



West



Jour Fix - Kurzvorstellung AGC Inc.

April 17, 2023

AGC Chemicals Europe, Ltd.

Claus-Peter Keller

Your Dreams, Our Challenge

Introduction AGC Inc.



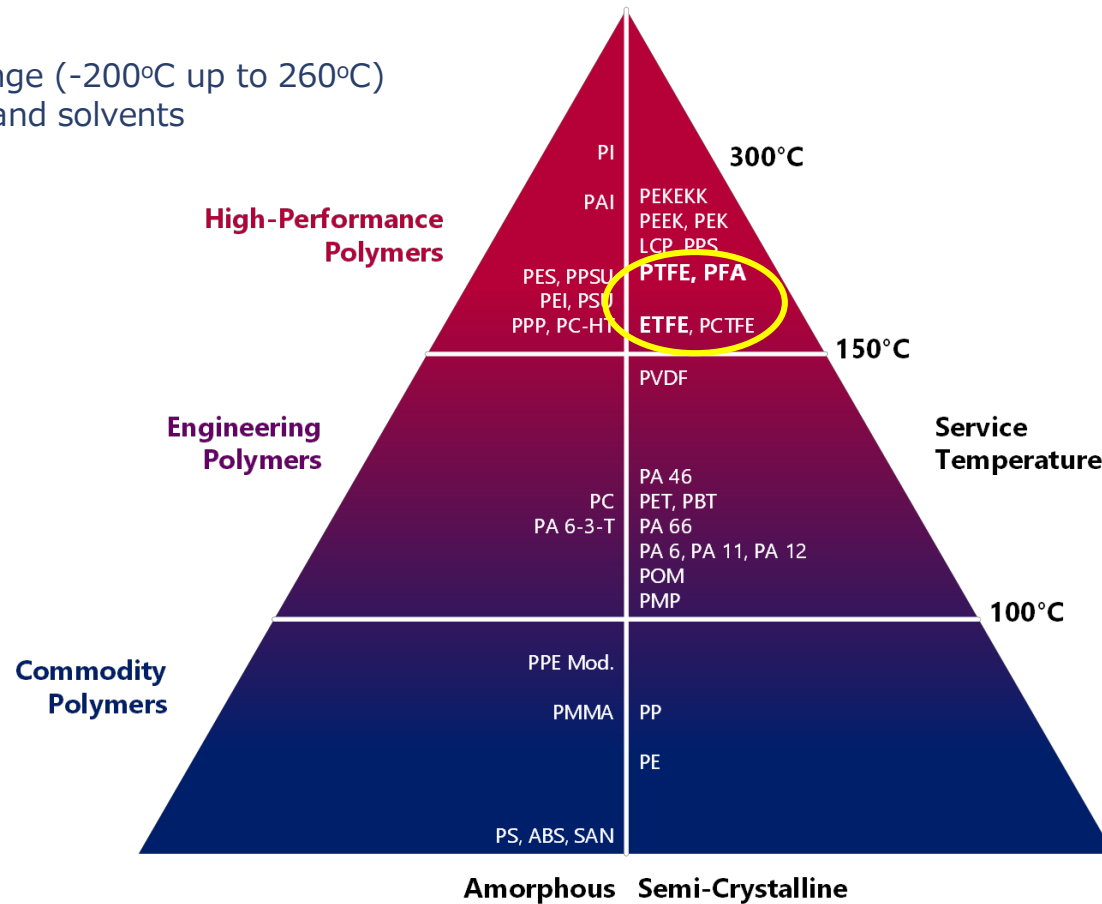
ETFE fluoropolymer architectural film

- Japanese company founded in 1907
 - HQ Tokyo – global presence
 - Founded as Asahi Glass Company – today AGC Inc
 - Today globally leading in float glass
 - 53,200 employees
 - Revenue 11,25 billion €
- AGC in glass, materials and chemicals
 - 51% glass
 - 18% electronics + ceramics
 - 31% chemicals **incl. fluoroproducts**

Fluoropolymers are high performance polymers

Typical Characteristics

- Heat resistance – over wide temperature range (-200°C up to 260°C)
- Chemical resistance to almost all chemicals and solvents
- Permeation resistance
- High folding endurance (MIT flex life)
- Non-flammability
- Low dielectric constant
- Low friction
- Non stick
- Weather resistance

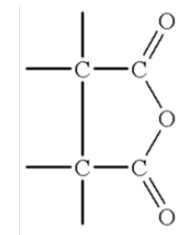


AGC's expertise for CF RTP and multi-material solutions

ETFE + PFA functional fluoropolymers (20 years experience)



Example:



MAH (maleic anhydride)
in polymer chain

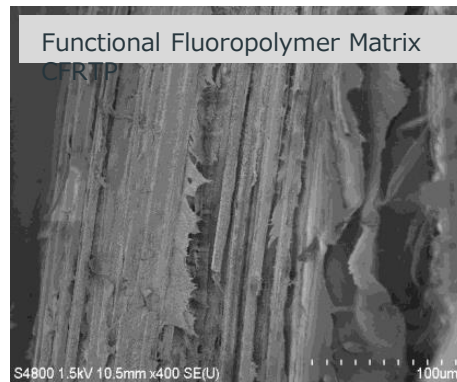
covalent bonding to fibres and other substrates (polymers, metals, etc.)
with reactive groups such as epoxy-, amino-, silane- or hydroxyl

Allows excellent blending as additive into thermoplastics

Development focus on...

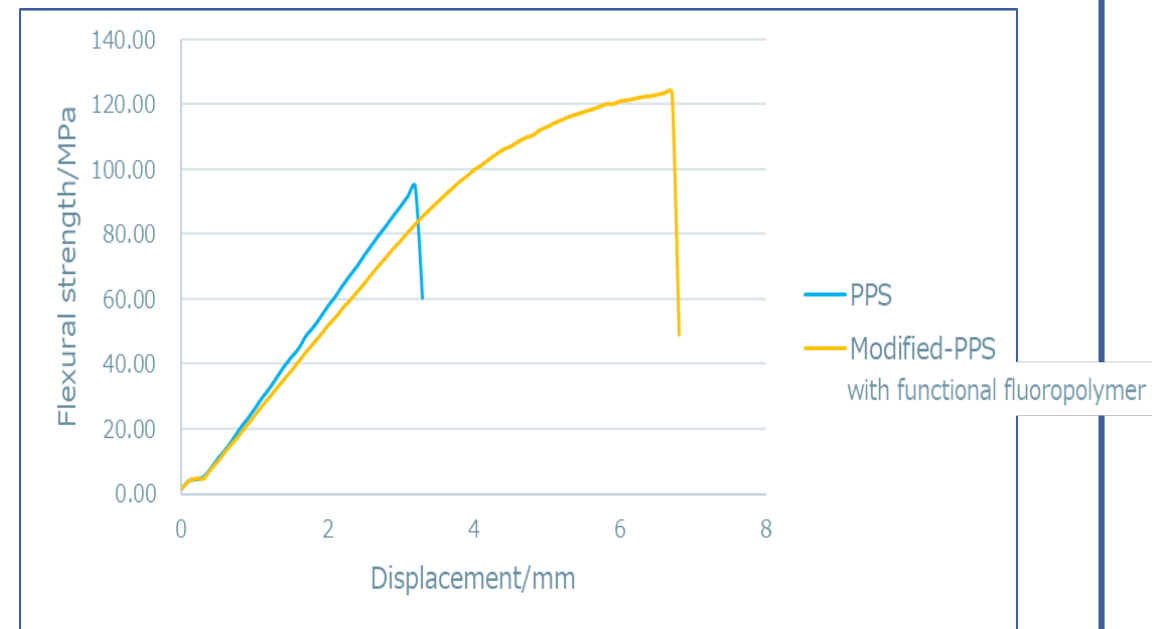
...fluoropolymer UD tapes

- pure functional fluoropolymer matrix
- Superior chemical resistance
- Fibre-matrix adhesion -> improved mechanical properties



...impact modified high temp matrix polymers

- with functional fluoropolymer additive
- improved stress-to-strain → reduced cracking
- For structural components



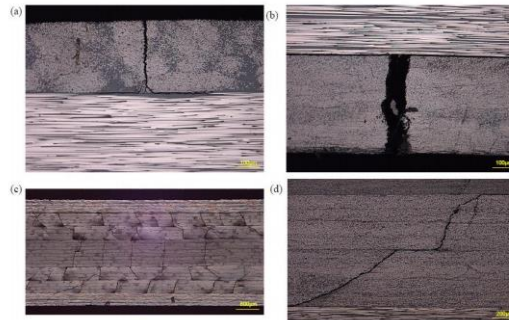
Development focus on...

...innovative CFRTP H2 tank technology

- with functional fluoropolymer additives
- reduced cracking -> improved permeability



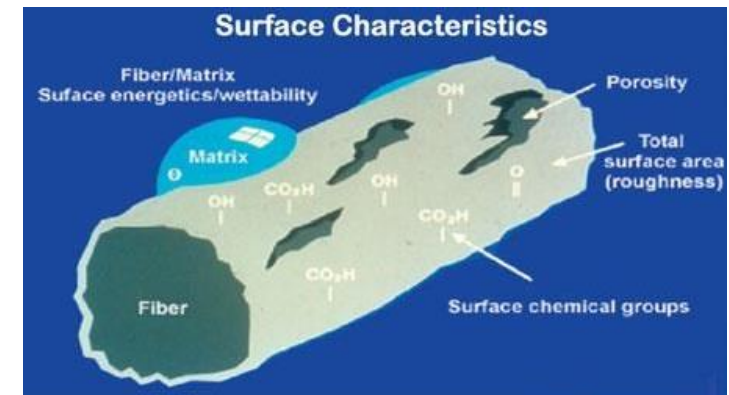
Picture for illustration purpose
Reference: Composites World



Pictures for illustration purposes:
Reference: David M. Grogan; Damage and permeability in linerless composite cryogenic tanks, National University of Ireland, September 2015

...high temperature fibre sizing

- with funct. fluoropol. dispersion
- PEEK, PPS, etc. matrix

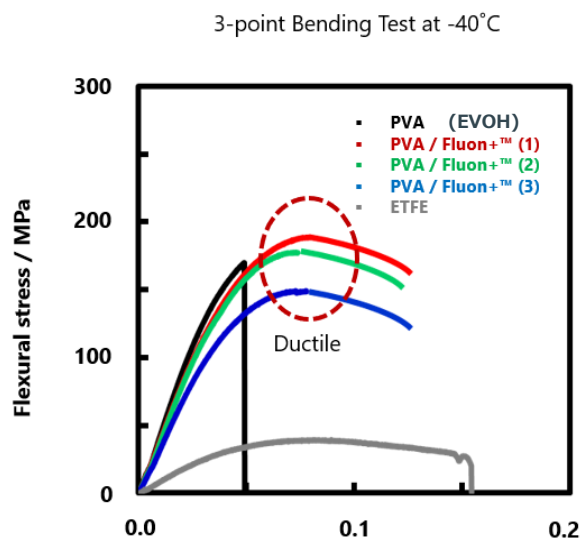


Picture for illustration purpose
Reference: Wikipedia

Development focus on...

...stress to strain improvement

- Blends using functional fluoropolymer
- Improved low temp. performance



Adding Fluon+™ increase the toughness of the base polymer to change the fracture behavior from brittle to ductile.

...improving thermoplastic barrier and matrix polymers

Material	Hydrogen Resistance (*1)	Hydrogen Permeation (*2)	Low Temp. Properties
HDPE	Poor	27000	
PFA	Poor	26700	Excellent
ETFE	Poor	13000	Excellent
PA-6 / PA-6T (PPA)	Fair	4300 - 745	Poor
EVOH / Fluon+™ blend	Excellent	431	Good
EVOH	Fair	287	Poor

(*1) Blister after 24hrs exposed under 90 MPa

(*2) Typical value (cc-20mm/m² day atm at 40°C)

AGC Chemicals / H2 Polymer Liner

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pitch event CU Nord

Have idea -Looking for consortium



Fact sheet:

Short description of project:

Idea

Main topic	Novel H ₂ Tank Liner Compound
Industry	Automotive / Transportation
Technology	Low temperature polymer blend (PA/EVOH/ETFE)

- Seeking partners with a need for low temperature polymer liner material
- Benefit: EVOH blend with improved low temperature ductility, reduced microcracking and blistering
- Tested at -40°C and 90MPa

Offer competence:

Looking for

- Functional high performance polymers and compounds
- Intense use in automotive / aerospace wire+cable + fluid handling
- Polymerization/ compounding/ film extrusion competence
- Low extractable leaching fuel lines
- Other: AGC is a leading in ion-exchange membranes

Looking for consortium:

- Consortium / partners with expertise in H2 tank design and manufacturing
- AGC R+D internal material tests demonstrate superior performance

**Seeking contacts for developement of novel CFRTP
and multi material solution in Europe**

**R+D centres in Japan and US
Co-operation with European Institutes**

**AGC is a leading manufacturer of PEM membranes
for H2 elecrolysis resp. fuel cells
Member of European Hydrogen association**

Thank you for your attention!

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