



International Flemion Seminar 2012

The New Flemion F-808x Membrane Generation

(Introduction
Flemion F-808x-series)

AGC Chemicals
ASAHI GLASS CO., LTD.

June, 2012

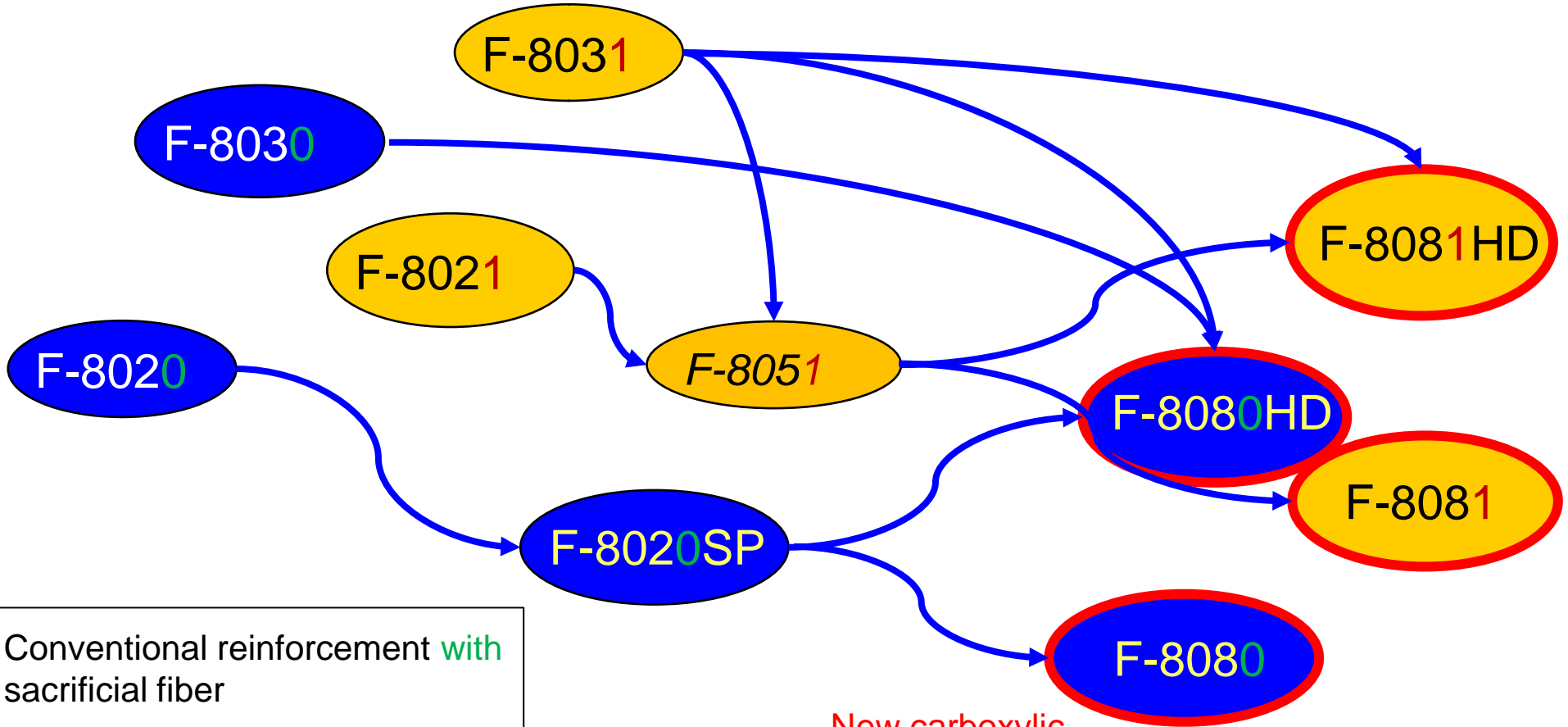
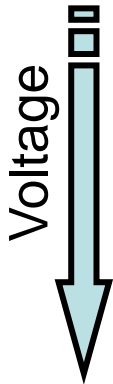
AGC Chemicals
Chemistry for a Blue Planet



- Low Voltage
- Stable Performance
- High Resistance against Impurities

2000

2011



New carboxylic polymer with uniform channel design

Conventional reinforcement with sacrificial fiber

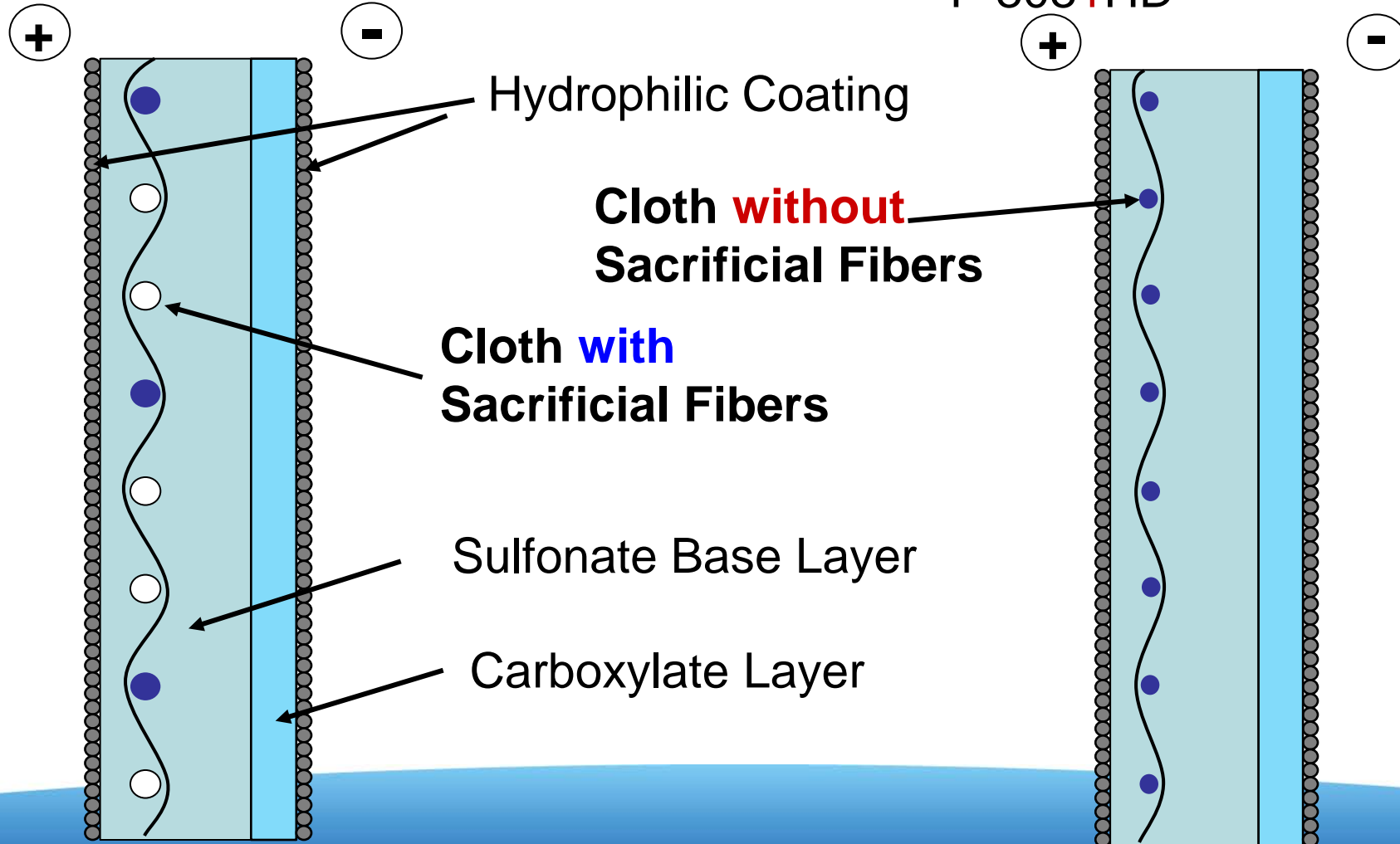
Tough reinforcement without sacrificial fiber

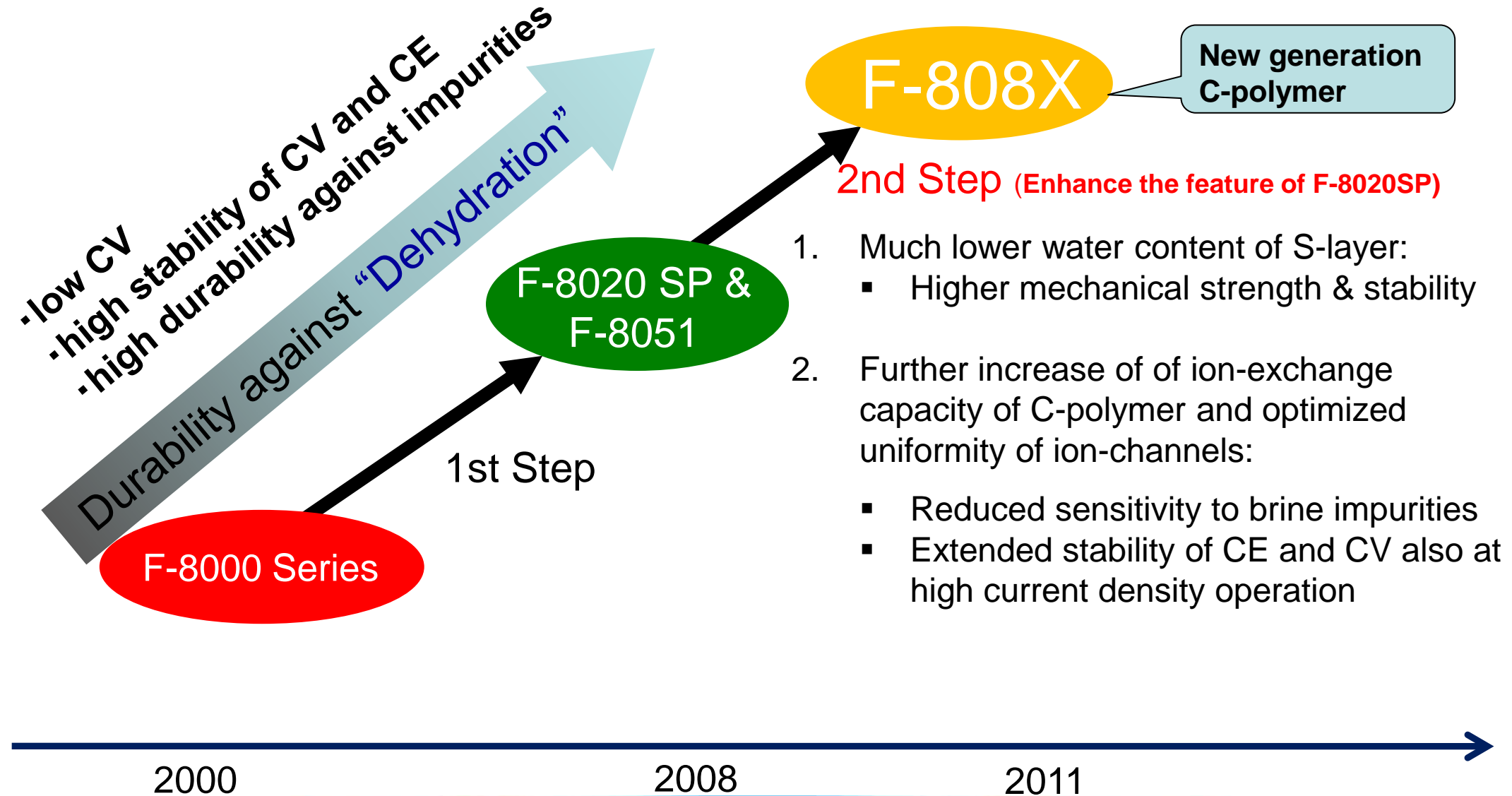
With Sacrificial Fibers

F-8020 / F-8020SP / F-8080 /
F-8080HD

Without Sacrificial Fibers

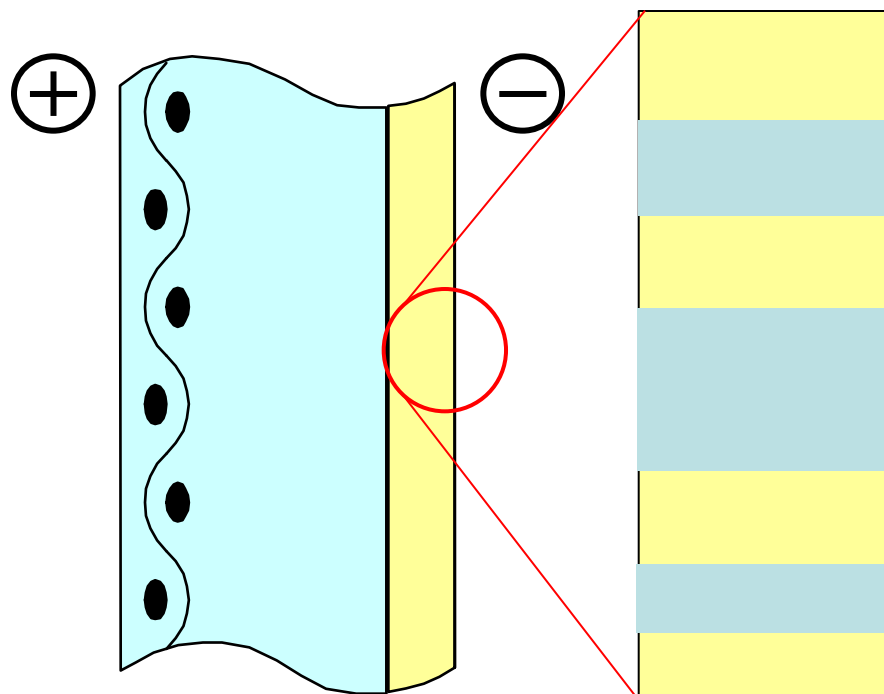
F-8031 / F-8051 / F-8081 /
F-8081HD





█ : Ion channel

Cross section



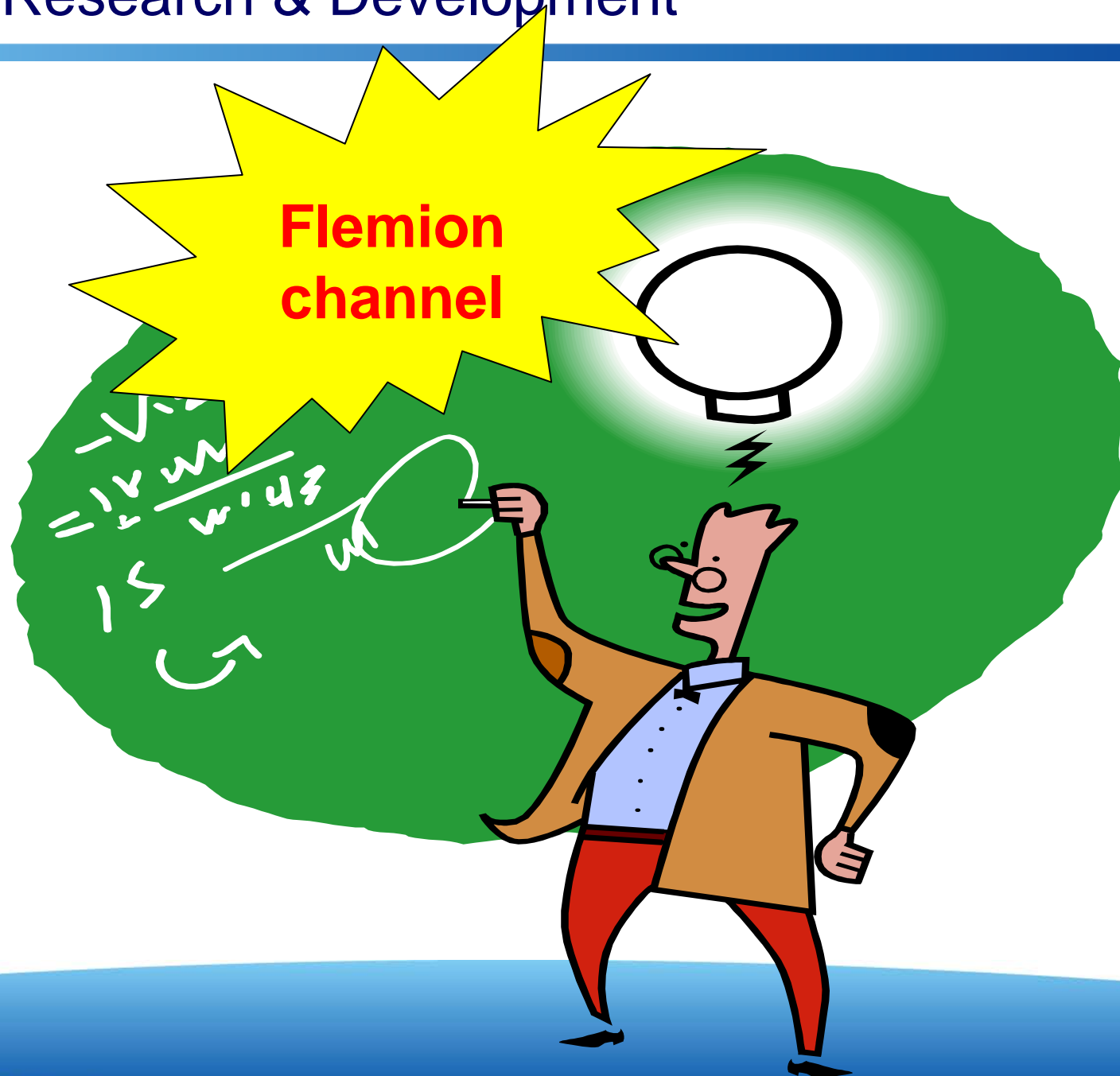
**Dehydrated by:
Stronger brine, caustic,
impurities or other
operating conditions**



Various size of ion channels



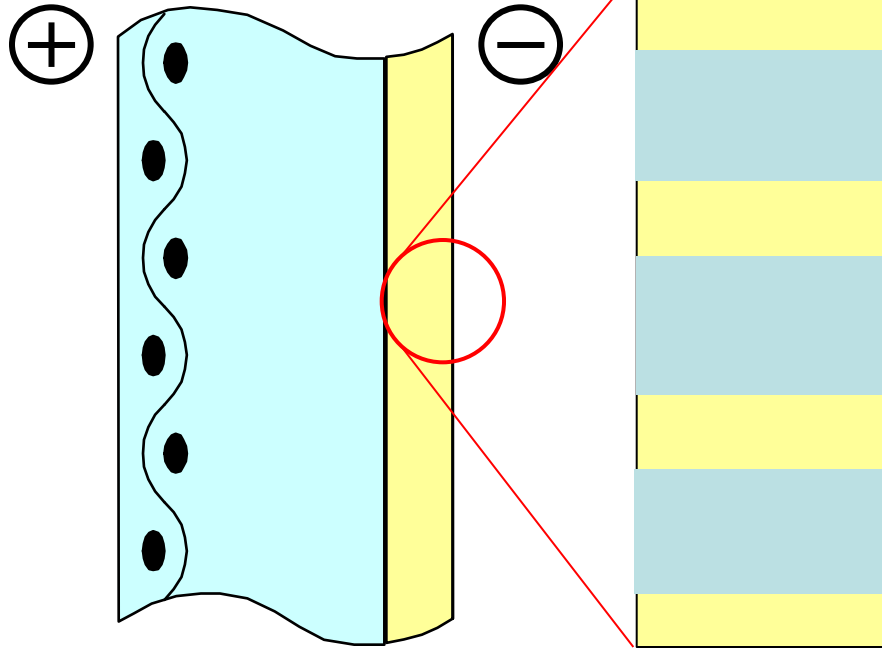
Relatively narrow channel will lose the function in strongly dehydrated state



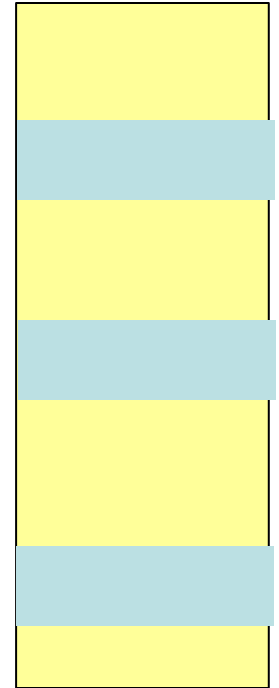
 : Ion Channel

F-808x

Cross section



**Dehydrated by:
Stronger brine, caustic,
impurities or other
operating conditions**



Uniform channel size avoids losing of function in dehydrated stage

Membrane Selection Criteria

High Mechanical Strength / Durability against Deterioration

Voltage

F-8080

- Best Voltage Performance
- Lowest Power Consumption
- High CD-Operation

F-8081

- Low Power Cons.
- High CD-Operation
- High Mechanical Strength

F-8080HD

- Balanced Power Cons.
- Load Shifting Operation
- Lower Cl⁻ in NaOH at Low Load
- Higher Durability against Polymer Layer Deterioration

F-8081HD

- Moderate Power Cons.
- Load Shifting Operation
- Lower Cl⁻ in NaOH at Low Load
- Highest Durability
- Highest Mechanical Strength

Line up of Membranes

Features & properties (Average numbers)

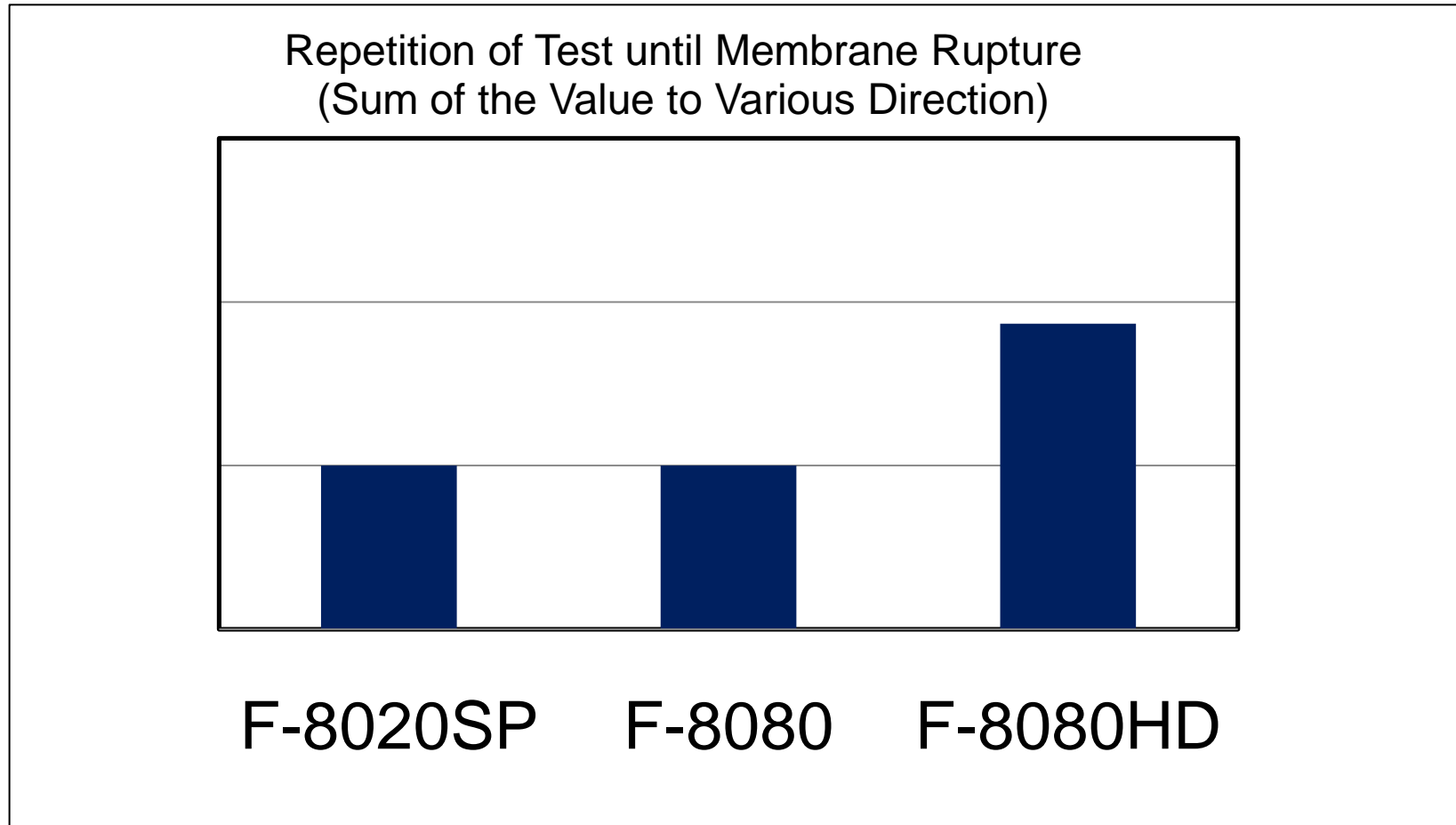
Name	Type	Expected Voltage Difference (mV) at 6 kA/m ²	Cl ⁻ in NaOH	Current Efficiency (expected)	Resistance against Impurities
F-8080	S/P	-60	low	approx. 97%	high
F-8080HD	S/P	-10	advanced	approx. 97%	high
F-8081	P	-20	low	approx. 97%	high
F-8081HD	P	+30	advanced	approx. 97%	high
F-8020 SP	S/P	-30	medium	approx. 97%	medium
F-8020	S/P	0	moderate	approx. 97%	standard
F-8030	S/P	+50	moderate	approx. 97%	standard
F-8051	P	0	moderate	approx. 97%	medium
F-8031	P	+70	moderate	approx. 97%	standard

Line up of Membranes

Features & properties (Average numbers)

Name	Tensile Strength (N/cm)	Elongation (%)	Polymer Thickness
F-8080	45	40	slightly thinner
F-8080HD	45	40	thick
F-8081	70	30	slightly thinner
F-8081HD	70	30	thick
F-8020 SP	45	40	standard
F-8020	45	45	standard
F-8030	45	40	thick
F-8051	70	30	slightly thicker
F-8031	65	50	thick

Comparison of F-8020SP, F-8080 and F-8080HD

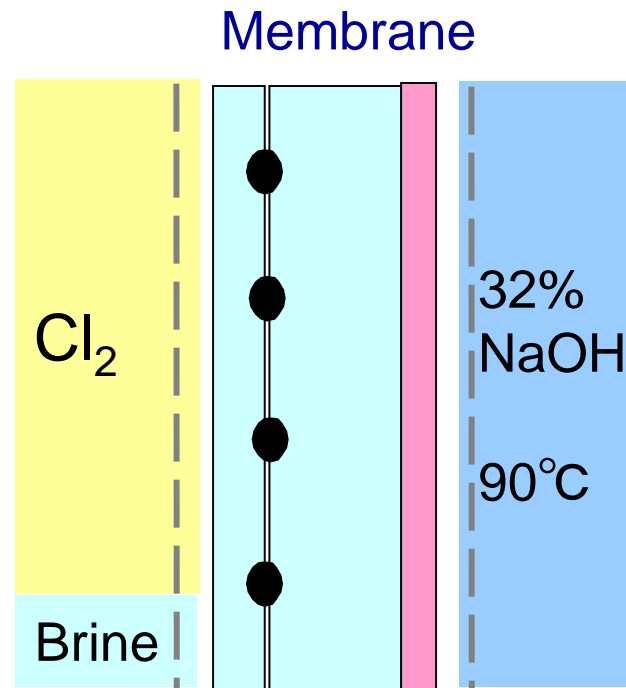


F-8080HD is nearly twice as robust for frequent load as F-8080

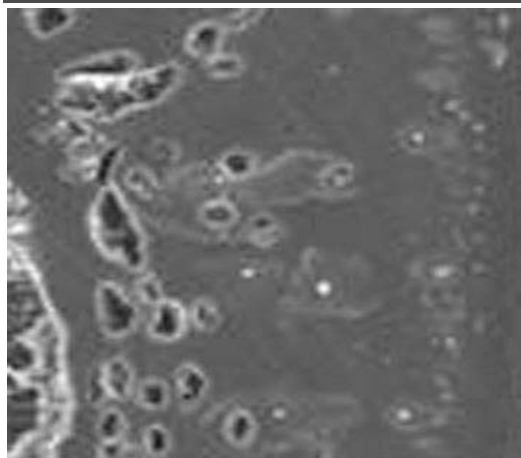
Special Test Conditions for F-8080HD Tests

Cl₂ gas stagnation on anode side and high caustic strength on cathode side. Under these conditions salt crystals may be formed in membrane

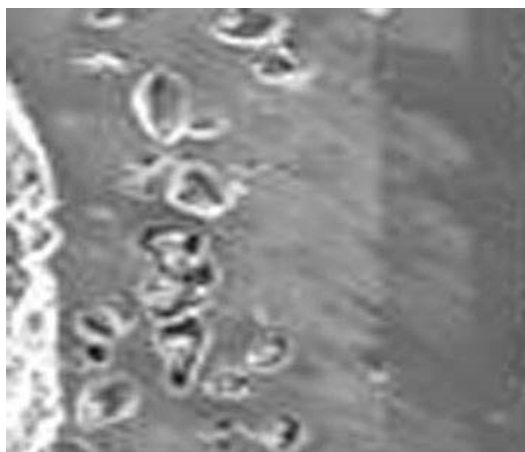
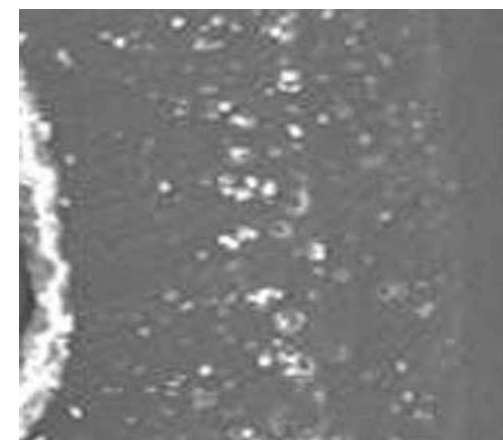
Test Method



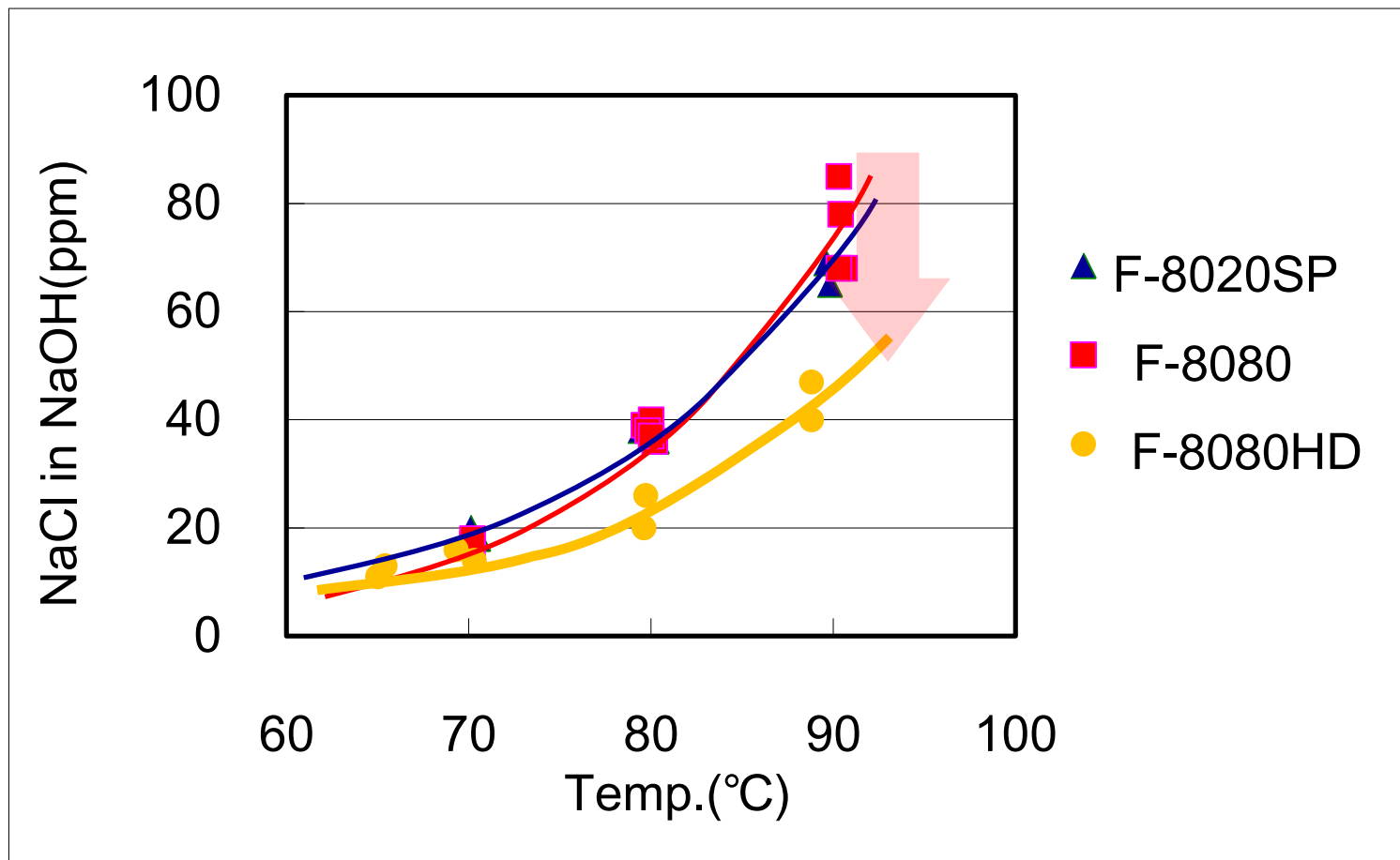
Test for Deterioration by Cl₂ Gas Stagnation

F-8020SP

- F-8080 has same durability for Cl₂ gas stagnation with very low voltage.
- F-8080HD has much higher durability for Cl₂ gas stagnation with lower voltage than F-8020.

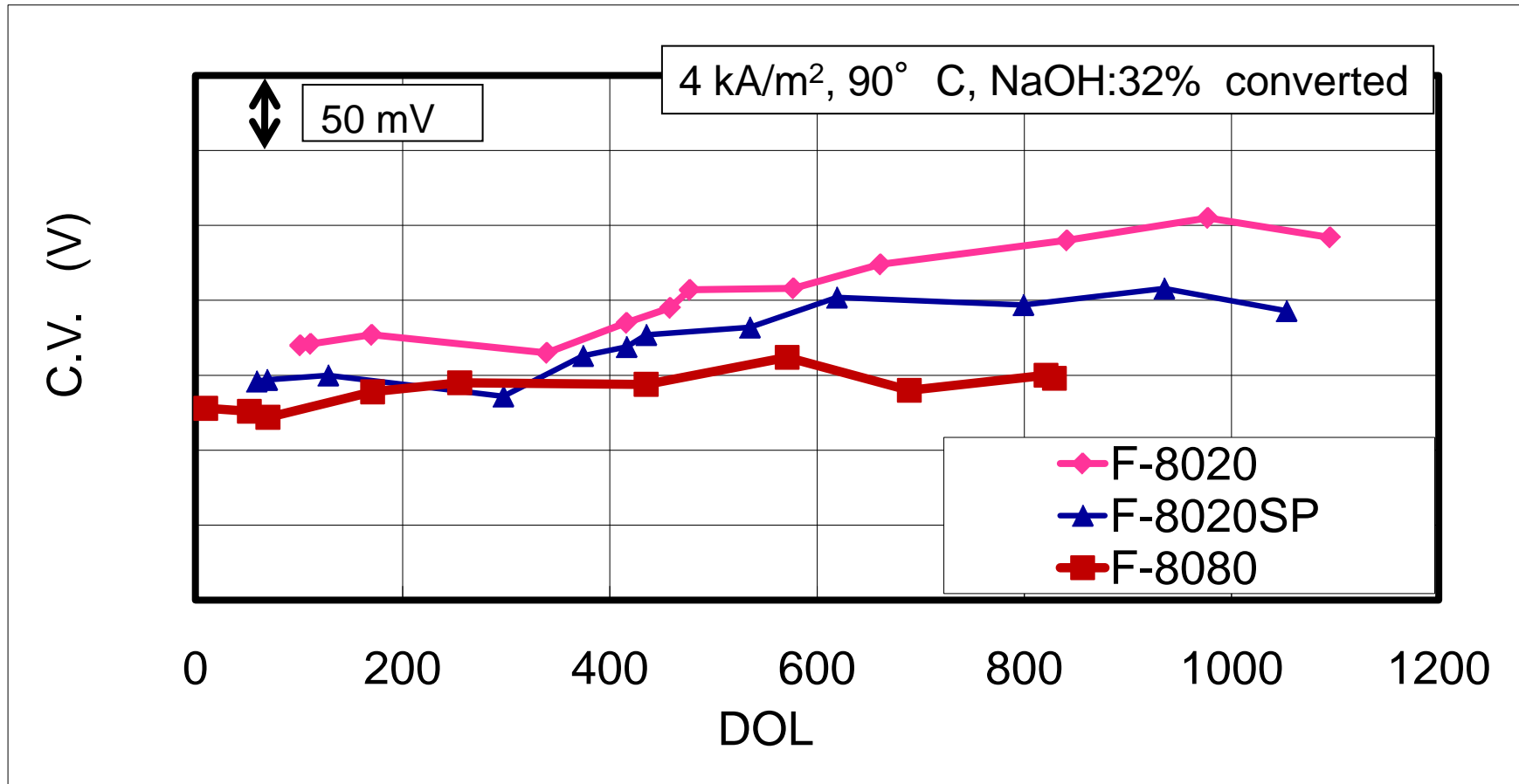
F-8080**F-8080HD**

AZEC-M3 Pilot Cell, 2 kA/m^2 , 32% NaOH

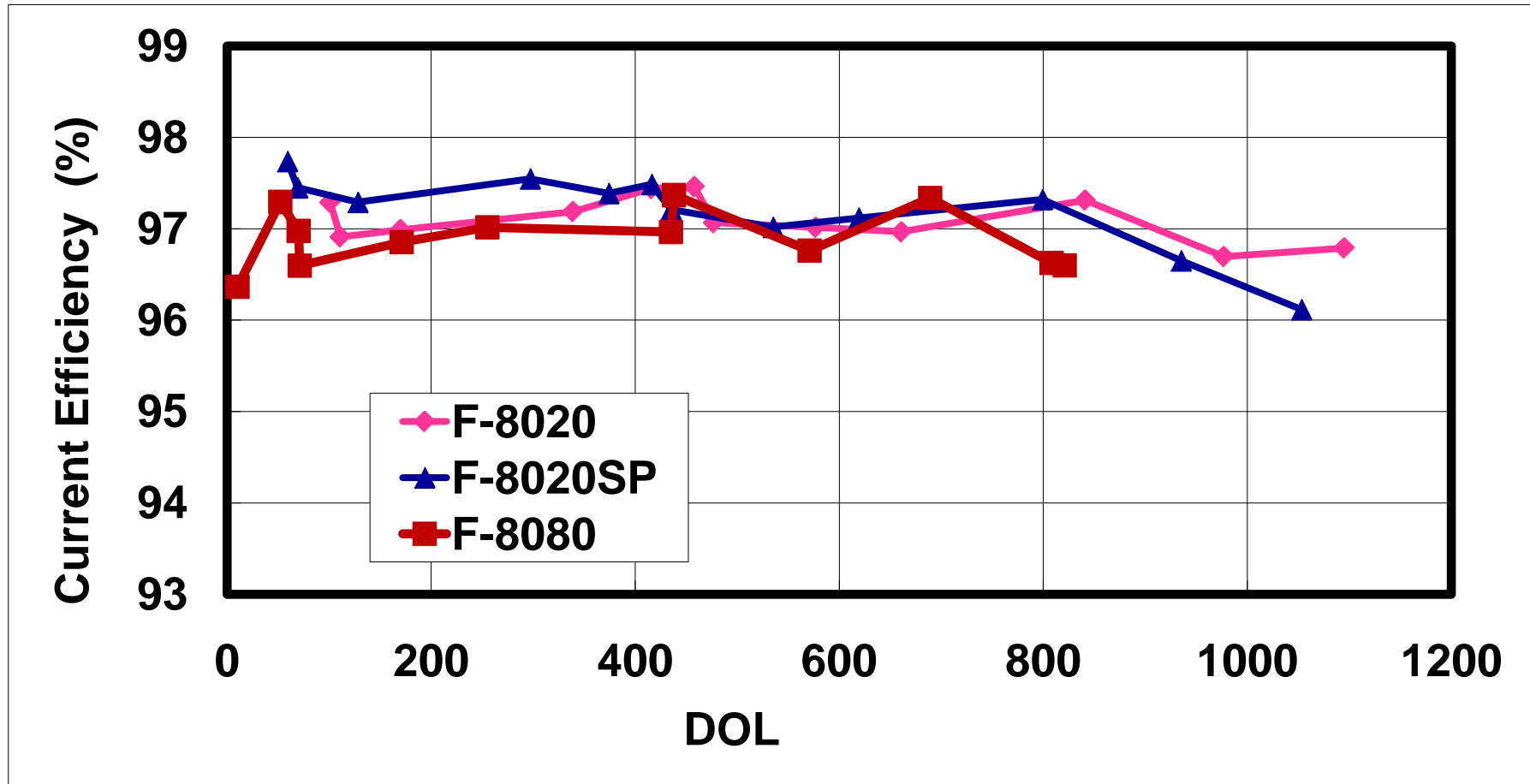


F-8080HD shows lower NaCl concentration in NaOH.

Long Term Membrane Performance with F-8080

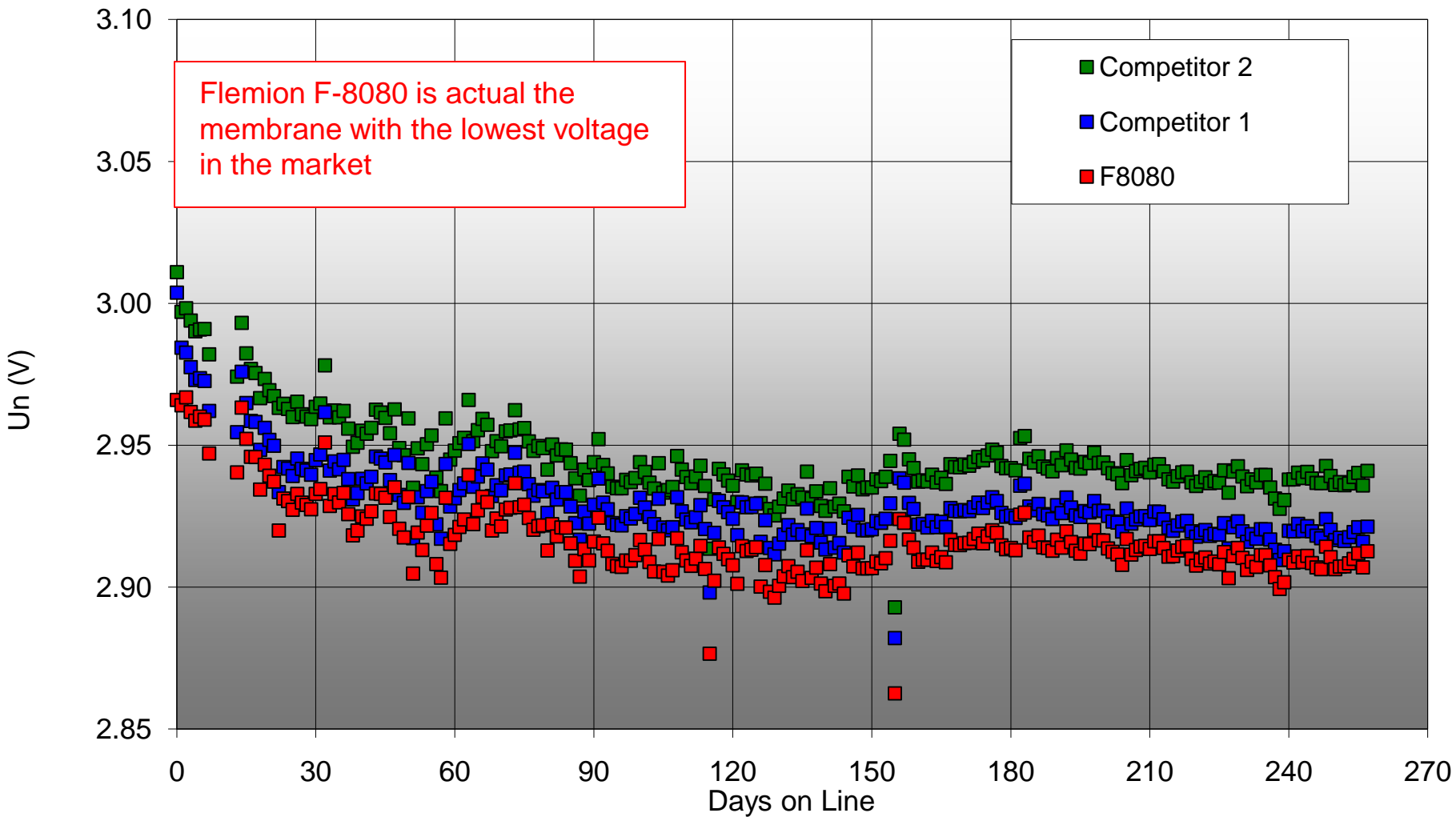


F-8080 shows most stable voltage during two years operation.



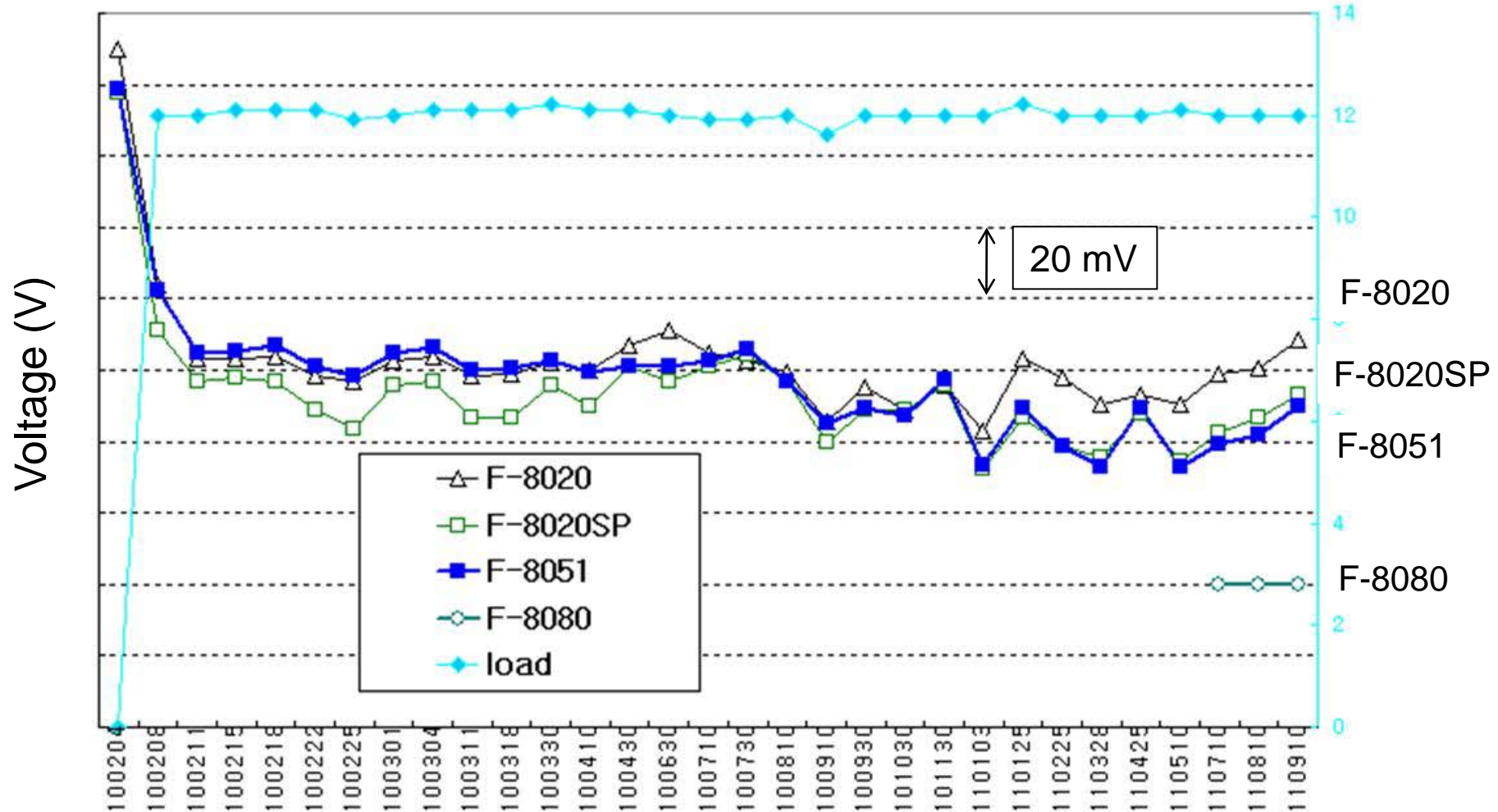
F-8080 has shown approx. 97 % Current Efficiency since more than 2 years.

Customer Performance of F-8080



Customer Performance of F-8080

in AK- NCZ electrolyses (4-6 kA/m²)



F-8080 is 50 – 60 mV lower than F-8020 SP

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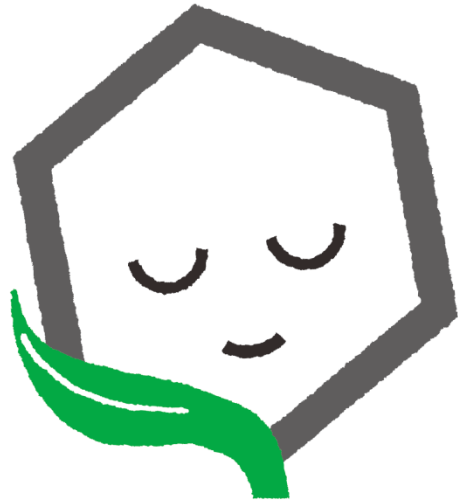
Request	Membrane Type
Lower Power Consumption	F-8080 / F-8081
Higher Current Density	F-8080 / F-8081
Less Impurity Influence	F-8080 / F-8081
Lower Current Density	F-8080HD / F-8081HD
Smaller NaCl in NaOH	F-8080HD / F-8081HD
Fewer Salt Blisters	F-8080HD / F-8081HD
Less Pinching Issues	F-8081 / F-8081HD

Membrane Selection for Different Electrolyser Types

Electrolyzer type	Membrane type
Uhde BM2.7 II	F-8080HD / F-8081HD / F-8081
Uhde BM2.7 III	F-8080 / F-8080HD
Uhde BM2.7 IV / V	F-8080 / F-8081
Bitac / n-Bitac	F-8080 / F-8081 / F-8080HD
CME (DCM)	F-8080 / F-8080HD
BiChlor	F-8080 / F-8080 HD
FM21 / FM1500	F-8080HD / F-8081HD / F-8081
DD88 / DD175	F-8081HD / F-8080HD
OxyTech	F-8080HD / F-8081HD
Lurgi	F-8081HD / F-8080HD
AK FC	F-8081 / F-8081HD
AK NCZ, NCH, NCS	F-8080 / F-8081 / F-8080HD
AZEC F2, M3	F-8080HD / F-8080
AZEC B1 and AZEC iB1	F-8080 / F-8080HD / F-8081HD

Final decision depends on different factors like: power costs, expected lifetime, shift operation, NaOH Specification, etc.

Thank you for your attention



**Chemistry
for a Blue Planet**
AGC Chemicals

私たちは化学の力を通じて、安全、安心、快適で、環境に優しい世の中を創造します。

Create a safe, secure, comfortable and environmentally friendly world with chemical technology.

通过我们的化学技术,来创造一个安全、安心、舒适且环保的世界!