AGC
Your Dreams, Our Challenge

FLEMION™ F-9060 for India's Chlor Alkali Industry: Proven Low Voltage Membrane Enabling Energy Efficiency and Lower CO_2

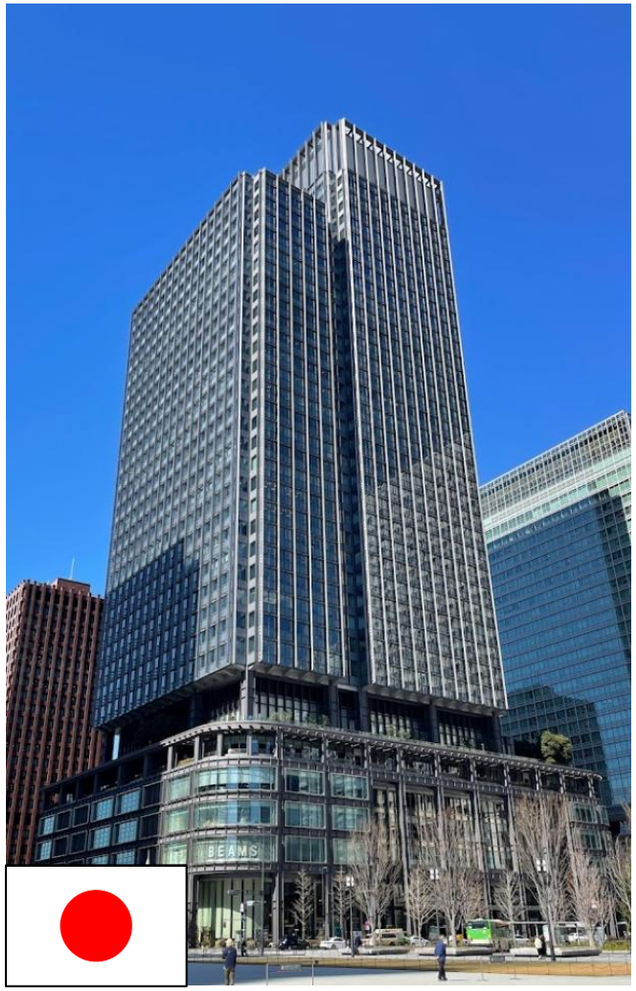
11th AMAI Alkali Industry Conference
11-12th February, 2026
AGC Inc.

CREATION THROUGH SEPARATION FORBLUE™

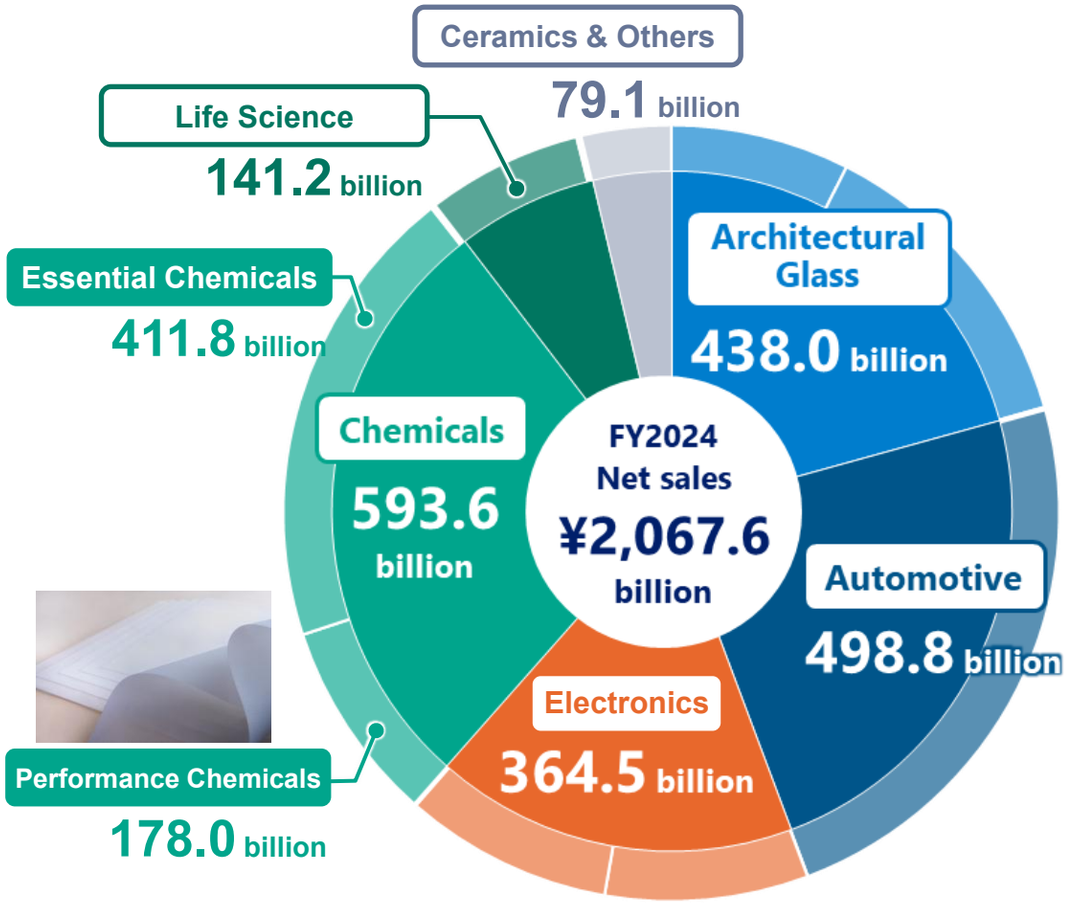
Topics

- Introduction of AGC and FLEMION™
- Actual performance data on F-9060 in commercial electrolyzers
- Cutting-edge technologies achieving F-9060`s performance
- Energy and CO_2 reduction in India

AGC Inc. : Overview



Company name	:	**AGC Inc.**
TSE code	:	**5201**
Established	:	**September 8, 1907**
Representative director	:	**Yoshinori Hirai**
Paid-in capital	:	**¥90.9 billion* ($583 million) ****
Consolidated net sales	:	**¥2,067.6 billion* ($13.3 billion)****
Consolidated no. of employees	:	**53,687***
No. of consolidated subsidiaries	:	**186 companies** (Of which 149 are overseas)*



* As net sales by business are before the deduction of eliminations, the sum of net sales by business does not equal Companywide net sales.
Sales to external customers are used for subsegment sales

* As of end-December 2024.
* * 1 USD = 155 JPY

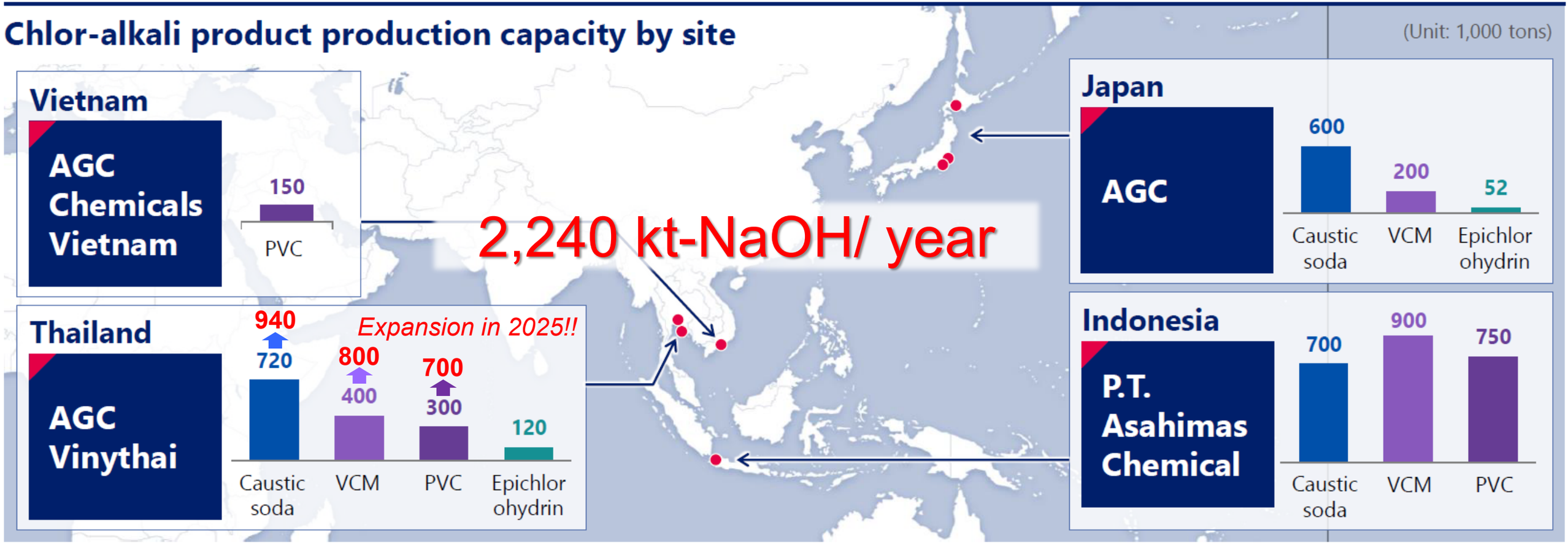
FORBLUE™

AGC Inc. : Leading Chlor-Alkali Producer in SEA

- Expanding business in Southeast Asia and Japan
- Expanding chlor-alkali business in the growing Southeast Asian market

Chlor-alkali product production capacity by site

(Unit: 1,000 tons)



Topics

- Introduction of AGC and FLEMION™
- **Actual performance data on F-9060 in commercial electrolyzers**
- Cutting-edge technologies achieving F-9060`s performance
- Energy and CO_2 reduction in India

Table of Initial Performance in Laboratory Cell

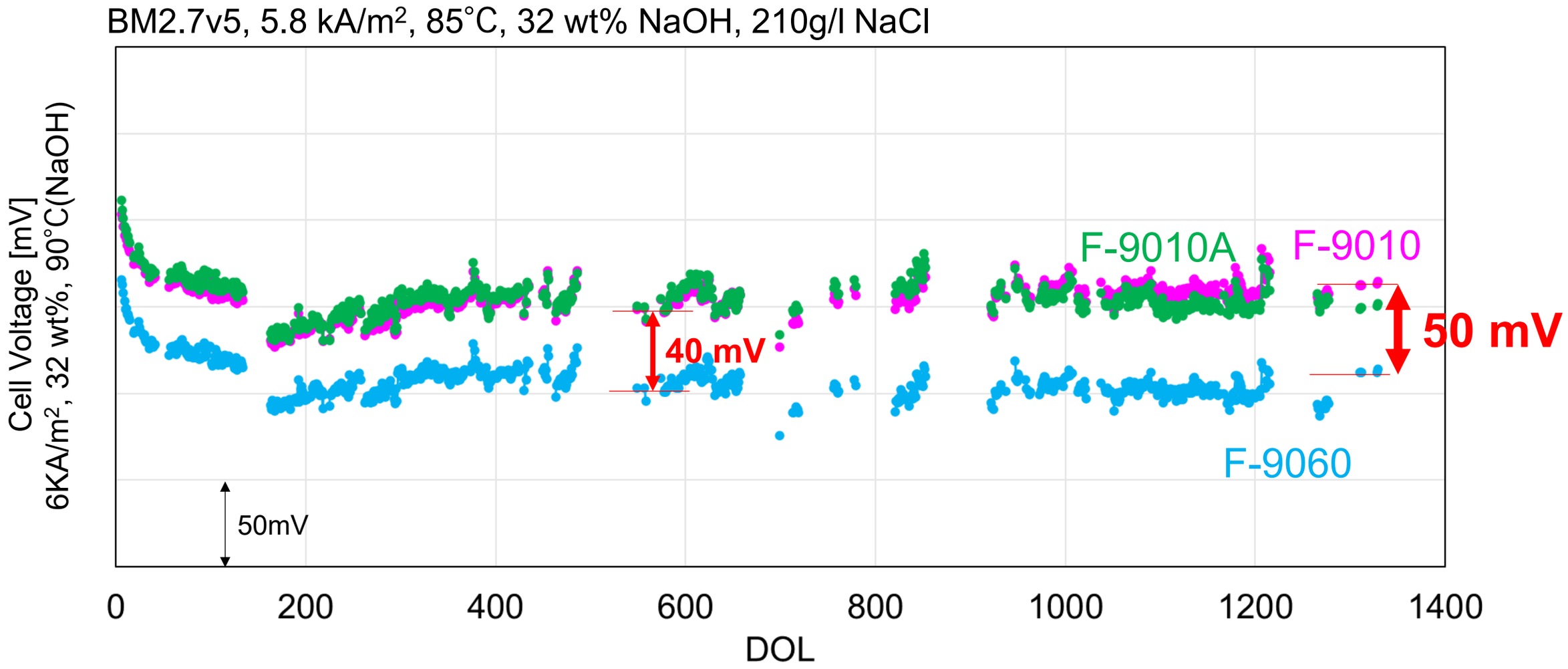
AGC lab cell, 6 kA/m^2, 90 °C, 32 wt% NaOH, 200 g/l NaCl

	CE	⊿CV	Features
F-8080	≧96.0	+50mV	Previous standard membrane
F-8080A	≧96.5	+50mV	Higher CE than F-8080 suitable for zero gap technology.
F-9010	≧96.8	0mV	Standard Membrane suitable for zero gap technology
F-9010A	≧97.0	+20mV	Higher CE than F-9010 with CV increase suitable for zero gap technology
F-9060	≧97.0	-40mV	the lowest voltage & the highest CE suitable for zero gap technology

Discontinued last year

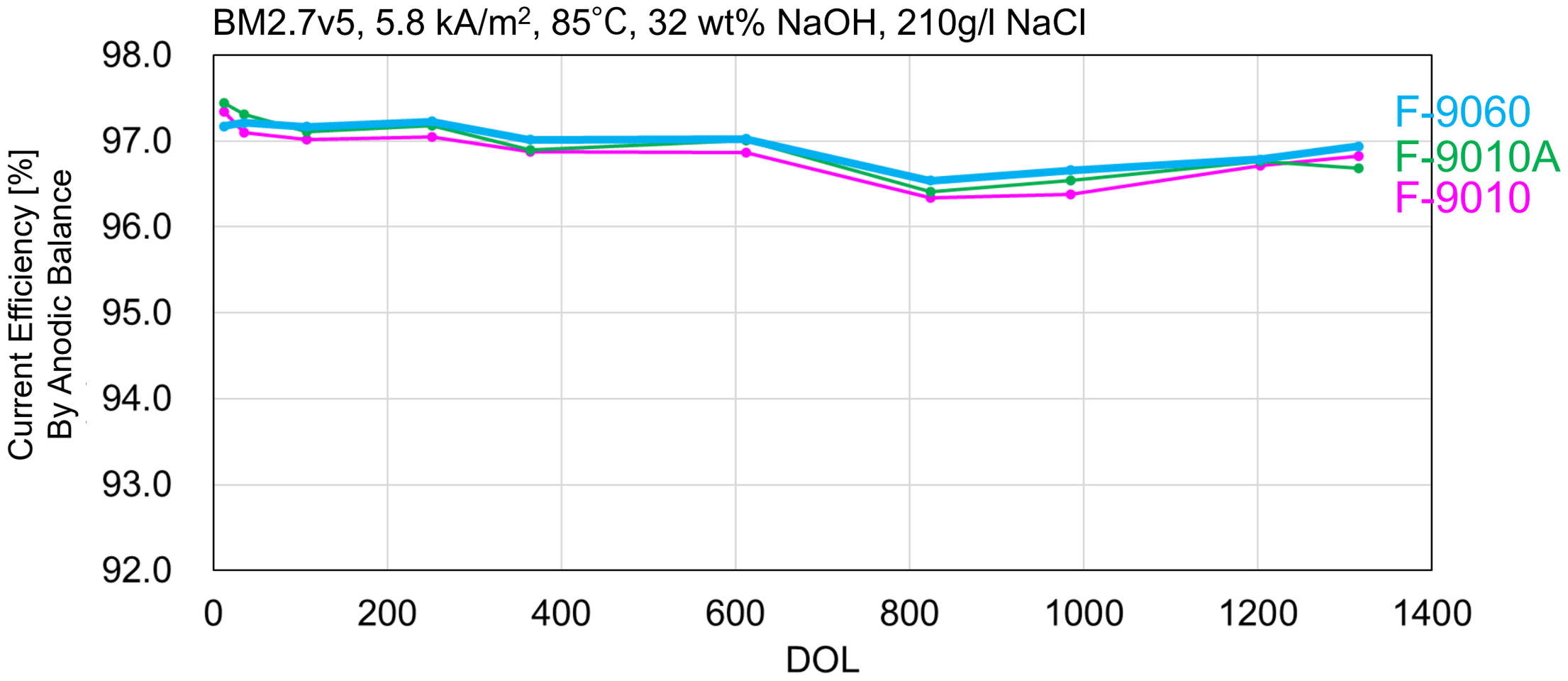
F-9060 has both the lowest voltage and the highest current efficiency.

Voltage of F-9060 in Commercial Plant A (AGC Group)



F-9060 holds stable, low voltage in AGC's commercial plant for about 4 years.

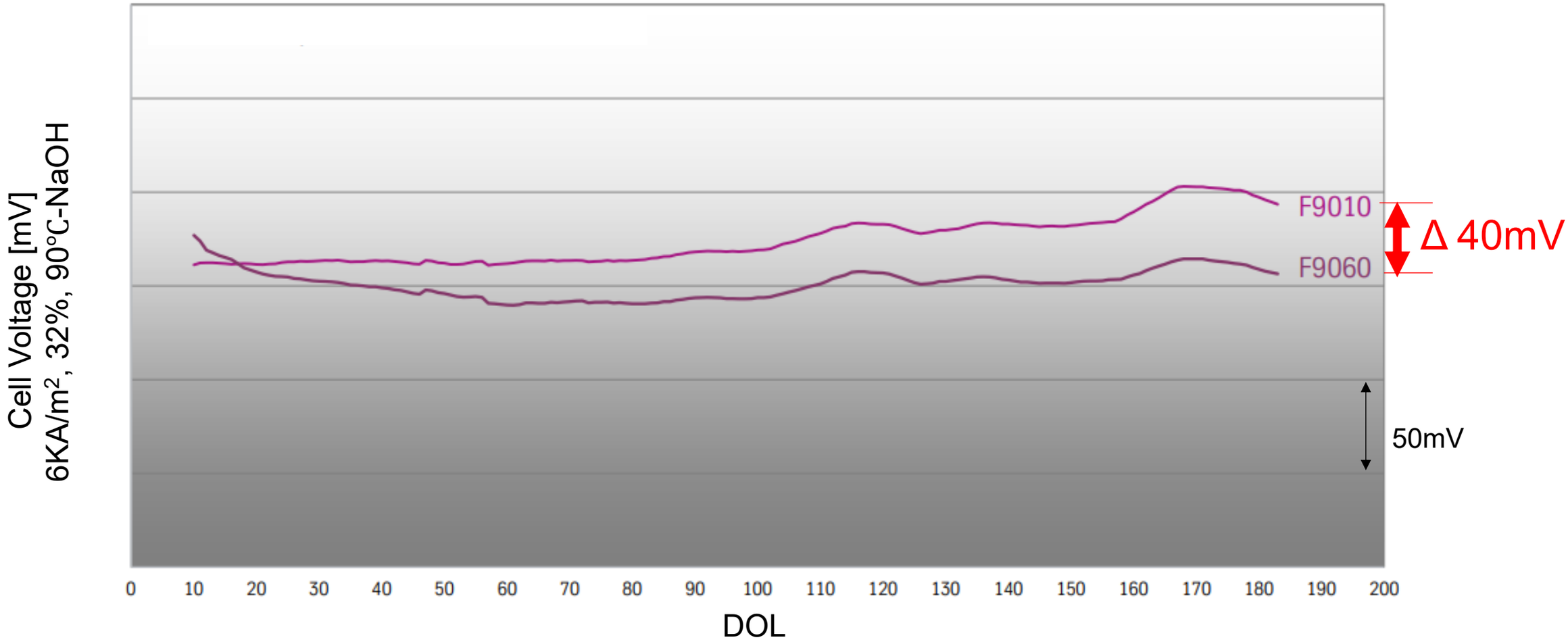
CE of F-9060 in Commercial Plant A (AGC Group)



F-9060 also shows stable high current efficiency.

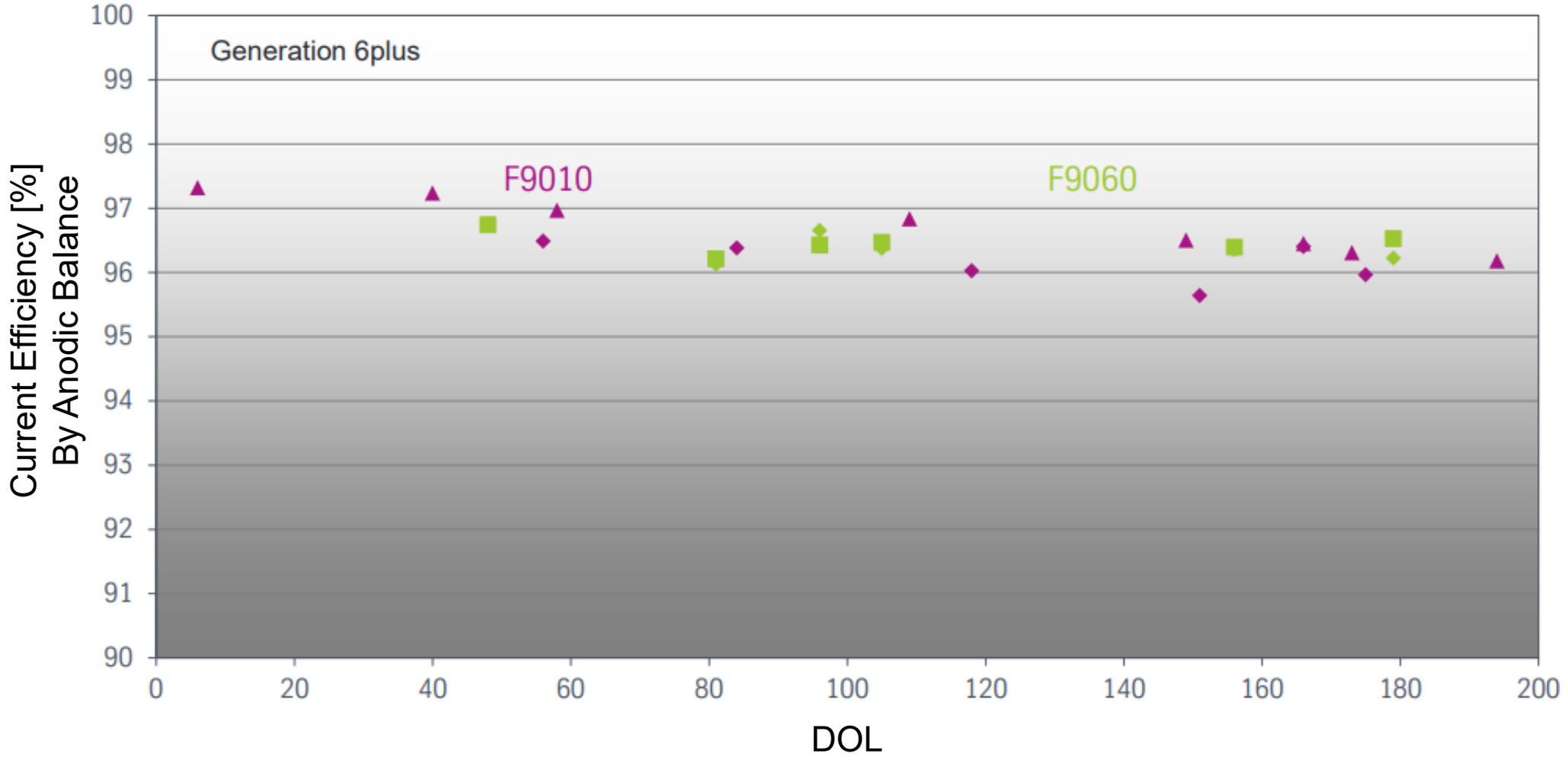
Voltage of F-9060 in Commercial Plant B

BM2.7 v6 plus, 6.0 kA/m^2, 90℃, 32 wt%-NaOH



CE of F-9060 in Commercial Plant B

BM2.7 v6 plus, 6.0 kA/m^2, 90℃, 32 wt%-NaOH



F-9060 Performance Feedback from Customers' Sites

Country	Technology	MOL	Voltage Reduction	C.D. (kA/m^2)	Reference Membrane
Japan	BM2.7 G5	44.4	▲50mV	5.8	F-9010
China	NCZ-Σ	40.0	▲53mV	5.3	Competitor
China	NBZ	36.0	▲100mV	5.0	Competitor
US	NCZ	35.0	▲35mV	6.0	F-9010
Japan	NBZ	24.8	▲20mV	6.0	F-9010
Korea	NCZ	24.1	▲70mV	6.0	Competitor
Korea	BM2.7 G6	23.0	▲60mV	5.5	Competitor
Korea	NCZ	23.0	▲20mV	6.0	Competitor
Japan	NCZ	20.0	▲60mv	6.0	F-9010
India	NCZ	19.0	▲70mV	4.0	Competitor
Japan	NCZ	16.8	▲100mV	6.0	F-9010
Japan	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
China	NCZ	12.0	▲40mV	6.0	F-9010A
China	NBZ	12.0	▲30mV	5.2	F-9010
China	BM2.7 G6	10.0	▲30mV	6.0	F-9010A
Japan	NCZ	9.9	▲18mv	6.0	F-9010
China	NCZ-Σ	7.4	▲60mV	5.7	Competitor
China	NCZ-Σ	7.4	▲40mV	5.7	F-9010A
Norway	BM2.7 G3	6.0	▲80mV	6.0	F-8080
Germany	BM2.7 G6plus	6.0	▲30mV	6.0	F-9010
India	BM2.7 G6	5.0	▲40mV	6.0	F-9010
Indonesia	BM2.7 G5plus	4.0	▲40mV	6.0	F-9010
France	BM2.7 G5	4.0	▲60mV	6.0	F-9010
China	INEOS-Bichlor	4.0	▲30mV	6.0	F-9010
India	BM2.7 G5b	4.0	▲34mV	6.0	F-9010

Proven in over 100 plants worldwide

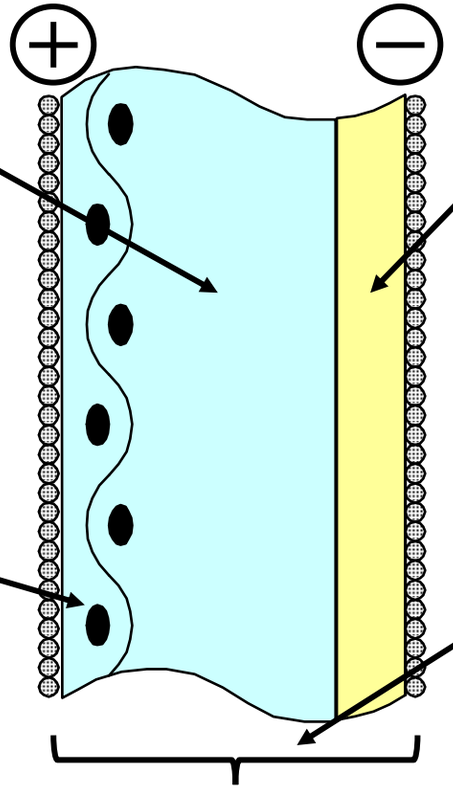
Topics

- Introduction of AGC and FLEMION™
- Introduction of actual performance data on F-9060 in full-scale commercial electrolyzers
- **Cutting-edge technologies achieving F-9060`s performance**
- Benefit for customers and summary

Key Technology of F-9060

New Sulfonic Polymer

→ *Low Voltage*



New Ion Channel

→ *Wider Operational Range*
& High CE Stability
in Zero Gap

Advanced Cloth as F-9010

→ Same Mechanical Strength

New Layer Configuration

→*High Durability*
against Brine Impurities

Concept of F-9060

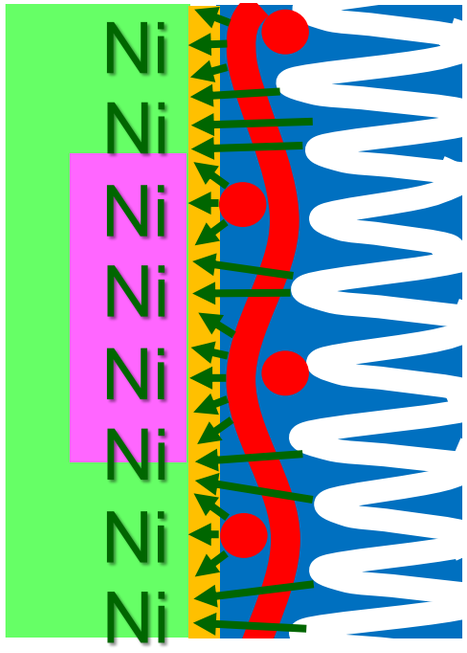
Keyword in Market	Main Required Features	Key Technology
Rising Electricity Cost & Decarbonization Society	Low Voltage	New S-Polymer
High Current Density Operation	High Brine Impurity Resistance	New Ion Channel
Zero Gap Electrolyzer	Wider Operational Range High CE Stability in Zero Gap	New Layer Configuration Advanced Cloth (same as F-9010)

F-9060 is the latest membrane based on further evolution and development of the technology of F-9010 series.

Influence of Zero Gap Configuration

1

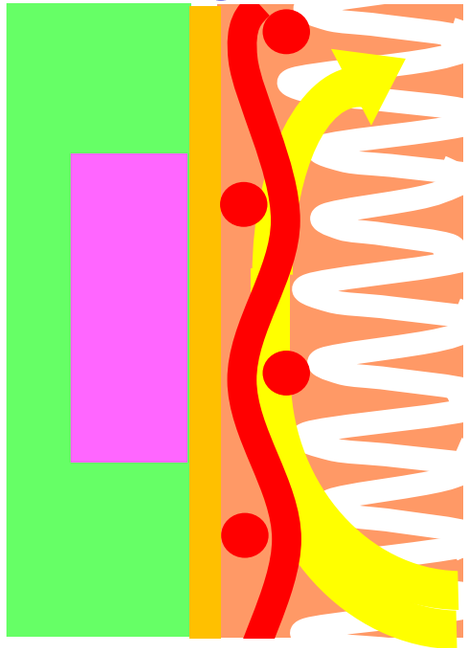
Contacting
Cathode parts



1 Ni stain

2

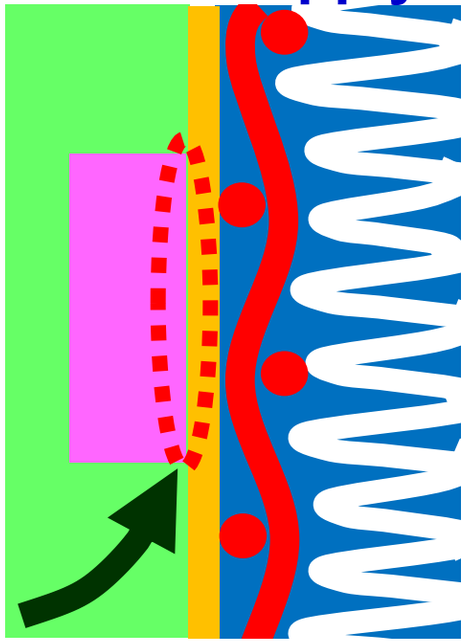
Less
Catholyte Flow



2 High Temperature

3

Less
Brine Supply

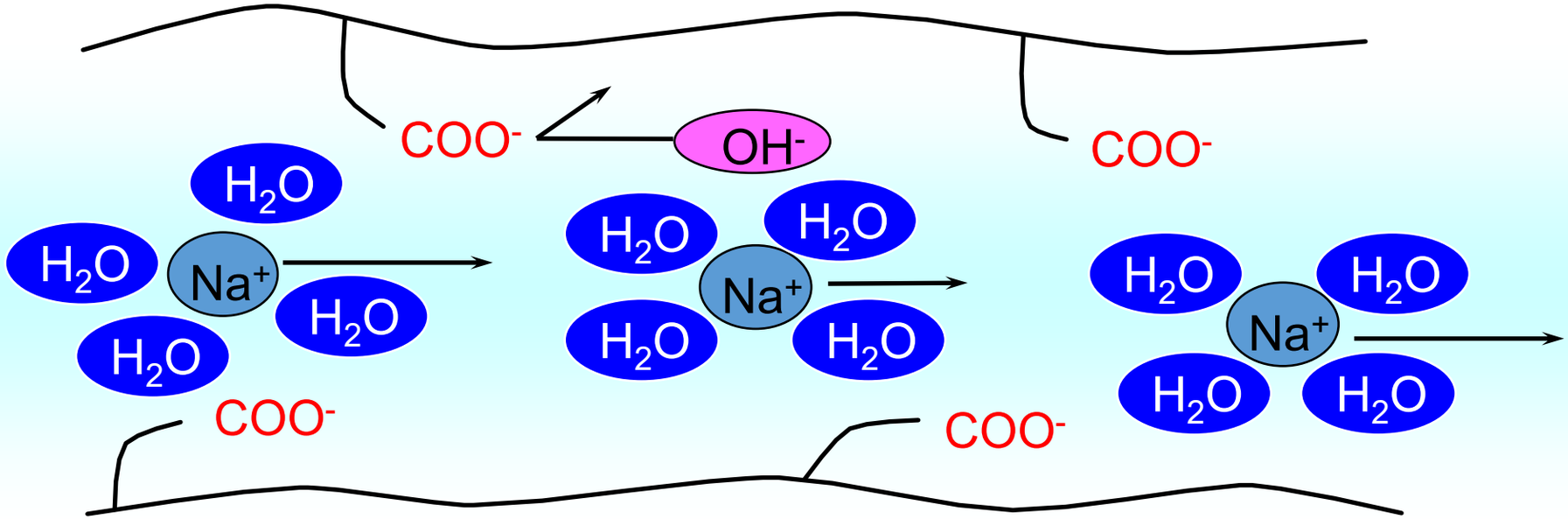


3 Weak brine

Mechanism of High Current Efficiency

In the C-layer

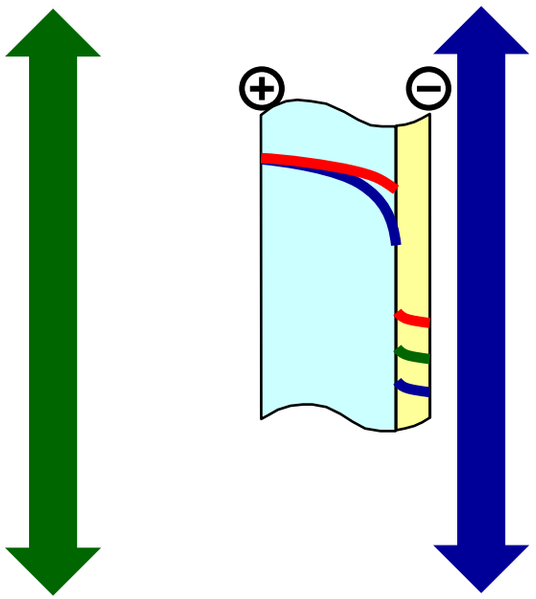
Na^+ are hydrated with enough H_2O. → Na^+ mobility is high.

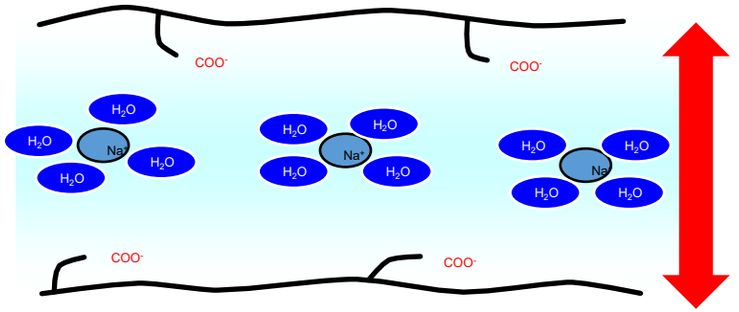


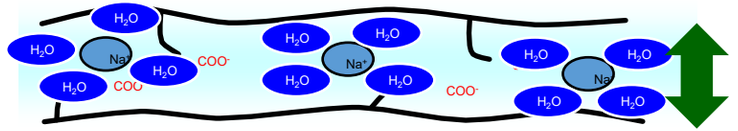
OH^- CANNOT pass through the membrane easily due to the repulsive force of fixed negative charge.

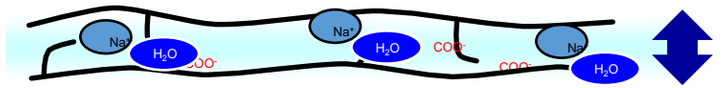
Summary of Ion Channel Size

Temp.	Water content	Ion Channel Size	C.E.
High	High	Wide	Lower
		Standard	High
Low	Low	Narrow	Lower





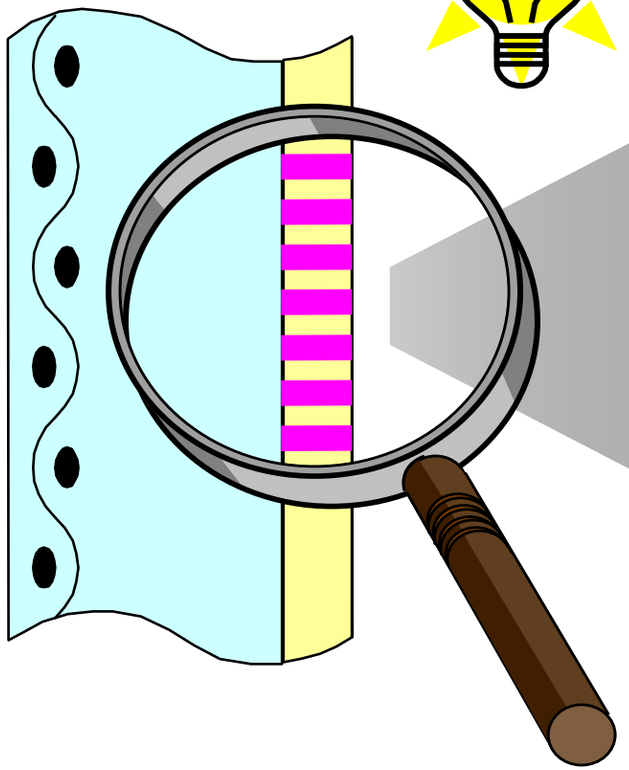




Further Improvement of Ion Channel

F-9060

Breakthrough !



Uniform Ion Channel

Proper

Proper

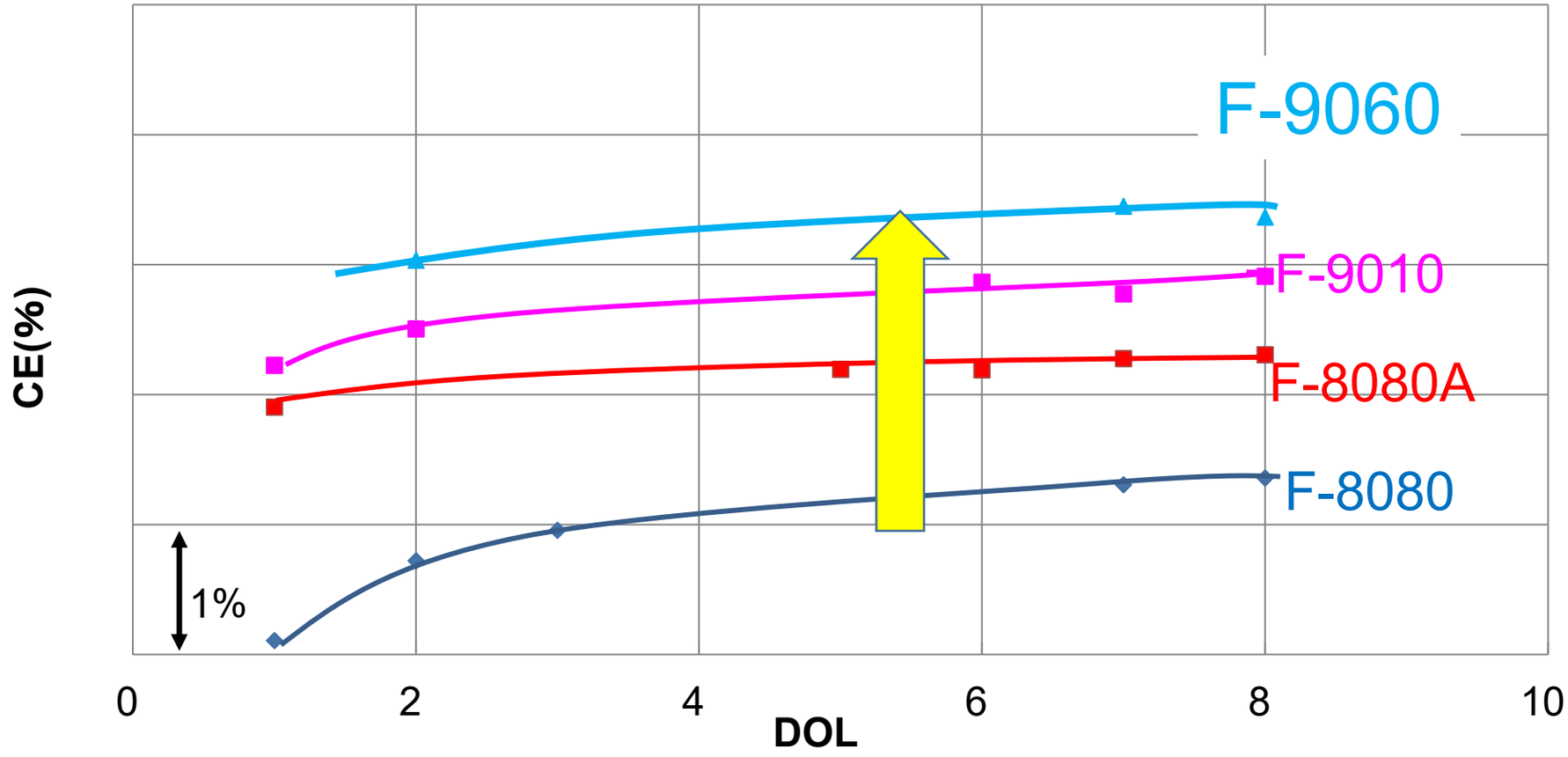
Prope

Proper

More Uniform & Optimized

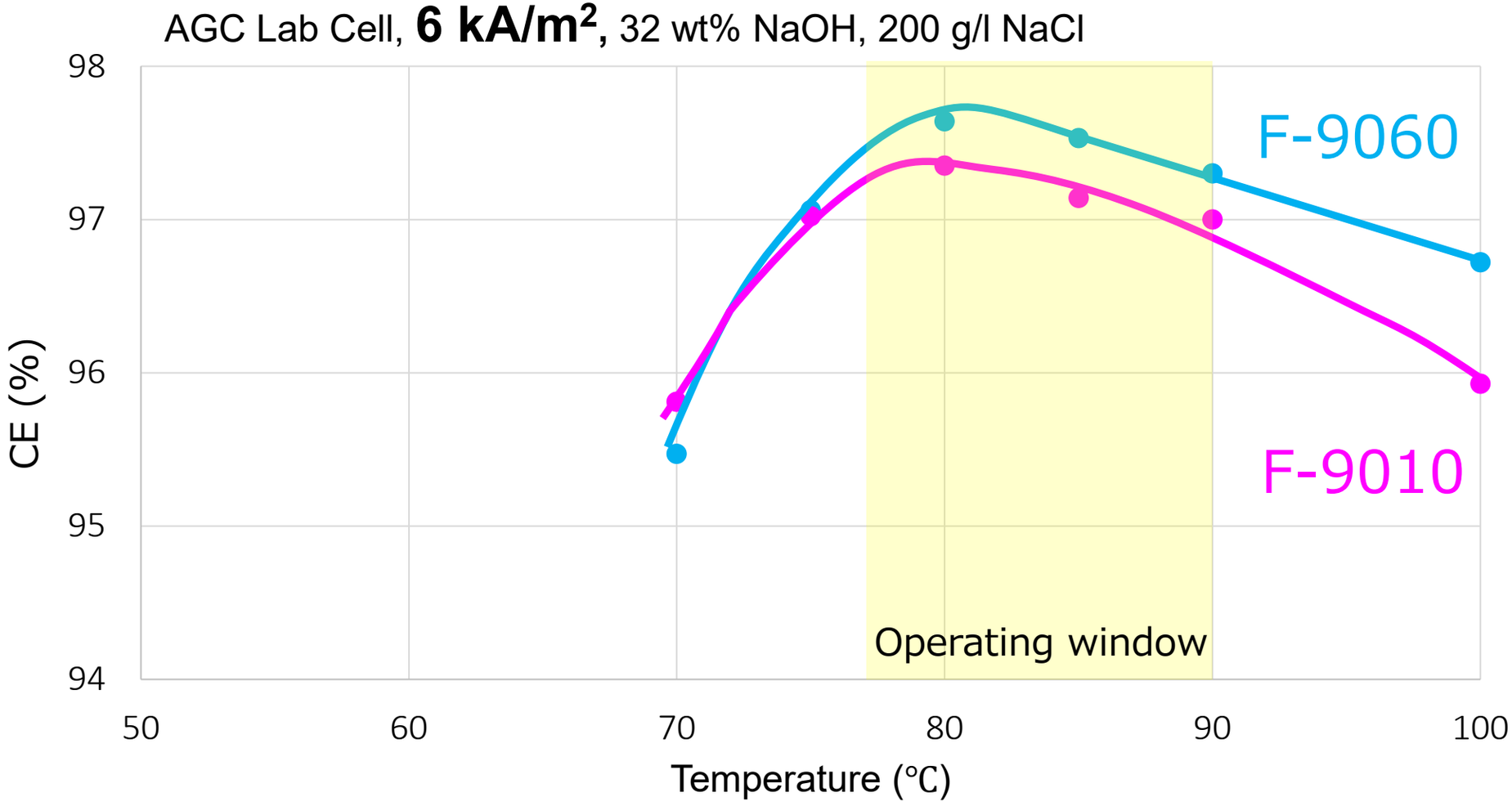
F-9060: Resistance to Ni stain

Precondition；Soaked in a Ni solution
AGC Lab Cell, 6 kA/m^2, 90 ℃, NaOH 32 wt%, NaCl 200 g/l



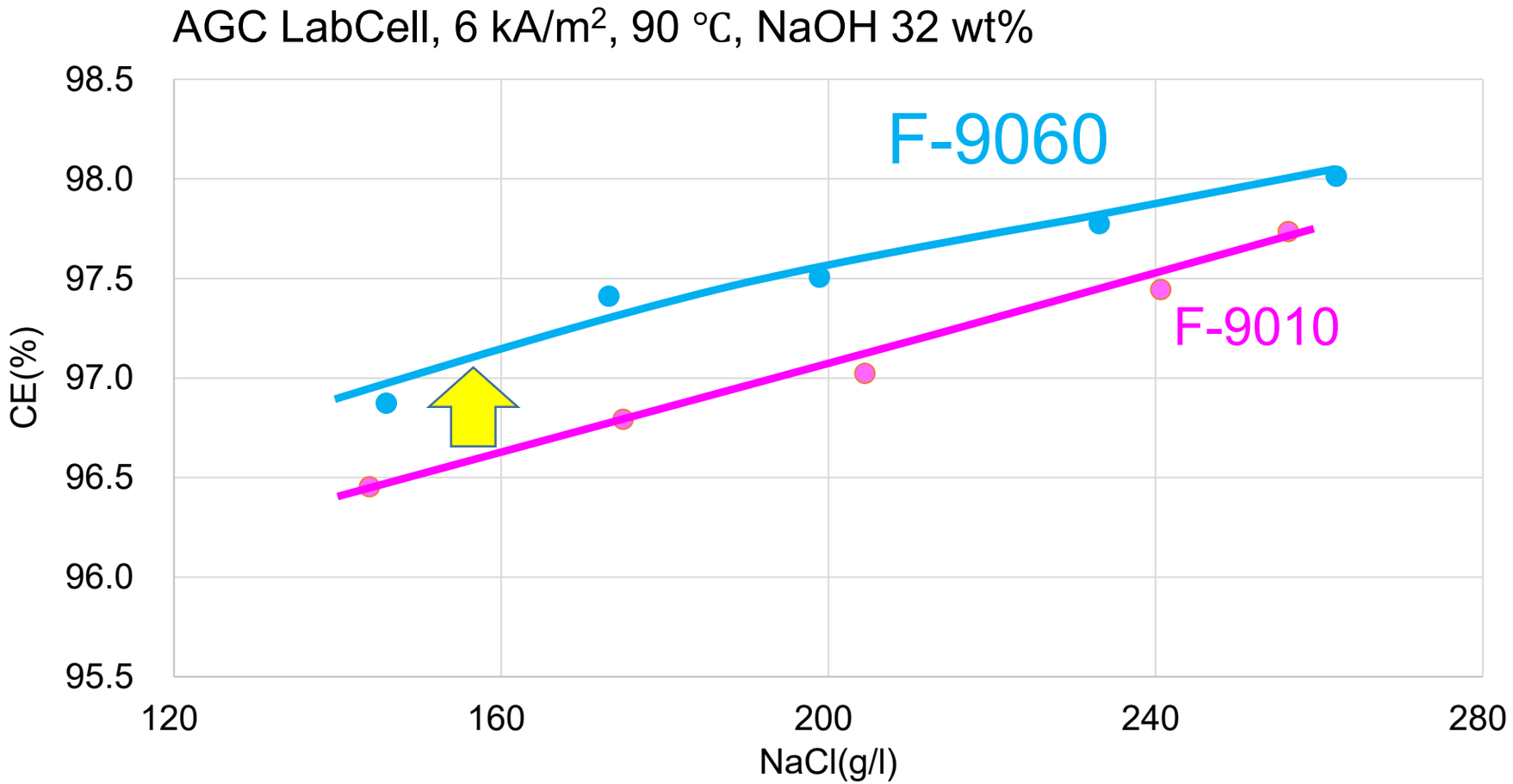
F-9060 shows the highest resistance to Ni stain

F-9060: Temperature Characteristic



F-9060 shows wider operational range, especially at higher temperature.

F-9060: NaCl Concentration Characteristic



F-9060 shows higher CE in all brine concentration.

Concept of F-9060

Keyword in Market	Main Required Features	Key Technology
Rising Electricity Cost & Decarbonization Society	Low Voltage	New S-Polymer
High Current Density Operation	High Brine Impurity Resistance	New Ion Channel
Zero Gap Electrolyzer	Wider Operational Range	New Layer Configuration
	High CE Stability in Zero Gap	Advanced Cloth (same as F-9010)

F-9060 is the latest membrane based on further evolution and development of the technology of F-9010 series.

Further Improved Durability against Brine Impurity

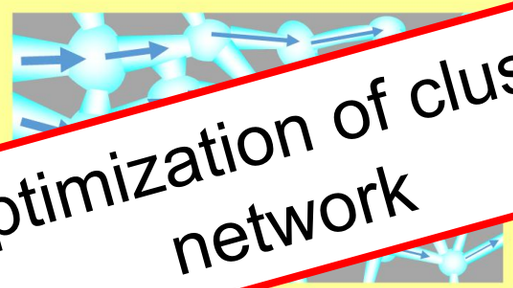
Breakthrough !

F-9060

New Sulfonic Polymer

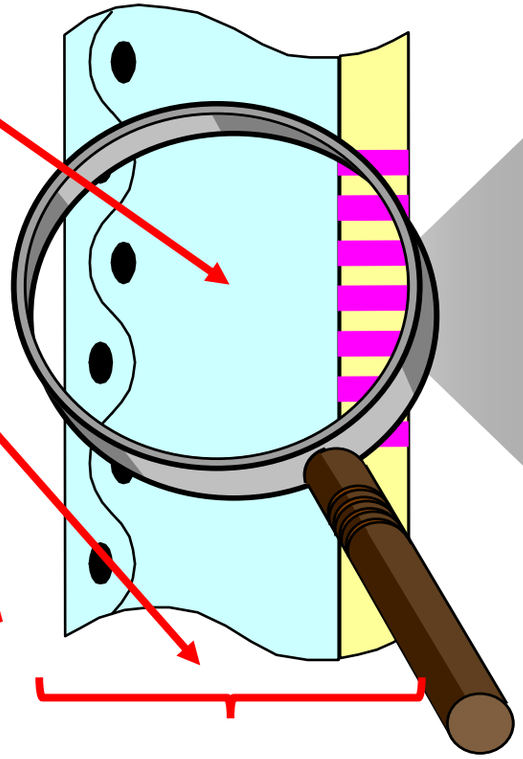
New Layer Configuration

⊕ Membrane inside



Low water content

Optimization of cluster network



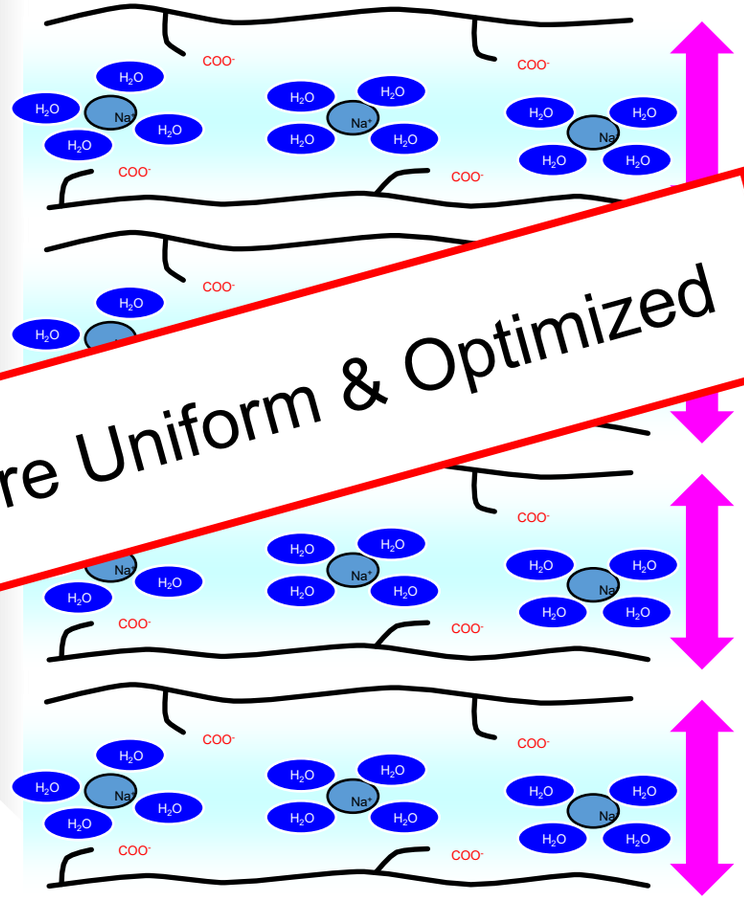
New Ion Channel

Proper

Proper

Pro

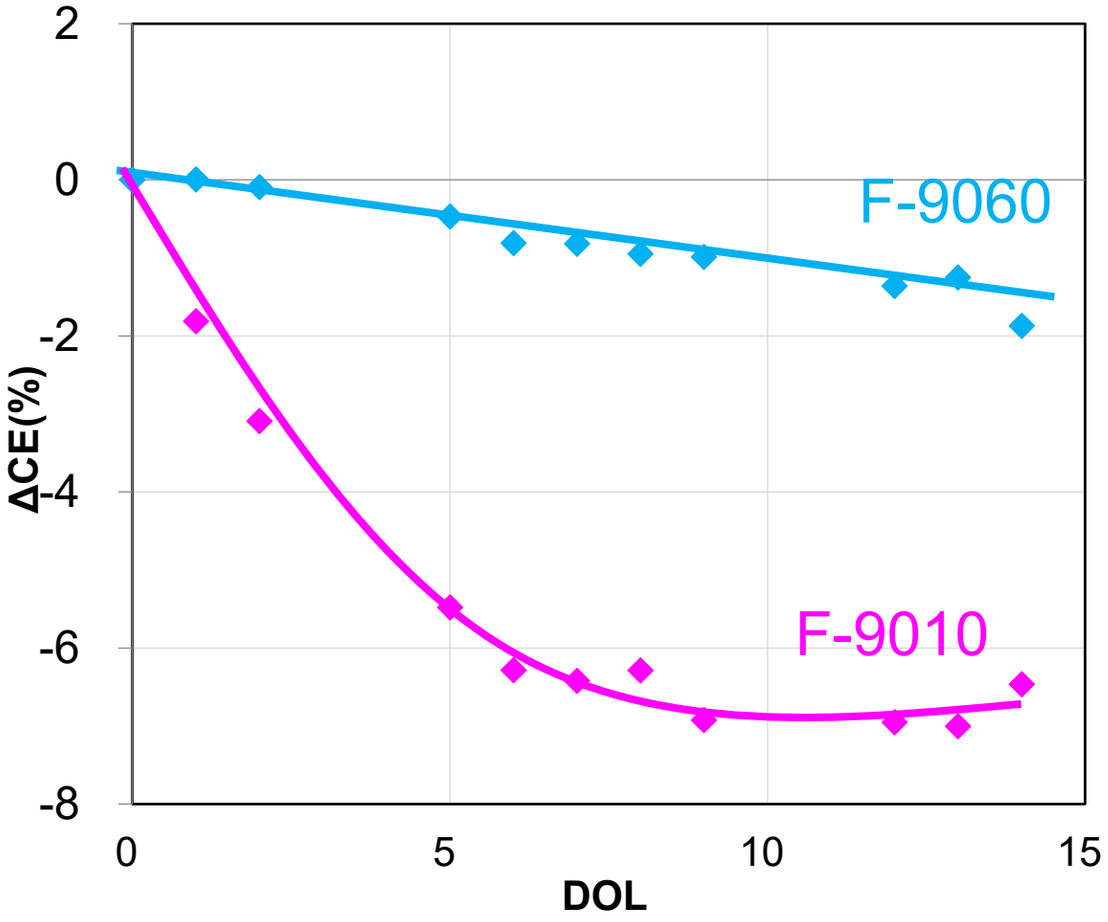
Proper



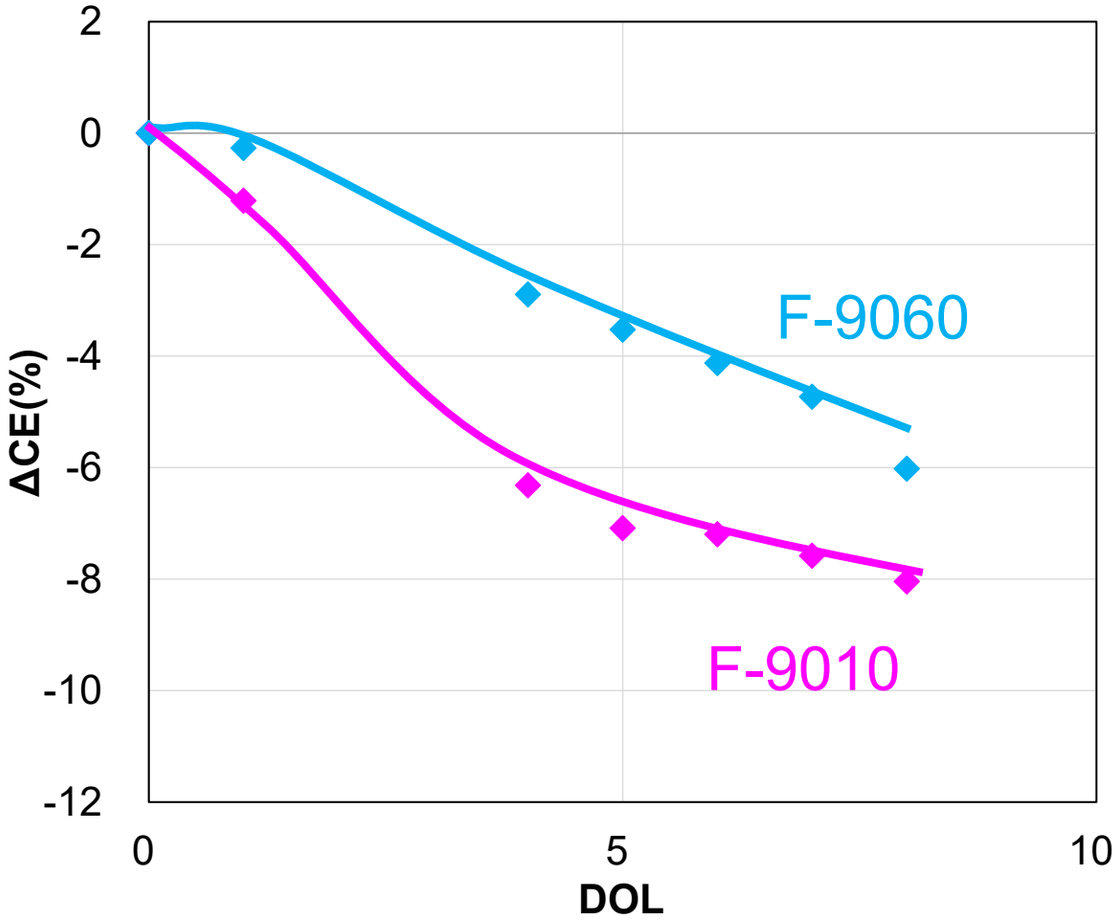
More Uniform & Optimized

Higher Durability against Sr/SiO_2 and Al/SiO_2

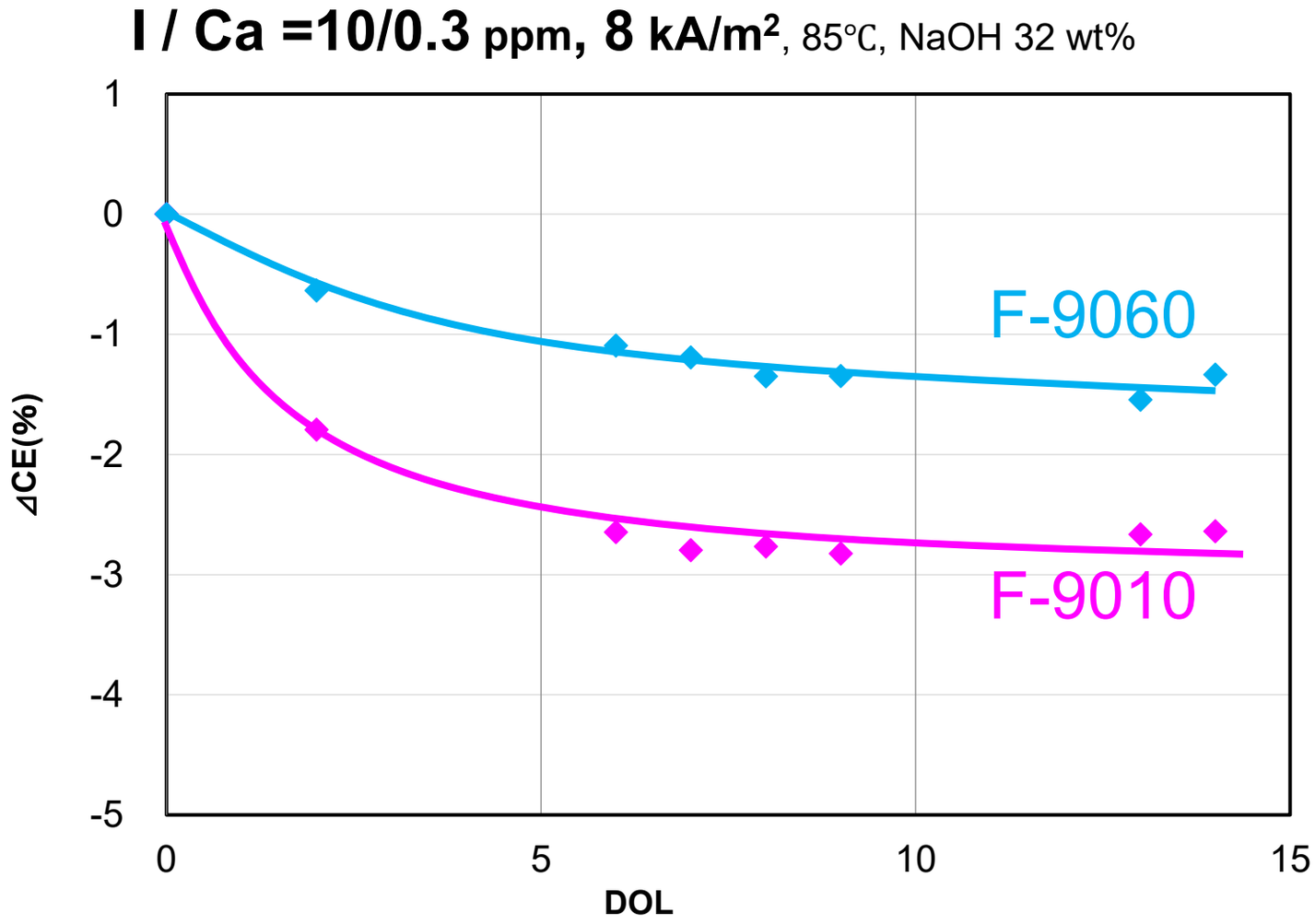
Sr/SiO_2 =1/30 ppm, 8 kA/m², 85℃, NaOH 32 wt%



Al/SiO_2 =1/30 ppm, 8 kA/m², 85℃, NaOH 32 wt%

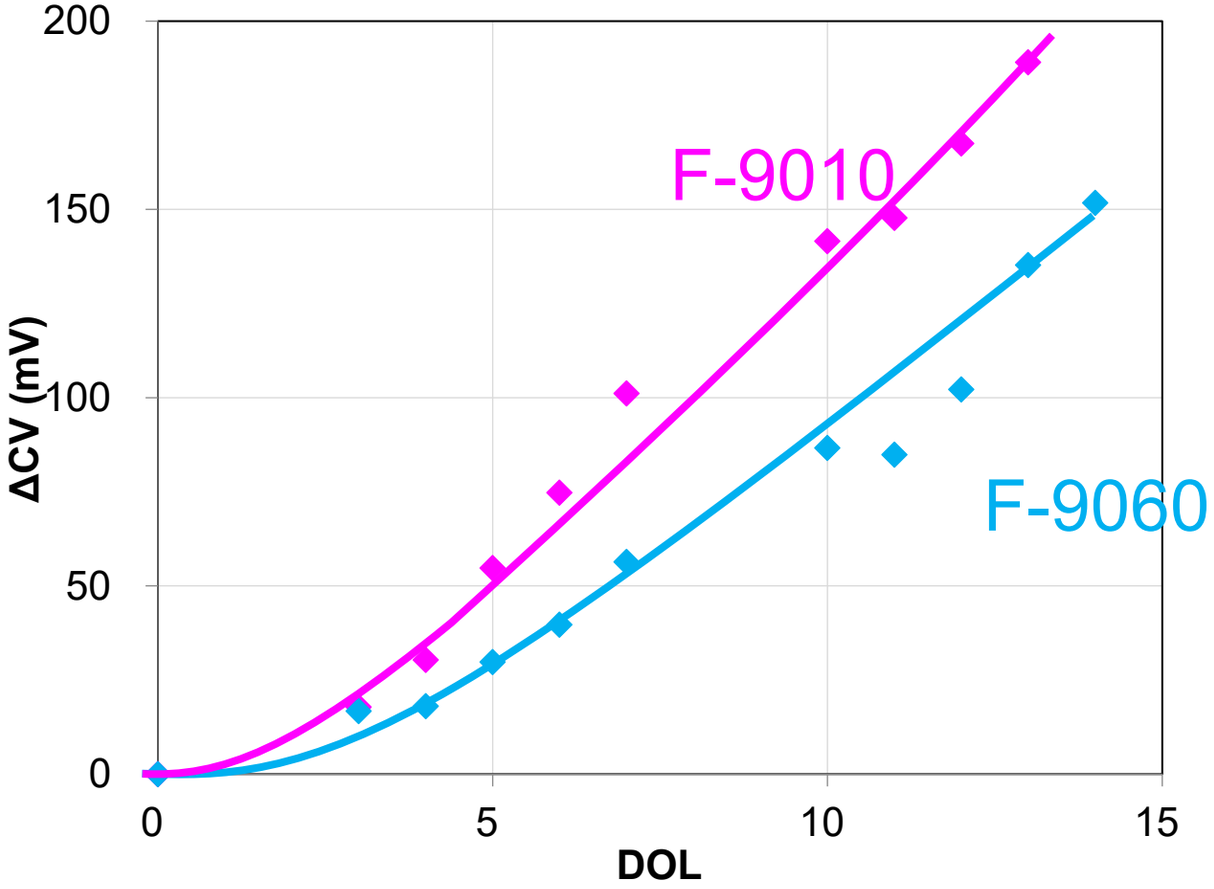


Higher Durability against I / Ca

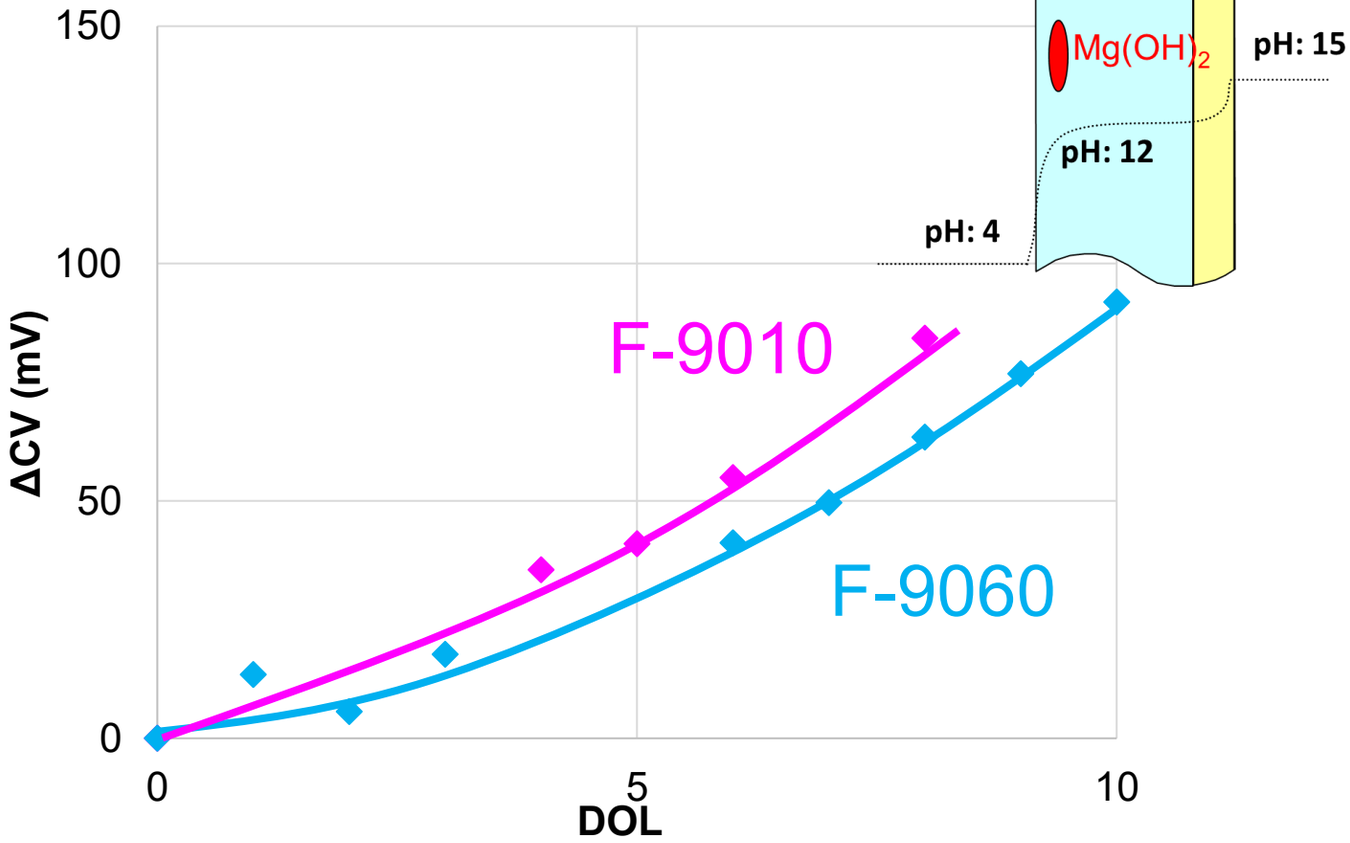


Higher Durability against Fe and Mg

Fe = 5 ppm, 8 kA/m², 85℃, NaOH 32 wt%



Mg=0.2 ppm, 8 kA/m², 85℃, NaOH 32wt%



F-9060 also shows higher durability against Fe and Mg, which deposit in sulfonic layer.

Topics

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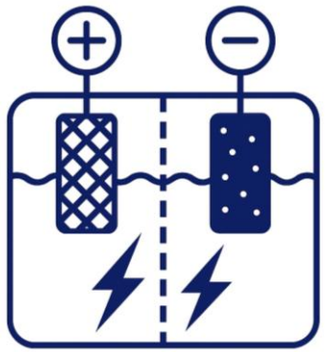
- Actual performance data on F-9060 in commercial electrolyzers
- Cutting-edge technologies achieving F-9060`s performance
- **Energy and CO_2 reduction in India**

Contribution of Membrane Performance Improvement



F-9060 for India's Chlor Alkali

- 40mV

Cost Saving

😊$700 k/y[1)]

+

Net - Zero Solutions

😊4 kt-CO_2/y[2)]

Environmental Compensation

😣 **- $160 k/y[2)]**

1) plant scale : 200 kt-NaOH / y
electricity price : $0.124 / kwh

2) CO_2 mission factor
for power generation : 0.00071 t-CO2 / kWh
Environmental Compensation : 40USD / t-CO2

Summary

1. Lowest voltage

- 40 mV lower voltage than F-9010 at 6 kA/m^2
- Contributes to reducing not only electricity cost but also CO_2 emissions

2. Higher Durability against Brine Impurities

Based on deeply understanding the correlation between polymer and performance, we achieved further improvement of durability against many species of impurities.

3. Higher CE Stability in Zero Gap and Wider Operational Range

- Focusing three key influence factor of zero gap, we improved CE stability in zero gap
- Wider operational range in each current density, especially at higher temperature.

Thank you very much for your attention!!

If you have any inquiries, please contact PIC in India.

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