D 570  | %  |
| Melt Flow Index, 275°C, 2.16 kg                         | ASTM D 1238   | g/10 min                                   |
| 275°C, 5 kg   |   | g/10 min                                   |
| Mechanical properties                                   |   |  |
| <b>Tensile (23°C)</b>                                   | ASTM D 638 50 mm/min                                  |  |
| Tensile stress at yield                                 |   | MPa (psi)                                  |
| Tensile stress at break                                 |   | MPa (psi)                                  |
| Elongation at yield                                     |   | %  |
| Elongation at break                                     |   | %  |
| Modulus   | ASTM D 638 1 mm/min                                   | MPa (psi)                                  |
| <b>Flexural (23°C)</b>                                  | ASTM D 790  |  |
| Strength  |   | MPa (psi)                                  |
| Modulus   | ASTM D 790 2.5 mm/min                                 | MPa (psi)                                  |
| IZOD impact (notched V 10 mm - at 23°C - 3.2 mm thick)  | ASTM D 256  | J/m  |
| IZOD impact (notched V 10 mm - at -40°C - 3.2 mm thick) |   |  |
| Shore D Hardness (2 mm thick)                           | ASTM D 2240   | -  |
| Abrasion resistance                                     | TABER CS 17/0.5 kg                                    | mg/1000 rev                                |
| Friction coefficient: static                            | ASTM D 1894   | -  |
| dynamic   |   | -  |
| Thermal properties                                      |   |  |
| <b>Crystallinity by DSC</b>                             | ASTM D 3418   |  |
| Melting point   |   | °C (°F)                                    |
| Heat of fusion (80°C to end of melting)                 |   | J/g  |
| Crystallizing point                                     |   | °C (°F)                                    |
| Crystallization heat                                    |   | J/g  |
| Deflection temperature (4 mm thick)                     | ASTM D 648  |  |
| load 0.46 MPa   |   | °C (°F)                                    |
| load 1.82 MPa   |   | °C (°F)                                    |
| Glass Transition (T <sub>g</sub> )                      | DMTA  | °C (°F)                                    |
| Brittleness temperature (on 2 mm pressed sheet)         | ASTM D 746 A  | °C (°F)                                    |
| Molding shrinkage                                       |   | %  |
| Thermal stability                                       | TGA - Temperature at 1% weight loss in N <sub>2</sub> | °C (°F)                                    |
| Linear thermal expansion coefficient                    | ASTM D 696  | 10 <sup>-6</sup> /K (10 <sup>-6</sup> /°F) |
| Thermal conductivity at 40°C / 104°F                    | ASTM C177   | W/m.K                                      |
| Specific heat   | 23°C  | J/g.K                                      |
| Electrical properties                                   |   |  |
| Volume resistivity @ 23°C, 50% RH                       | ASTM D 257  | ohm.cm<br>ohm.in                           |
| Dielectric strength @ 23°C, 3.2 mm thick                | ASTM D 149  | kV/mm<br>V/mil                             |
| Dielectric constant, 23°C @ 10 <sup>6</sup> Hz          | DIN 53483   |  |
| Fire resistance   |   |  |
| UL-94 Flammability test                                 | UL-94   | Class                                      |
| Limiting Oxygen Index (sheet 3 mm thick)                | ASTM D 2863   | %  |

| COPOLYMERS   |  |                                   |                           |   |  |                                      |
|--|--|-----------------------------------|---------------------------|---|--|--------------------------------------|
| 300  | 350  | 500                               | 513                       | 901   | 902                                    | 1450                                 |
| Film/tube extrusion<br>Wire & Cable<br>Injection molding | Film/tube extrusion<br>Wire & Cable<br>Injection molding | Wire & Cable<br>Injection molding | Monofilament<br>extrusion | Sheet / pipe extrusion<br>Compression molding | Sheet extrusion<br>Compression molding | Fiber extrusion<br>Injection molding |
| 1.68   | 1.68   | 1.68                              | 1.68                      | 1.68  | 1.71                                   | 1.68                                 |
| < 0.1  | < 0.1  | < 0.1                             | < 0.1                     | < 0.1   | < 0.1                                  | < 0.1                                |
| 1.5 - 3  | 3 - 6  | 15 - 22                           | 18 - 20                   | 0.8 - 1.3                                     | -                                      | 40 - 60                              |
| -  | -  | -                                 | -                         | -   | 0.8 - 1.3                              | -                                    |
| 30-32 (4300-4600)  |  |                                   |                           |   |  |                                      |
| 50-55 (7300-8000)  |  | 40-50 (5800-7300)                 |                           | 52-57 (7500-8300)                             | 45-50 (6500-7300)                      | 30-40 (4400-5800)                    |
| 3-5  |  |                                   |                           |   |  |                                      |
| 250-300  |  |                                   |                           |   |  |                                      |
| 1400-2100 (203000-304000)                                |  |                                   |                           |   |  |                                      |
| 45-55 (6500-8000)  |  |                                   |                           |   |  |                                      |
| 1600-1800 (232000-261000)                                |  |                                   |                           |   |  |                                      |
| no break   | no break   | no break                          | no break                  | no break                                      | no break                               | no break                             |
| 105  | 95   | 50                                | 50                        | 110   | 65                                     | 35                                   |
| 70-75  | 70-75  | 70-75                             | 70-75                     | 70-75   | 70-75                                  | 70-75                                |
| 5  | 5  | 5                                 | 5                         | 5   | 5                                      | 5                                    |
| 0.1-0.2  | 0.1-0.2  | 0.1-0.2                           | 0.1-0.2                   | 0.1-0.2                                       | 0.1-0.2                                | 0.1-0.2                              |
| 0.1-0.2  | 0.1-0.2  | 0.1-0.2                           | 0.1-0.2                   | 0.1-0.2                                       | 0.1-0.2                                | 0.1-0.2                              |
| 242 (468)  | 242 (468)  | 242 (468)                         | 242 (468)                 | 242 (468)                                     | 222 (434)                              | 242 (468)                            |
| 42   | 42   | 42                                | 42                        | 42  | 28                                     | 42                                   |
| 222 (432)  | 222 (432)  | 222 (432)                         | 222 (432)                 | 222 (432)                                     | 205 (400)                              | 222 (432)                            |
| 40   | 40   | 40                                | 40                        | 40  | 28                                     | 40                                   |
| 90 (195)   | 90 (195)   | 90 (195)                          | 90 (195)                  | 90 (195)                                      | 90 (195)                               | 90 (195)                             |
| 70 (160)   | 70 (160)   | 70 (160)                          | 70 (160)                  | 70 (160)                                      | 70 (160)                               | 70 (160)                             |
| 85 (185)   | 85 (185)   | 85 (185)                          | 85 (185)                  | 85 (185)                                      | 85 (185)                               | 85 (185)                             |
| <-76 (<-105)   | <-76 (<-105)   | <-76 (<-105)                      | <-76 (<-105)              | <-76 (<-105)                                  | <-76 (<-105)                           | <-76 (<-105)                         |
| 2.5  | 2.5  | 2.5                               | 2.5                       | 2.5   | 2.5                                    | 2.5                                  |
| 405 (760)  | 405 (760)  | 405 (760)                         | 405 (760)                 | 405 (760)                                     | 405 (760)                              | 405 (760)                            |
| 90 (50)  | 90 (50)  | 90 (50)                           | 90 (50)                   | 90 (50)                                       | 90 (50)                                | 90 (50)                              |
| 0.15   | 0.15   | 0.15                              | 0.15                      | 0.15  | 0.15                                   | 0.15                                 |
| 0.95   | 0.95   | 0.95                              | 0.95                      | 0.95  | 0.95                                   | 0.95                                 |
| > 1 · 10 <sup>16</sup>                                   | > 1 · 10 <sup>16</sup>                                   | > 1 · 10 <sup>16</sup>            | > 1 · 10 <sup>16</sup>    | > 1 · 10 <sup>16</sup>                        | > 1 · 10 <sup>16</sup>                 | > 1 · 10 <sup>16</sup>               |
| > 1 · 10 <sup>16</sup>                                   | > 1 · 10 <sup>16</sup>                                   | > 1 · 10 <sup>16</sup>            | > 1 · 10 <sup>16</sup>    | > 1 · 10 <sup>16</sup>                        | > 1 · 10 <sup>16</sup>                 | > 1 · 10 <sup>16</sup>               |
| 15   | 15   | 15                                | 15                        | 15  | 15                                     | 15                                   |
| 385  | 385  | 385                               | 385                       | 385   | 385                                    | 385                                  |
| 2.6  | 2.6  | 2.6                               | 2.6                       | 2.6   | 2.6                                    | 2.6                                  |
| V-0  | V-0  | V-0                               | V-0                       | V-0   | V-0                                    | V-0                                  |
| 52   | 52   | 52                                | 52                        | 52  | 52                                     | 52                                   |

| TERPOLYMERS               |                           |   |
|---------------------------|---------------------------|---|
| 600                       | 600 TP                    | 650                                     |
| Thick rod extrusion       | Tower packing only        | Extrusion Injection molding clear grade |
| 1.68                      | 1.68                      | 1.72                                    |
| < 0.1                     | < 0.1                     | < 0.1                                   |
| 10 - 15                   | 4 - 22                    | 5 - 9                                   |
| -                         | -                         | -                                       |
| 30-32 (4300-4600)         |                           |   |
| 45-50 (6500-7300)         | 40-50 (5800-7300)         | 35-45 (5100-6500)                       |
| 5                         | 9                         | 4                                       |
| 325                       | 250                       | 300                                     |
| 1500-1800 (218000-261000) |                           |   |
| 45-50 (6500-7300)         | 40-50 (5800-7300)         | 45-50 (6500-7300)                       |
| 1600-1800 (232000-261000) | 1400-1800 (203000-261000) | 1400-1600 (203000-232000)               |
| no break                  | no break                  | no break                                |
| 207                       | 200                       | 53                                      |
| 70                        | 75                        | 74                                      |
| 5                         | 5                         | 5                                       |
| 0.2                       | 0.3                       | 0.3                                     |
| 0.2                       | 0.3                       | 0.3                                     |
| 220-227 (428-440)         |                           |   |
| 28                        | no spec                   | 180-200 (356-392)                       |
| 205 (400)                 | 218 (424)                 | 162 (324)                               |
| 28                        | 18                        | 5                                       |
| 80 (176)                  | 72 (162)                  | 62 (144)                                |
| 65 (150)                  | 67 (153)                  | 56 (133)                                |
| 80 (176)                  | 63 (145)                  | 75 (167)                                |
| <-76 (<-105)              | <-76 (<-105)              | -61 (-78)                               |
| 2.5                       | 2.5                       | 2.5                                     |
| 405 (760)                 | 405 (760)                 | 405 (760)                               |
| 100 (56)                  | 100 (56)                  | 100 (56)                                |
| 0.15                      | 0.15                      | 0.15                                    |
| 0.95                      | 0,95                      | 0,95                                    |
| > 1 · 10 <sup>16</sup>    |                           |   |
| > 1 · 10 <sup>16</sup>    | > 1 · 10 <sup>16</sup>    | > 1 · 10 <sup>16</sup>                  |
| 14                        | 14                        | 14                                      |
| 350                       | 350                       | 350                                     |
| 2.6                       | 2.6                       | 2.6                                     |
| V-0                       |                           |   |
| 52                        | 52                        | 52                                      |

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