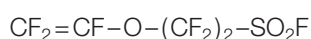


Aquivion® PFSA

Solid, Perfluorinated Superacid Catalysts

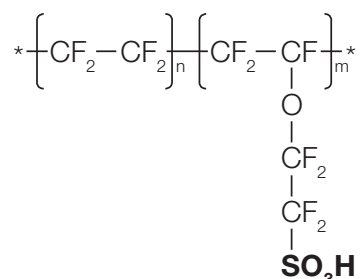
Aquivion® PFSA is a copolymer of tetrafluoroethylene and the sulfonyl fluoride vinyl ether



produced by Solvay Specialty Polymers. This copolymer is typically referred to as the “short side chain (SSC) ionomer”.

In its final form, after $-\text{SO}_2\text{F}$ group hydrolysis, Aquivion® PFSA incorporates the superacid functional SO_3H group:

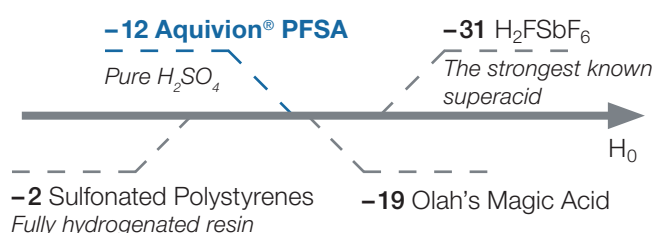
Chemical structure of Aquivion® PFSA



This simple chemical structure imparts a number of benefits for heterogeneous catalysis: highest crystallinity amongst commercial PFSA, chemical inertness and operating temperatures up to 140–160 °C (284–320 °F).

Thanks to the strong electronegative effect of fluorine atoms in its perfluorinated structure, Aquivion® PFSA is a superacid, with a Hammett acidity function of -12 , at par with the value of pure sulfuric acid.

Hammett acidity function scale



Aquivion® PFSA Catalysts at a Glance

- Superacid
- Grades' acid capacities between 1.0 and 1.5 meq/g
- Resistant in highly aggressive environments (low pH, strong oxidants, strong reducing agents, etc.)
- Best-in-class thermo-mechanical stability up to 160 °C (320 °F)
- Adaptable to a variety of chemical reactions
- Adaptable to static or dynamic reactor designs
- Compatible with many organic solvents and water
- Safe and easy to handle
- Easy to recover from fluid phase
- Both ready-to-use powders and precursor grades for the manufacture of specific catalyst particles
- Zero leaching of chlorides, HCl or other trace chemicals

The superacidity of Aquivion® PFSA resin and its high functional group concentration enables this material to be used either alone (self-standing) or as an ingredient of composite structures that are active as heterogeneous catalysts. These encompass a wide range of organic syntheses and related reaction mechanisms already described in public literature.

Examples of Chemical Reaction Mechanisms Promoted by Aquivion® PFSA Catalysts

- Etherifications and Esterifications
- Dehydration
- Friedel-Crafts Acylation
- Carboxylation and Formylation
- Cyclization/Ring-closures
- Nitration of aromatic ring structures
- Multicomponent reactions

Aquivion® PFSA dispersions (–SO₃H form) **for catalytic surface coatings** are suitable for catalyst immobilization on various inert supports, surface coating or for use as homogeneous catalyst in multiphase reaction environments.

Grade*	Total Acid Capacity [meq/g]	Polymer Concentration [w/w %]	Solvent System [w/w %]	HSE/Transport Class
D72-25BS	1.35–1.43	25	>99% water	corrosive
D79-25BS	1.23–1.30	25	>99% water	corrosive
D83-24B	1.18–1.23	24	>99% water	corrosive
D98-25BS	0.98–1.06	25	>99% water	corrosive

* Transparent liquids of water-like viscosity below 15 mPa·s (cP)

Aquivion® PFSA pellets (–SO₂F form) **for custom shapes** are suitable for melt-processing into various shapes via extrusion or injection molding. Final forms must be converted to their acid form (–SO₃H) prior to use via a simple, standard chemical treatment.

Grade*	Total Acid Capacity [meq/g]	MFI at 280 °C (536 °F), 5 kg [g/10']	Physical Form
P98	0.98–1.06	3–15	Transparent cylinders
P87S	1.11–1.19	20–50	Transparent cylinders

* Average dimensions: 2.5 mm x 2.5 mm

Aquivion® PFSA (–SO₃H form) **coarsely grained powders** are suitable as a ready-to-use catalyst.

Grade	Water Content [w/w %]	Total Acid Capacity [meq/g]	Physical Form
PW79S	5	1.23–1.30	White powder
PW87S	5	1.11–1.19	White powder
PW98	5	0.98–1.06	White powder

Health, Safety and Environment

Aquivion® PFSA dispersions, pellets and powders are not harmful if used and handled according to standard processing procedures (see for example the “Guide to the Safe Handling of Fluoropolymer Resins” issued by the Society of the Plastics Industry). If handled inappropriately (e.g. overheated for an extended period of time) these materials may release harmful toxic chemicals such as, for example, hydrogen fluoride or carbonyl fluoride. Aquivion® PFSA dispersion grades are classified as a hazardous material subject to transportation regulations (ADR, IATA, IMDG). Please refer to the corresponding Safety Data Sheets (SDS) for more information on handling and safety.

Packaging, Shipment and Storage

Aquivion® PFSA pellets and powders are delivered in standard polypropylene bottles and drums. Products should be kept closed in their original packaging.

Aquivion® PFSA dispersions should be stored away from direct sunlight and other sources of heat or irradiation. Containers should be kept tightly closed to avoid water evaporation.

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