

ARKEMA

CHEMICAL
PROCESSING
SOLUTIONS



→ THE WORLD PRODUCES
**2.8 MILLION TONS OF
HIGHLY CORROSIVE HCl** EACH YEAR

To foster the progression and safety of the CPI market there is a need for extreme chemical resistance and long-standing performance paired with high temperature performance.



1

Overview

CPI applications and relevant chemicals

Pulp & Paper

Bleaching
chemicals

Metal Preparation

High
temperature
acids

Petrochemicals

Alkylation acids,
hydrocarbon
mixtures

Food & Beverage

FDA listing,
steam cleaning,
acidic foods

Waste Water

Chemical
mixtures,
outdoor
exposure

Mining

High abrasion &
chemicals

General Chemicals

pH <1 to 13.5

Semi-Conductor

High purity
water, acids,
ozone

Pharmaceutical/ Biotech

Ozone, steam
cleanable, FDA
acids

Plenum Pipe

Acid waste
drainage

Chemical processing ≠ easy

EXTREME →

Temperatures

Regulations

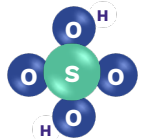
Corrosion

Chemicals

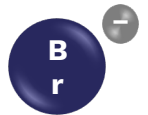
Hydrochloric acid



Sulfuric acid



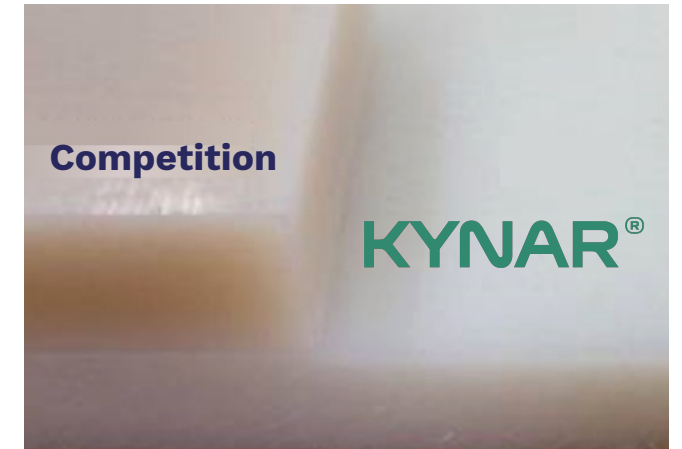
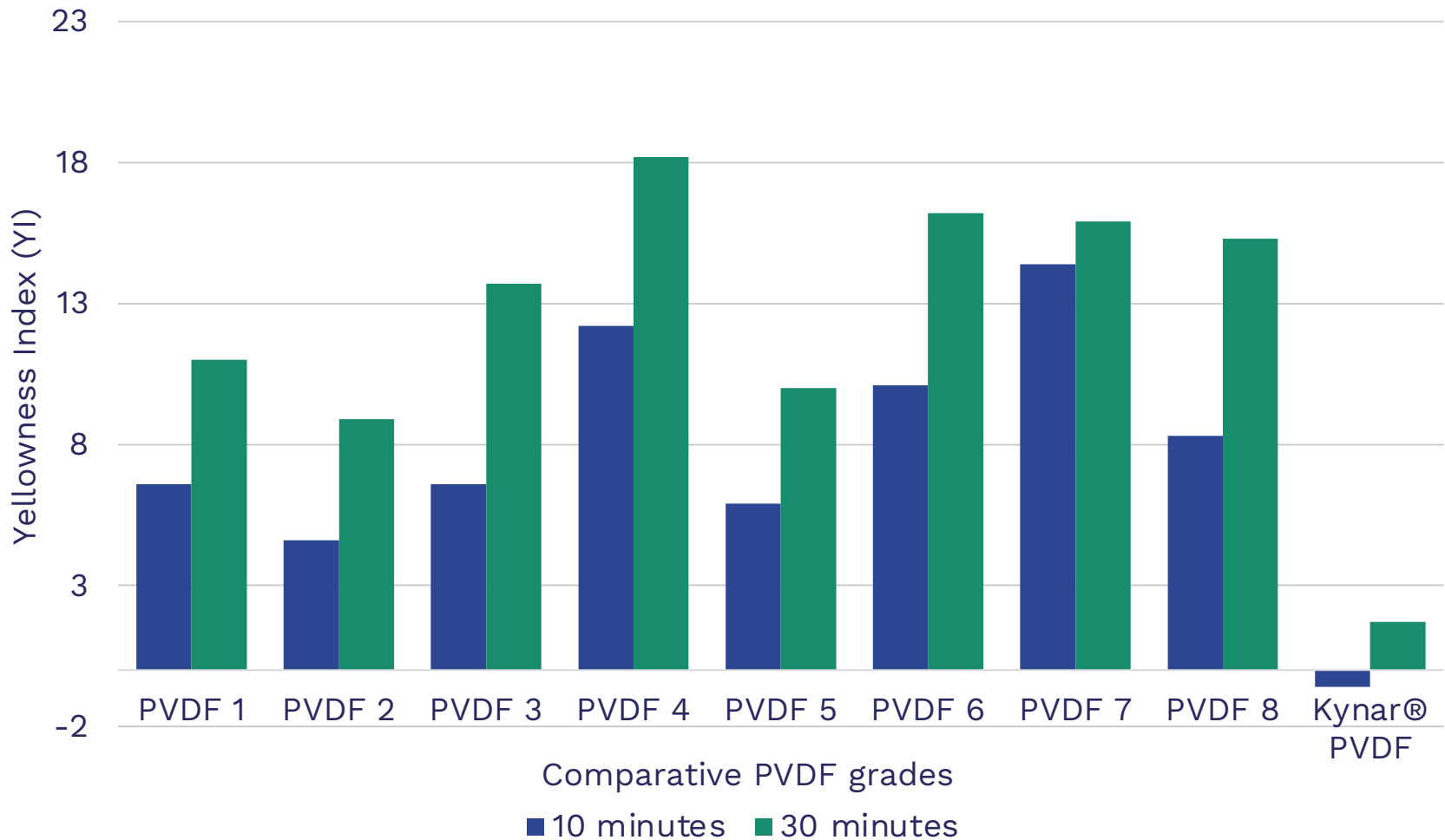
Bromide



**Maintenance is costly
→ both time and money**

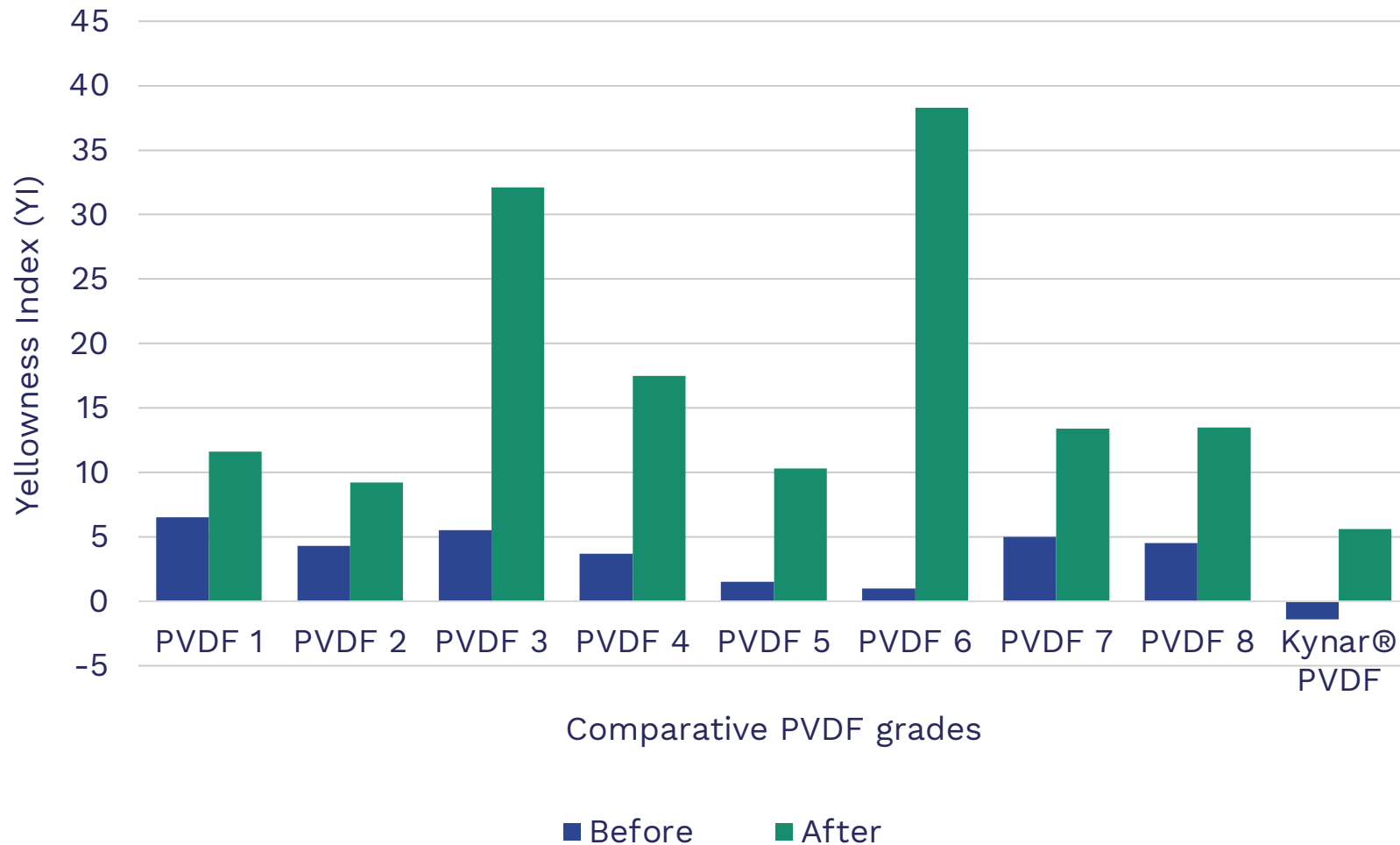
Performance starts at processing

Yellowness after molding of PVDF plates at 230°C



Retention of whiteness

Whiteness of plaque before/after 990h at 130°C



Chemical exposure – whiteness retention

Extrusion of thick plates

KYNAR®



7 days in 96% H₂SO₄ at 50°C

KYNAR®



7 days in 37% HCl at 50°C

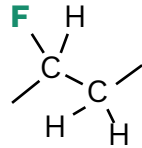
KYNAR®



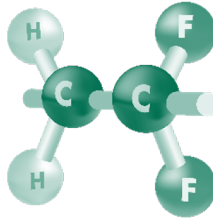
Many fluoropolymers – one standout

Homopolymers

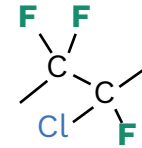
PVF



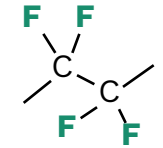
PVDF



PCTFE

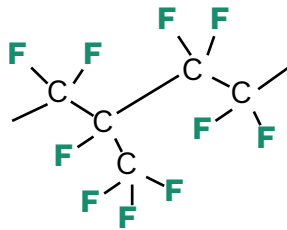


PTFE

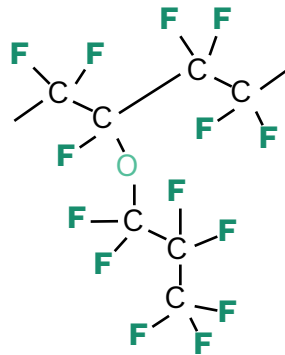


Copolymers

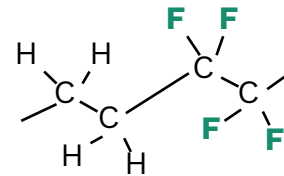
FEP



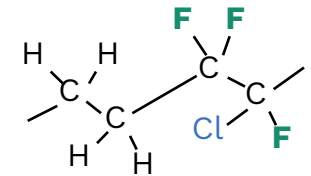
PFA



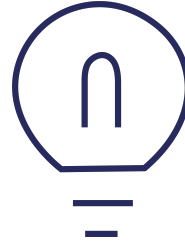
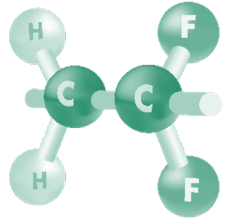
ETFE



E-CTFE



Many fluoropolymers – one standout



PVDF has the best balance of mechanical properties and melt processability among all the fluoropolymers

	PVDF	PTFE	PFA	FEP	ETFE	ECTFE	PCTFE
Density	1.79	2.18	2.15	2.14	1.76	1.68	2.13
Tensile yield strength (MPa)	48	14	19	15	28	31	40
Flexural modulus (MPa)	2000	550	600	620	1100	1700	1500
Dielectric constant	8	1.9	1.9	1.9	2.2	2.5	2.6
LOI %	44	90	90	90	30	60	90
Decomposition (°C)	340	400	400	~300	360	~320	320
T_m (°C)	170	342	305-307	275-295	270	240-247	214

Chemical exposure – whiteness retention



7 days



50°C

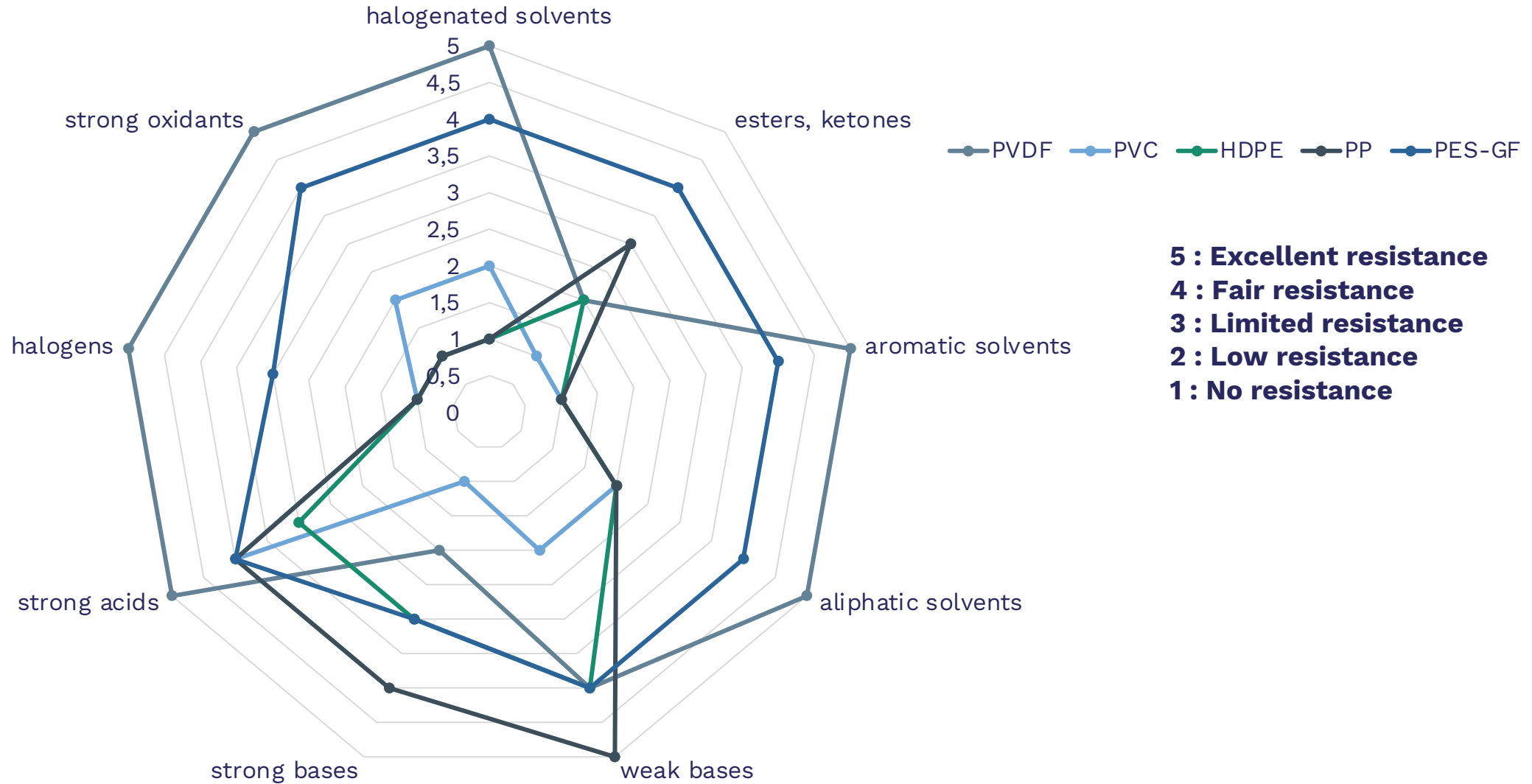
Control

69.8% HNO₃

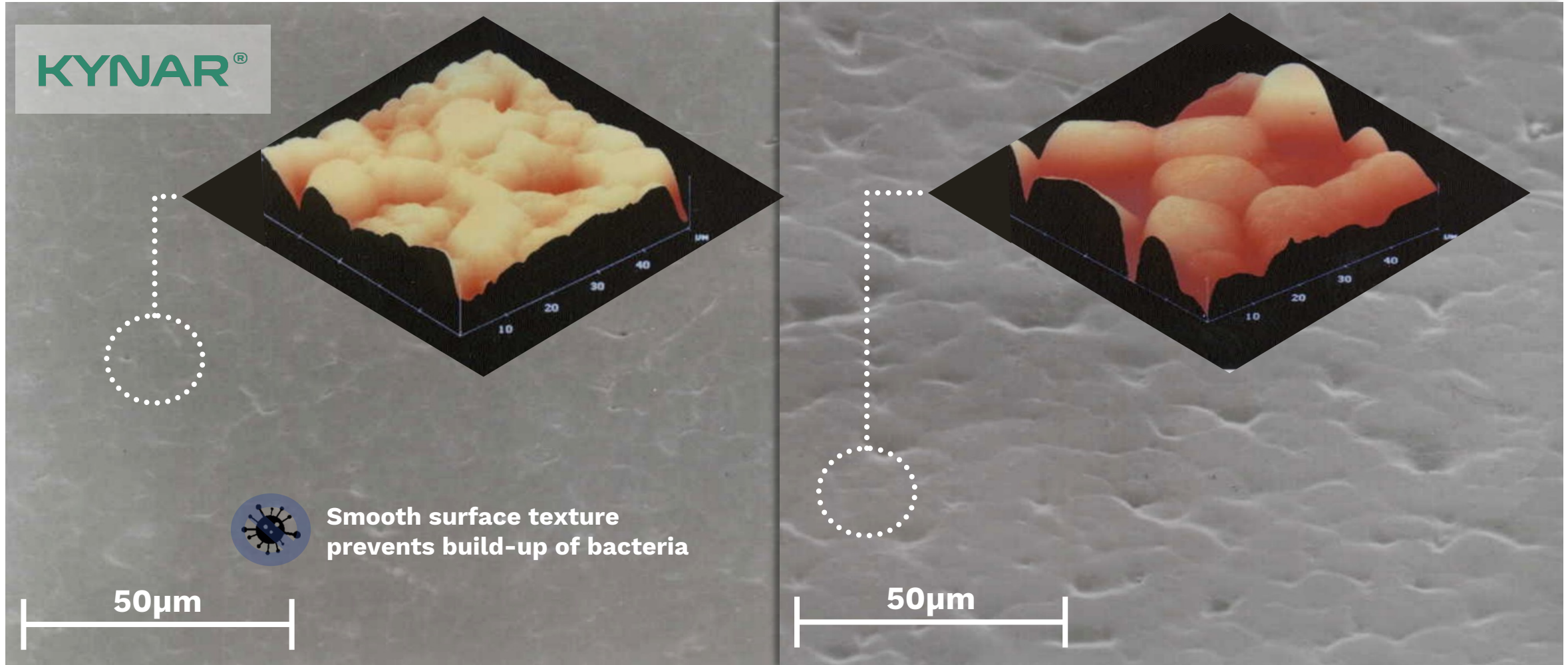
96% H₂SO₄

37% HCl

Kynar® in CPI applications : chemical resistance 93°C



Reduced bacteria & microorganism build-up



CPI – by the application

Stock Shapes (rods, sheets)

Kynar® 1000HD

Kynar® 740

Tubing, Molding, Plenum Pipe

Kynar® 1000HD

Kynar® 9000HD

Kynar® 740

Kynar® 720

**Tower Packing,
Filters,
Compounds**

Kynar® 9000HD

Kynar® 720

For lower viscosity: **4000 series** and **6000 series**

Kynar® UHM glass filled grades available

EXTREME WHITENESS AND PERFORMANCE

EXCELLENT PERFORMANCE BALANCE

Kynar® PVDF vs. suspension PVDF

Property	Kynar® PVDF	Suspension PVDF
Melting Point	167-172°C	170-180°C
HDT (0.45MPa)	145°C	156°C
Rockwell	110-115	115
Mechanical Properties	Equivalent	
Electrical Properties	Equivalent	
Heat Stability	High	Decomposition at lower T
Melt Processability	Good	Surface roughness
Purity	High Purity	Slightly lower
Chemical Resistance	Good	Good but color change

Kynar® ADX for powder coatings

Allows primer less powder coating (direct adhesion to metals) after standard surface preparation

Can be used easily in the standard application processes:

- Dip coating in fluidized bed
- Electrostatic spraying
- Hot spraying

Product range:

- Kynar® ADX 281 :
 - PVDF copolymer
 - Natural version ⇨ aspect, easy identification/differentiation

Strong experience of Kynar® PVDF in CPI applications

- Similar chemical resistance as regular Kynar® PVDF
- Durable adhesion ensured by thickness enough and low permeation of fluids in contact

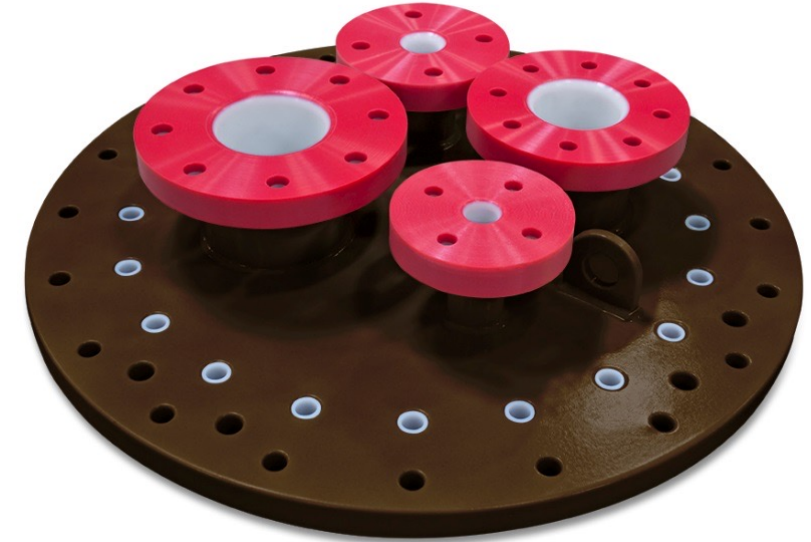


Image courtesy of SALCO PRODUCTS

Melt Point (°C)	Flex Modulus at 23°C (Mpa)	Characteristics
156	1000	Thermal cycling flexibility

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