Next-generation HCFO Solvent, AMOLEA™ AS-300, Developed by AGC

AGC Inc.
Tsuyoshi Hanada
Advanced Material Div., Performance Chemicals General Div.,
Chemicals Company

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AGC Overview

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AGC's business extends into over 30 countries and regions.

Company Name	Established	Group companies
AGC Inc. *2018~ Former company name Asahi Glass Co., Ltd.	**1907** September 8	**201** Companies *164 companies are out of Japan
Net Sales	**Employees**	**Worldwide Share**
USD **14.5** billion Japan & Asia 9.3 billion Americas 1.5 billion Europe 3.7 billion	appox. **57,600** Japan & Asia 35,700 Americas 4,700 Europe 17,200	**No.1** Float flat glass Automotive glass Fluoropolymer resin ETFE and for on site coatings

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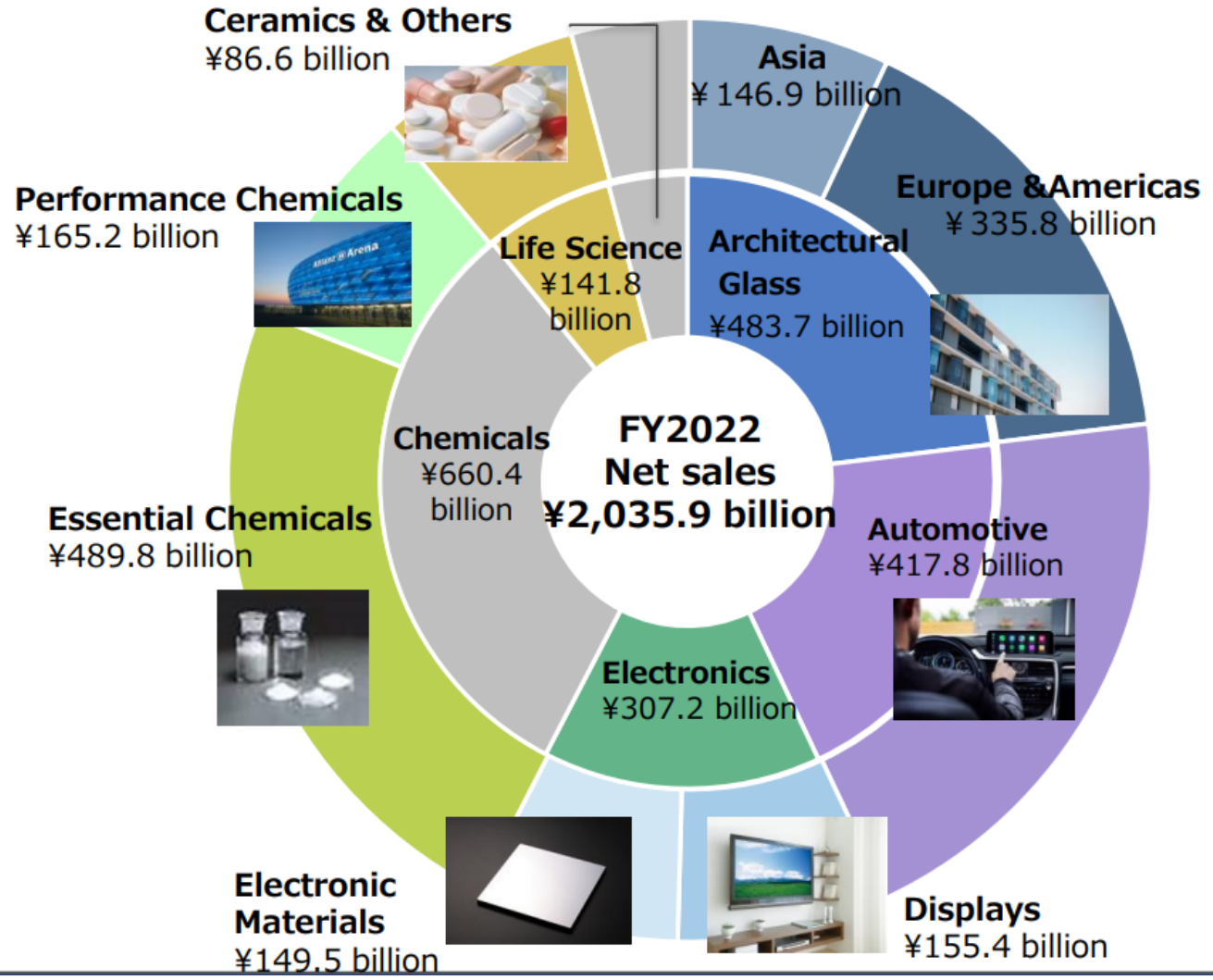
AGC's products enrich our daily lives.



AGC Chemicals Global Network

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AGC Chemicals Americas (AGCCA) supports customers in North America.

Development Background of AMOLEA™ AS-300

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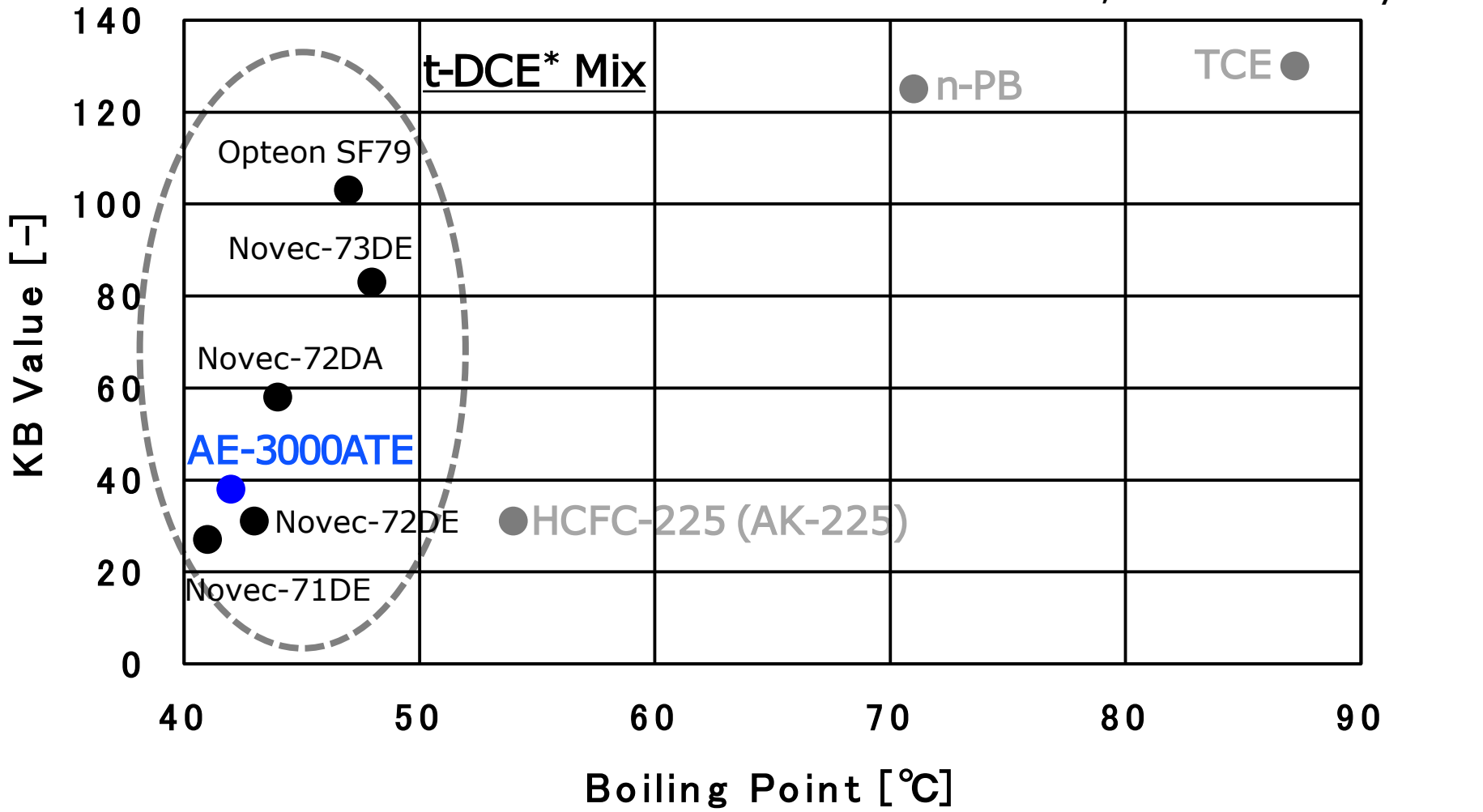
Market demand for non-flammable, single component cleaning solvent.

*trans-1,2-Dichloroethylene



Concept of AMOLEA™ AS-300

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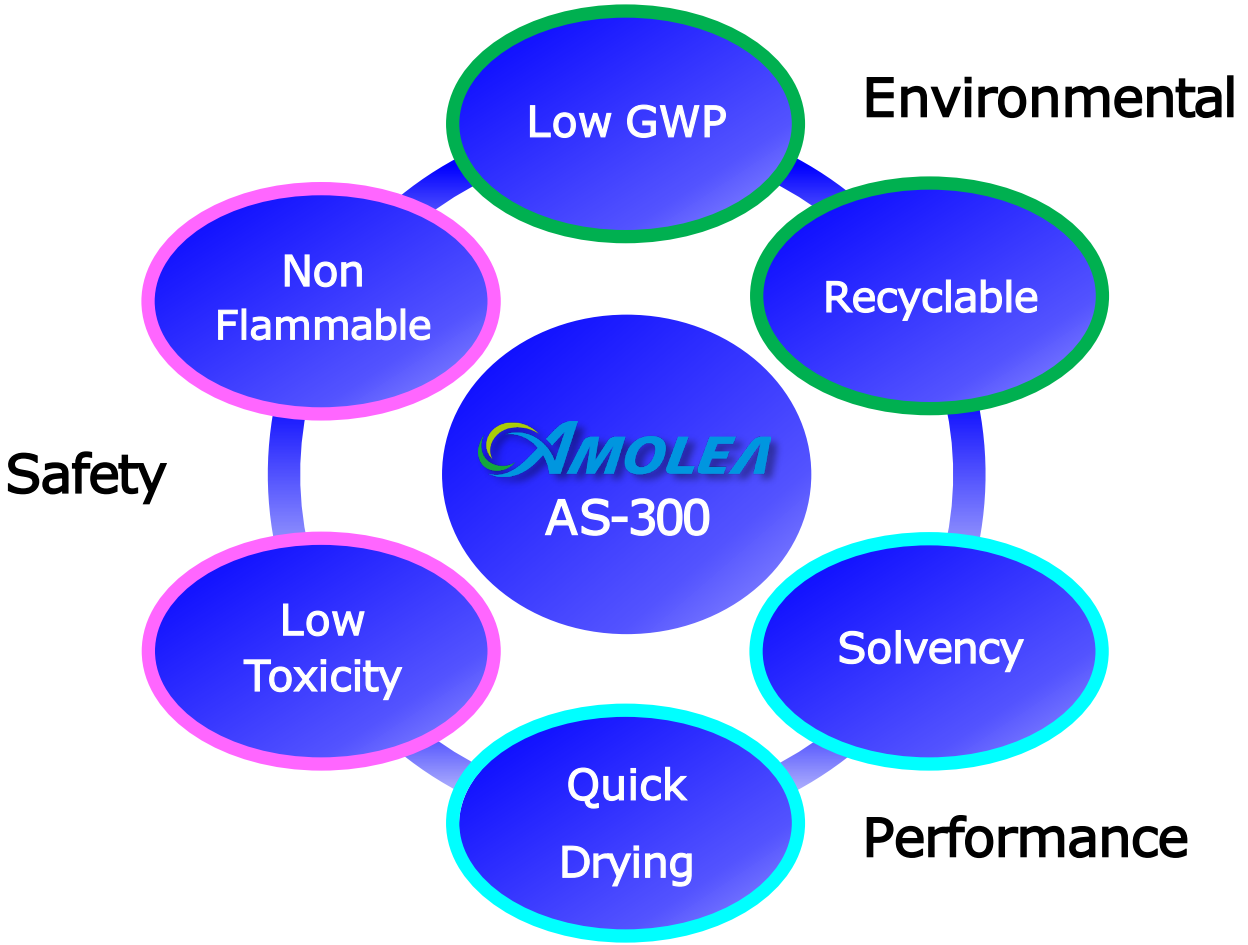
Superior performance satisfy all desired features.



*AMOLEA: AGC Makes Hydrofluoro-Olefins as Alternatives

History of AGC's Fluorinated Solvents in U.S.A.

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AGC developed products that comply with environmental regulations.

- ✓ AGC developed HCFO-1233yd in 2018 and commercially launched AMOLEA™ AS-300 in Japan as a direct alternative to AK-225.
- ✓ US EPA SNAP approved in 2022 and became available in the US market from AGCCA.

1st Gen. CFCs

*Flonsolve (CFC-113)

↓ ODP reduction

2nd Gen. HCFCs

ASAHIKLIN™ AK-225 (HCFC-225)

↓ ODP zero

3rd Gen. HFCs/HFEs

ASAHIKLIN™ AE-3000 (HFE-347pc-f2)

ASAHIKLIN™ AE-3000ATE

↓ GWP reduction

4th Gen. HFOs/HCFOs

AMOLEA™ AS-300

AMOLEA™ AS-300AT

1990 1995 2000 2005 2010 2015 2020 2025 2030 2035

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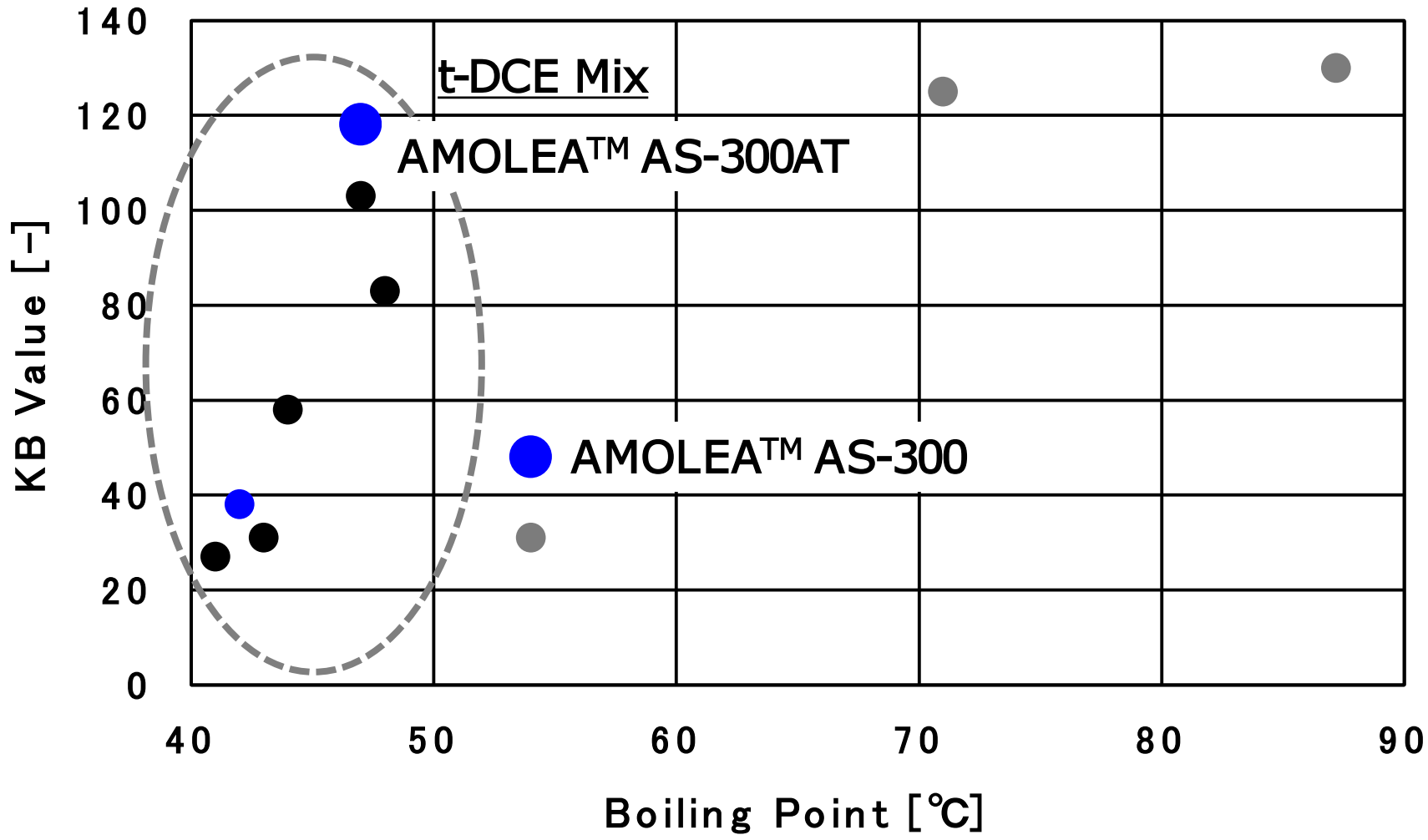
AMOLEA™ AS-300 series are suitable for cleaning application.



AGC's Fluorinated Solvents Line-up

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ASAHIKLIN™ and AMOLEA™ cover wide customers' requirements.

		Component	
		Mixture	Single
Solvency	High	AMOLEA™ AS-300AT	
	Medium	ASAHIKLIN™ AE-3000ATE	AMOLEA™ AS-300 ASAHIKLIN™ AK-225
	Low	ASAHIKLIN™ AE-3100E	ASAHIKLIN™ AE-3000

Features of AMOLEA™ AS-300

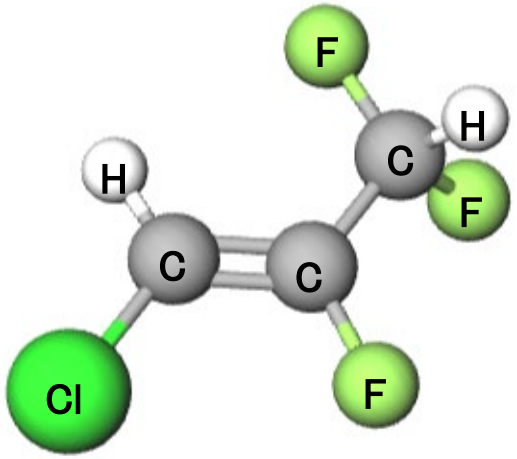
AMOLEA™ AS-300 has suitable performance for cleaning application.

- ✓ Ideal boiling point
- ✓ Non-flammable
- ✓ Very low GWP
- ✓ Low surface tension
- ✓ Good solubility for oils
- ✓ Good material compatibility
- ✓ Recyclable
- ✓ Thermally stable

AMOLEA™ AS-300

AGC originally developed AMOLEA™ AS-300.

Boiling Point	°C	54
Flash Point	°C	None
Atmosphere Lifetime	Days	21
GWP (ITH=100)	CO_2=1	<1
Allowable Exposure Limit (AEL)	ppm	250



HCFO-1233yd(Z)

Physical Properties Comparison

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The physical properties of AMOLEA™ AS-300 is close to AK-225.

		ASAHIKLIN™ AK-225	AMOLEA™ AS-300	AMOLEA™ AS-300AT
Classification		HCFC	HCFO	HCFO+t-DCE
Boiling Point	°C	54	54	47
Density (@25°C)	g/cm^3	1.55	1.39	1.28
Surface Tension (@25°C)	mN/m	16	22	23
Vapor Pressure (@25°C)	kPa	39	32	46
Relative Exposure Rate	Ether=100	90	64	73
KB Value	-	31	44	118
Flash Point	°C	None	None	None

Various Oil Solubility

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AMOLEA™ AS-300 series have a broad range of cleaning capabilities.

Add oil samples into solvents. Agitate for 30 seconds and let it sit for 10 minutes.
Repeat the operation until the mixture is immiscible (opaque).

	ASAHIKLIN™ AK-225	AMOLEA™ AS-300	AMOLEA™ AS-300AT
Cutting Oil	50%<	50%<	50%<
Tool Oil	50%<	50%<	50%<
Quenching Oil	50%<	50%<	50%<
Rolling Oil	50%<	50%<	50%<
Anti-rust Oil	50%<	50%<	50%<
Silicon Oil	50%<	50%<	50%<
Synthetic Oil	50%<	50%<	50%<

Material Compatibility for Metals

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AMOLEA™ AS-300 has no affects for metals.

	ASAHIKLIN™ AK-225	AMOLEA™ AS-300	AMOLEA™ AS-300AT
Iron (SPCC-SB)	Compatible	Compatible	Compatible
SUS-304	Compatible	Compatible	Compatible
Cupper	Compatible	Compatible	Compatible
Aluminum	Compatible	Compatible	Compatible
Nickel	Compatible	Compatible	Compatible
Silver	Compatible	Compatible	Compatible
Zinc	Compatible	Compatible	Compatible
Titanium	Compatible	Compatible	Compatible
Solder	Compatible	Compatible	Compatible

Material Compatibility for Plastics

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AMOLEA™ AS-300 affects polymers more than AK-225.

	ASAHIKLIN™ AK-225	AMOLEA™ AS-300	AMOLEA™ AS-300AT
ABS	Compatible	Incompatible	Incompatible
Acrylic	Incompatible	Incompatible	Incompatible
Polycarbonate	Compatible	Incompatible	Incompatible
Polyethylene	Compatible	Compatible	Incompatible
Nyron66	Compatible	Compatible	Compatible
Polyacetal	Compatible	Compatible	Compatible
Polyphenylene sulfide	Compatible	Compatible	Compatible
PTFE	Compatible	Compatible	Compatible
Phenolic	Compatible	Compatible	Compatible

Material Compatibility for Elastomers

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AMOLEA™ AS-300 swells some elastomers more than AK-225.

	ASAHIKLIN™ AK-225	AMOLEA™ AS-300	AMOLEA™ AS-300AT
Natural rubber	Compatible	Compatible	Compatible
Butyl rubber	Compatible	Compatible	Compatible
Nitril rubber	Compatible	Incompatible	Incompatible
Chloroprane rubber	Compatible	Compatible	Compatible
Chlorosulfonated polyetylene	Compatible	Compatible	Compatible
EPDM	Compatible	Compatible	Compatible
Fluoro elastomer	Compatible	Compatible	Compatible
Silicon rubber	Incompatible	Incompatible	Incompatible
Urethan rubber	Compatible	Incompatible	Incompatible

LOX Mechanical Impact Sensitivity (LOXMIS) Test

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AMOLEA™ AS-300 passed LOXIMS test.

✓ **Test protocol: ASTM G86-17**

Standard test method for determining ignition sensitivity of materials to mechanical impact in ambient liquid oxygen and pressurized liquid and gaseous oxygen environments

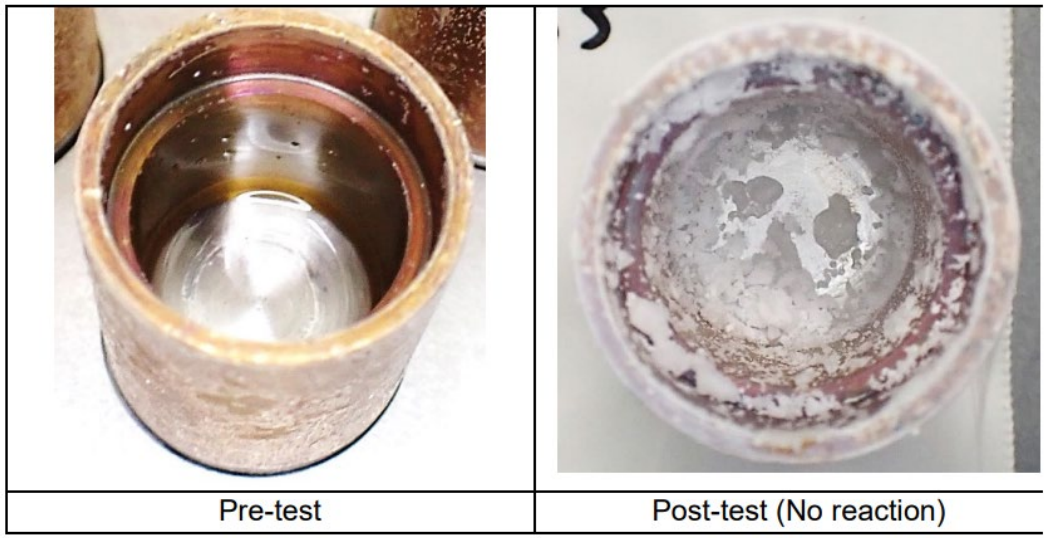
✓ **Test condition:**

Pass/Fail methods per ASTM G86

Energy level: 98 joules

✓ **Test Result:**

Met the pass requirements of ASTM G86, with 0 reactions out of 20 impacts.



Pre-test	Post-test (No reaction)

End Use Examples of AMOLEA™ AS-300 series

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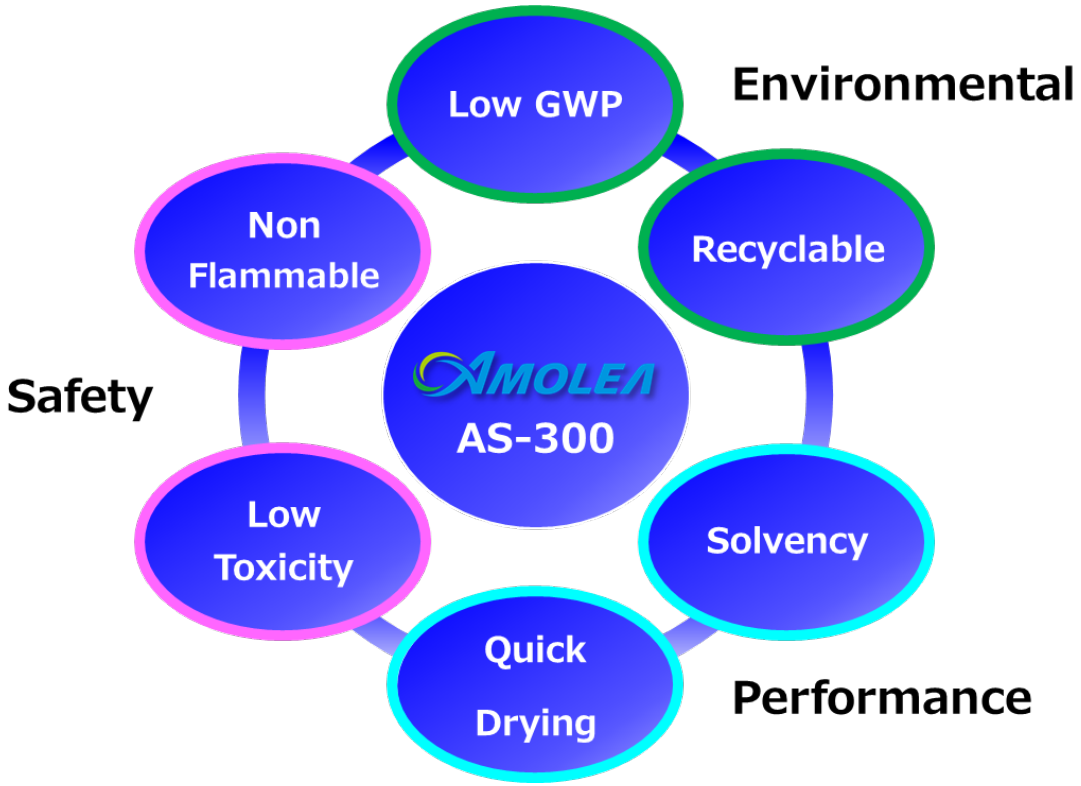
Lots of adoption examples in a wide range of applications.

Classification	Application
Aerospace	LOX cleaning, Oxygen systems parts, Metal parts, Aircraft maintenance
Medical	LOX cleaning, Oxygen systems parts, Medical devices, Needles, Catheters,
Optics	Optical lenses, Optical fibers, Crystal oscillators
teLe-communication	Mobile phone parts, Displays
Electric & electronics	Printed circuit boards, Electronic component
Automotives	Engine parts, Bearings, Motor parts
Semiconductors	Semiconductor manufacturing equipment parts, Removal depots

Summary of AMOLEA™ AS-300

AMOLEA™ AS-300 is suitable for cleaning application.



Environmentally Friendly

- ✓ Very Low GWP
- ✓ Recyclable with distillation

Safety

- ✓ Non-flammable
- ✓ Low Toxicity

Performance

- ✓ Good solvency for oils
- ✓ Quick drying with no residue
- ✓ Good material compatibility
- ✓ Thermally Stable
- ✓ Retrofittable

For more information, please contact:

Taichi Naka
taichi.naka@agc.com
610-349-7025
AGC Chemicals Americas, Inc (USA)

Tsuyoshi Hanada
tuyosi.hanada@agc.com
AGC Inc. (Japan)

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