Ver. 20170904

Technical data

ASAHIKLIN™ AE-3000
ASAHIKLIN™ AE-3100E

-Drying Application-

INTRODUCTION

ASAHIKLIN™ AE-3000 and AE-3100E are the environmental-friendly solvents with following features. The features are aero ozone depleting potential (ODP), low Global warming potential (GWP), non-flammable, higher evaporation rate than HC solvents, alcohols, water, high chemical and thermal stability, etc. ASHIKLIN AE-3100E is a mixture of AE-3000 and 5.5wt% ethanol. ASAHIKLIN AE-3000 and AE-3100E are suitable for dewatering system for optical articles etc.

1 Physical properties

Physical properties of ASAHIKLIN AE-3000 and AE-3100E are shown in table1.

項　目	Unit	AE-3000	AE-3100E
Boiling point	℃	56	54
Melting point	℃	-94	-86
Density*1	―	1.47	1.40
Viscosity*1	mPa-s	0.65	0.60
Surface tension*1	mN/m	16.4	16.1
Vapor pressure*1	kPa	31	28
Latent heat of vaporization*1	kJ/kg	163	200
Specific heat*2	kJ/kg/K	1.26	1.33
Evaporation rate(ether=100)	―	67	66
Solubility of water*1	g-water/100g-solvent	0.09	0.53
Solubility to water*1	g-solvent/100g-water	0.01	―
Flash point	℃	none	none
KB-value	―	13	14
Ozone depleting potential（ODP）	CFC-11=1	0	0
Global warming potential(GWP)	CO_2=1、100yarITH	580	-

Table1. Physical properties of ASAHIKIN AE-3000 and AE-3100E

*1: at 25°C

*2: at 23°C

*3: at boiling point

*4: referenced from IPCC AR4 report

2 Stability of ASAHIKLIN AE-3000 and AE-3100E

ASAHIKLIN AE-3000 and AE-3100E are stable at the following accelerated oxidation test.

The test method: Solvent was refluxed for 48hrs under lamp irradiation with moisture saturated oxygen bubbled through continuously. Test coupons made of carbon steel were located in both the vapor and liquid phases.

Table.2 Stability results after 48hrs

Solvent	Acidity	Corrosion
ASAHIKLIN AE-3000	No Detectable	Non Apparent
ASAHIKLIN AE-3100E	No Detectable	Non Apparent

Detection Limit of Acidity: <1ppm

3 Application for dewatering

The features of the dewatering system with ASAHIKLIN AE-3000 and AE-3100E.

- Short time drying
- Suppressing watermarks

The comparison with the physical properties of isopropanol (IPA) and water in table 3.

Table3. The comparison with the physical properties.

	unit	AE-3000	AE-3100E	IPA	Water
Boiling point	℃	56	54	82	100
Density	-	1.47	1.40	0.79*	0.997
Vapor pressure	kPa	31	28	4	3
Latent heat of vaporization	kJ/kg	163	200	666	2,384
Specific heat	kJ/kg/K	1.26	1.33	2.55	4.18
Evaporation rate(ether=100)	-	67	66	9	<1
Solubility of water (25℃)	g-water/100g-solvent	0.09	0.53	∞	—
Flash point	℃	non	non	11.7	non

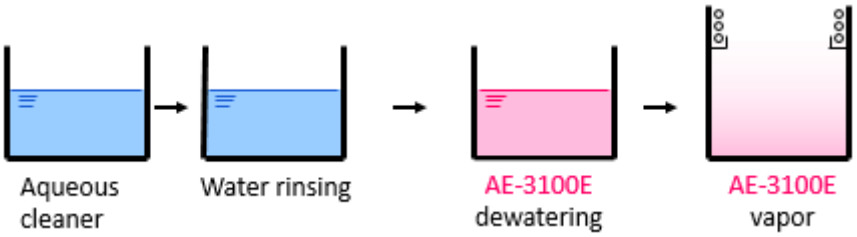
Applications

- drying after cleaning: precise drying for optical parts (lens, prisms), before surface treatment (deposition, plating)

There are two drying system with ASAHIKLIN AE-3000 and AE-3100E

- ASAHIKLIN AE-3000 drying after IPA

- ASAHIKLIN AE-3100E dewatering after water rinsing



- Traditional drying system

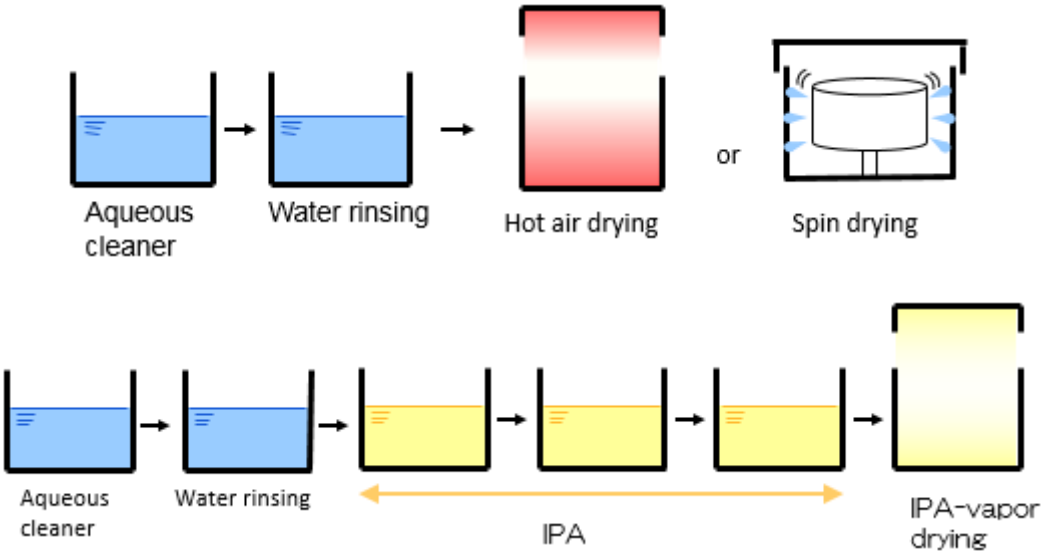


Fig.1 Schematic diagrams of several drying system

4 ASAHIKLIN AE-3000 drying after IPA

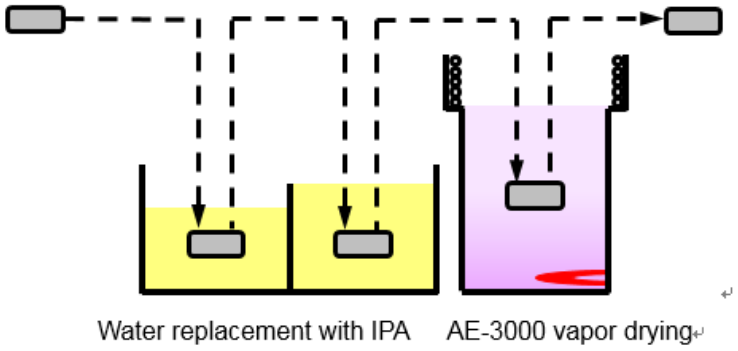


Fig.2 AE-3000 dewatering process after IPA

The process of ASAHIKLIN AE-3000 drying after IPA

- It is a drying method utilizing the property that IPA dissolves in AE - 3000. As a result, articles can be dried in a shorter time than IPA vapor drying. Also, ASAHIKLIN AE-3000 is less solubility to water than IPA, so there is the advantage that drying problem (watermarks etc.) due to moisture.

The control of AE-3000 condition

- It is necessary to keep the IPA concentration contained in AE-3000 low in order to maintain drying quality by vapor drying with AE-3000. Since IPA concentration contained in AE-3000 correlates with solvent density, it be obtained by measuring density.
- From measured density and temperature, obtain the ethanol concentration using the graph in Figure1.

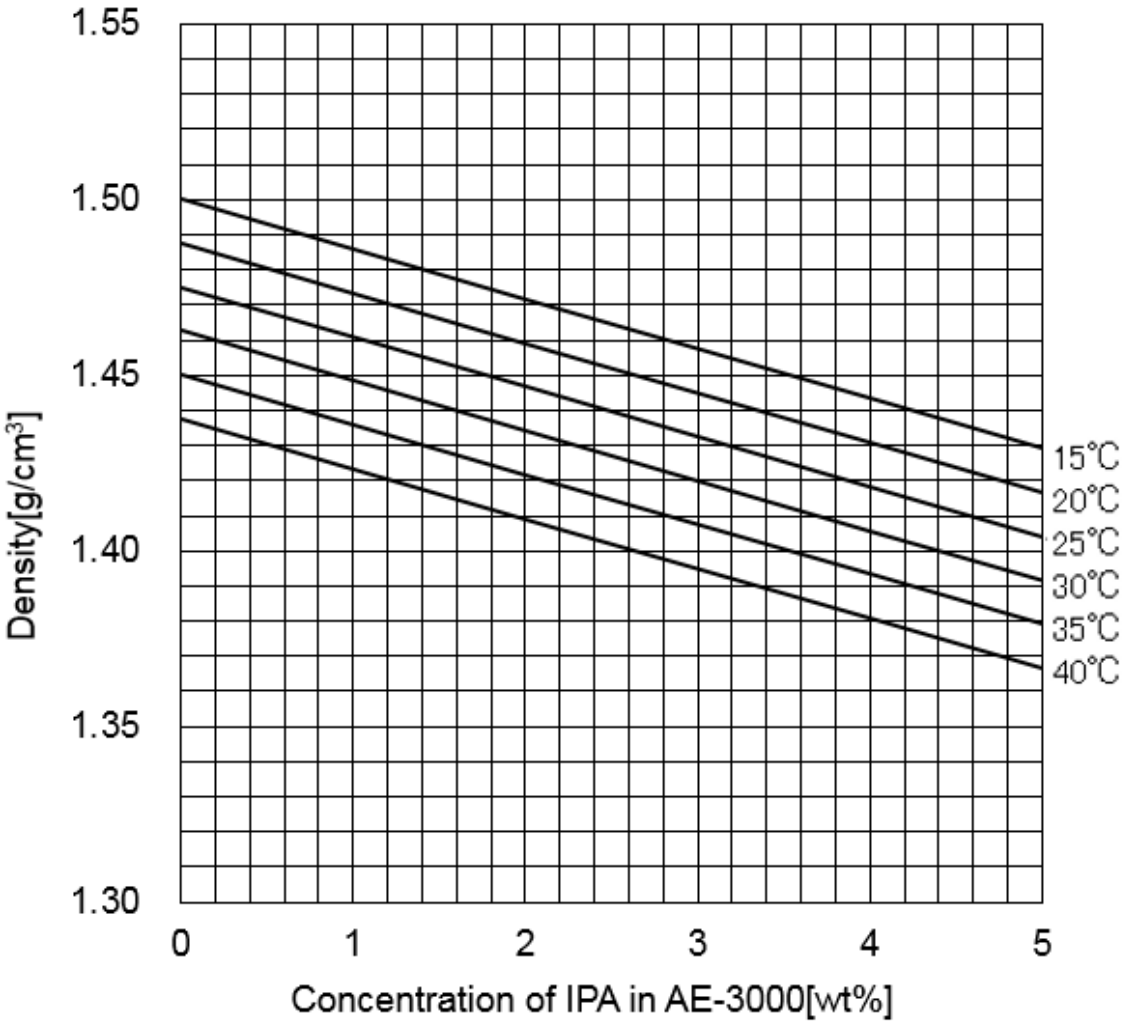


Fig.3 The relationship density and concentration of IPA in AE-3000

5 ASAHIKLIN AE-3100E dewatering

The principle of ASAHIKLIN AE-3100E dewatering is the following.(Fig.4)

- Separating water from article
- Separated water rises due to difference of density.

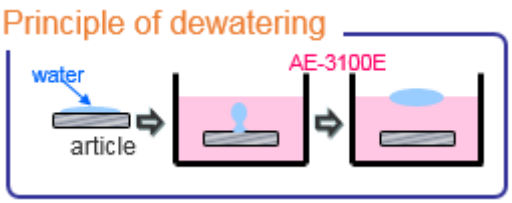


Fig.4 principle of dewatering with AE-3100E

The dewatering system with ASAHIKLIN AE-3100E

- When articles with water are immersed in ASAHIKLIN AE-3100E, the water is separated from the surface of article due to the difference of each density. Water floating on the liquid surface of ASAHIKLIN AE-3100E overflows to the water separation sump so that it will not re-attach when lifting the article.

- Figure5 is a schematic diagram of a dewatering process with ASAHIKLIN AE -3100E.

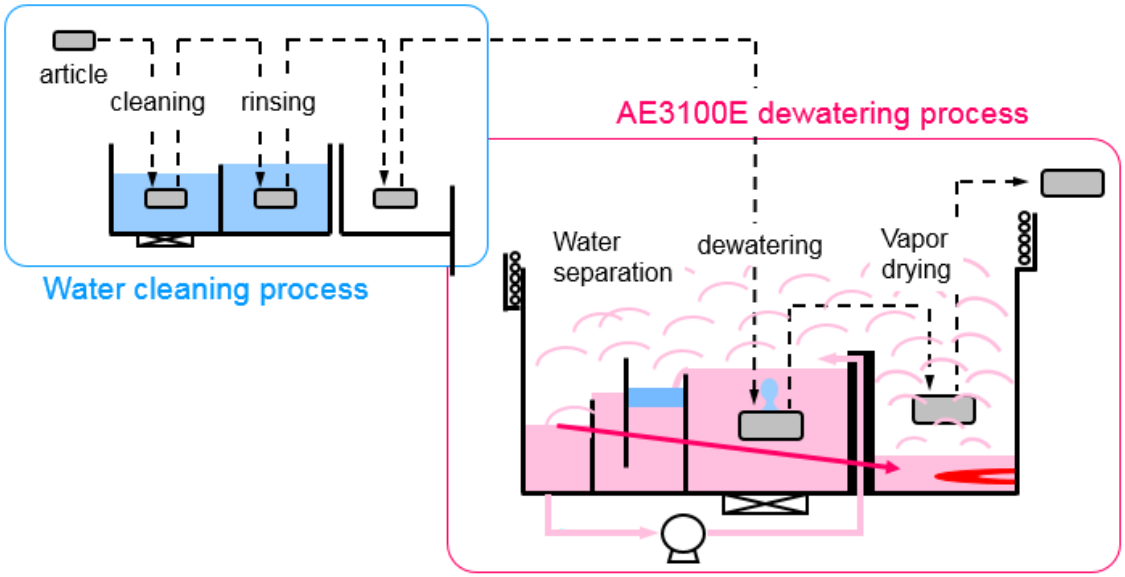


Fig.5 Schematic diagram of a dewatering process with ASAHIKLIN AE-3100E

Operation method of dewatering system with ASAHIKLIN AE-3100E

- Temperature of dewatering sump over 45°C
- Reducing water from following process
- Ultrasonic can increase dewatering effect

The control of concentration of ethanol

Repeating ASAHIKLIN AE-3100E dewatering, the ethanol component of ASAHIKLIN AE-3100E is extracted into water, and the ethanol concentration of ASAHIKLIN AE-3100E decreases. Due to decrease the ethanol concentration, water cannot be removed enough. If the ethanol concentration is lower, add the required amount of ethanol.

The concentration of ethanol in AE-3100E can be measured by liquid density.

- From measured density and temperature, obtain the ethanol concentration using the graph in Figure6.

Attention

- If the ethanol concentration is over 10%, the composition will be flammable, so add ethanol so that the ethanol concentration is controlled under 10wt%.

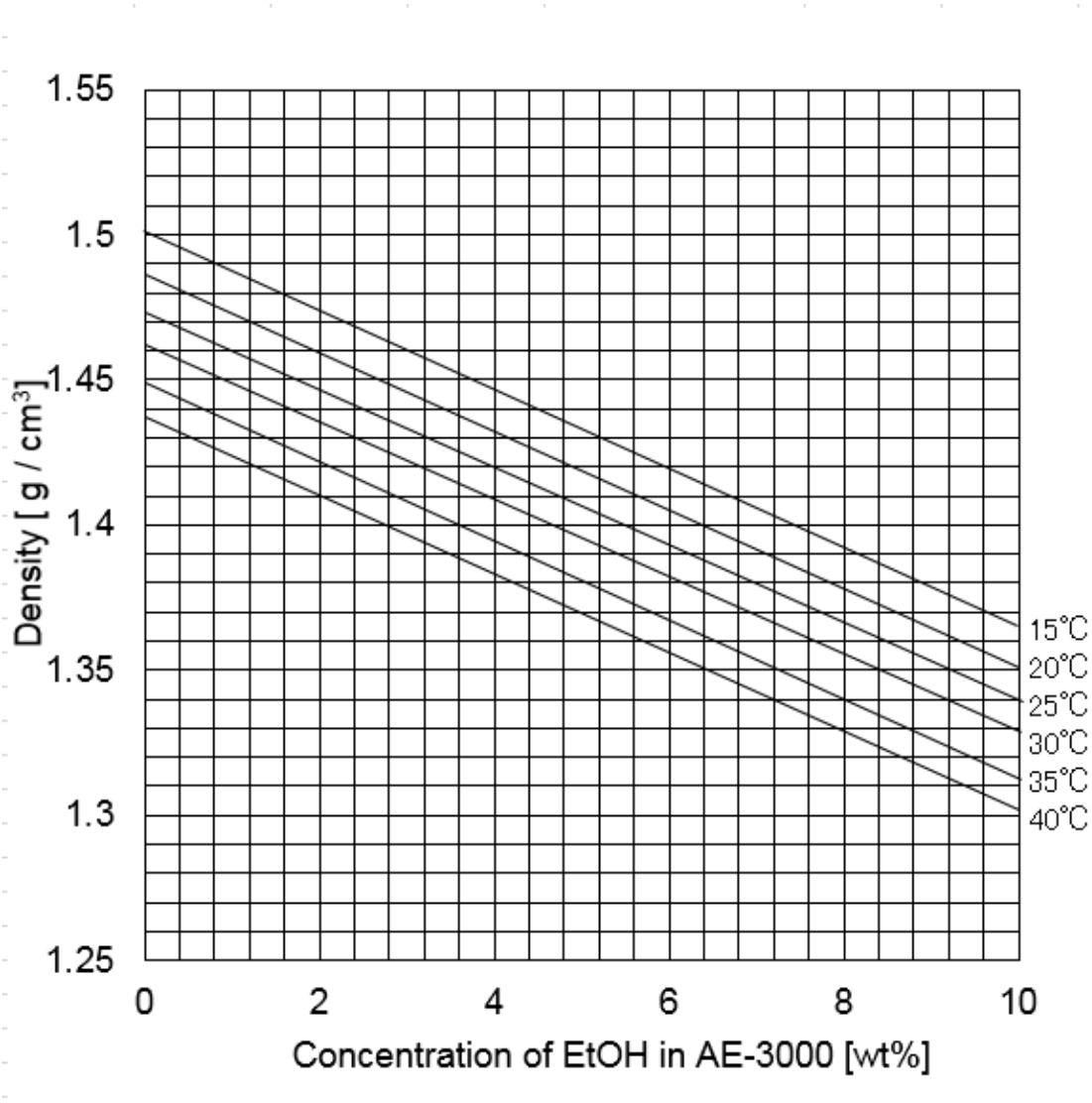


Fig.6 The relationship density and concentration of EtOH in AE-3000

6 Material compatibilities

<Metal materials> ASAHIKLIN AE-3000 and AE-3100E are no-effect for metal materials

-Iron (SPCC), SUS (SUS304), Magnesium, Aluminum, Zinc, Copper, Nickel plating, Nickel-chromate plating

-Method: Immerse in AT2 at boiling point for 7days.

<Plastics>

Table4 and Table5 show the compatibilities of ASAHIKLIN AE-3000 and AE-3100E for several plastics.

Table4 Effect of ASAHIKLIN AE-3000 on Plastics at the boiling point.

	At boiling point for 5min			At boiling point for 3days		
	Weight Change (%)	Linear Swell (%)	Extract-ables(%)	Weight Change (%)	Linear Swell (%)	Extract-ables(%)
Polyvinyl chloride(rigid)	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Polyvinyl chloride(plasticized)	<0.1	0.2	0.1	0.8	0.3	5.6
Polyethylene(HP)	<0.1	0.4	<0.1	0.2	0.1	<0.1
Polyethylene(LP)	<0.1	0.4	<0.1	0.7	0.4	<0.1
Polypropylene	<0.1	0.2	<0.1	0.9	0.3	<0.1
Polystyrene	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Acrylic	<0.1	0.2	0.7	Affected	Affected	Affected
Polycarbonate	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
Polyacetal	<0.1	<0.1	<0.1	0.5	<0.1	<0.1
Polyphenylene oxide	<0.1	-0.1	<0.1	<0.1	<0.1	<0.1
Phenolic	<0.1	<0.1	<0.1	-1.3	-0.2	<0.1
ABS	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Nylon6	<0.1	0.3	<0.1	0.1	<0.1	<0.1
Nylon66	<0.1	<0.1	<0.1	0.5	<0.1	<0.1
Polyester	<0.1	<0.1	<0.1	-0.1	<0.1	0.1
PTFE	<0.1	0.2	<0.1	1.3	0.3	<0.1
Epoxy	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Table5 Effect of ASAHIKLIN AE-3100E on Plastics at the boiling point.

	At boiling point for 5min			At boiling point for 3days		
	Weight Change (%)	Linear Swell (%)	Extract-ables(%)	Weight Change (%)	Linear Swell (%)	Extract-ables(%)
Polyvinyl chloride(rigid)	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Polyvinyl chloride(plasticized)	0.2	<0.1	0.2	3.7	<0.1	9.4
Polyethylene(HP)	<0.1	0.2	<0.1	0.8	0.6	<0.1
Polyethylene(LP)	<0.1	0.4	<0.1	0.4	0.3	<0.1
Polypropylene	<0.1	<0.1	<0.1	1.0	0.5	<0.1
Polystyrene	<0.1	0.1	<0.1	0.4	0.2	<0.1
Acrylic	Affected	Affected	Affected	Affected	Affected	Affected
Polycarbonate	<0.1	<0.1	<0.1	0.2	0.2	<0.1
Polyacetal	<0.1	0.1	<0.1	1.4	0.6	<0.1
Polyphenylene oxide	<0.1	<0.1	<0.1	0.2	0.2	<0.1
Phenolic	<0.1	<0.1	<0.1	-1.0	0.2	<0.1
ABS	<0.1	<0.1	<0.1	6.6	0.6	0.2
Nylon6	<0.1	0.2	<0.1	-0.5	0.3	<0.1
Nylon66	<0.1	0.2	<0.1	0.2	0.2	<0.1
Polyester	<0.1	<0.1	<0.1	2.9	0.3	0.8
PTFE	<0.1	0.2	<0.1	1.0	0.6	<0.1
Epoxy	0.2	<0.1	<0.1	<0.1	0.2	<0.1

<Elastomers>

Table6 and Table7 show the compatibilities of ASAHIKILIN AE-3000 and AE-3100E for several elastomers.

Table6 Effect of ASAHIKLIN AE-3000 on elastomers at the boiling point.

	At boiling point for 5min			At boiling point for 3days		
	Weight change (%)	Linear swell (%)	Extract-ables(%)	Weight change (%)	Linear swell (%)	Extract-ables(%)
Natural rubber	<0.1	0.1	<0.1	-2.1	-1.3	3.6
Urethane rubber	2.5	0.8	<0.1	33.3	7.1	0.2
Isobutylene isoprene rubber	-0.1	<0.1	0.2	-4.7	-1.5	6.0
Chloroprene rubber	<0.1	<0.1	0.1	-1.7	-1.1	4.2
Fluor elastomer	5.5	1.5	<0.1	86.2	24.1	2.5
Chlorosulfonated plyethylene	<0.1	<0.1	<0.1	-2.0	-1.5	3.4
Silicone rubber	3.8	0.9	<0.1	10.9	1.9	1.4
Nitrile rubber	<0.1	<0.1	<0.1	-3.2	-2.5	10.6
EPDM	0.1	0.3	<0.1	<0.1	-0.3	2.0

Table7 Effect of ASAHIKLIN AE-3100E on elastomers at the boiling point.

	At boiling point for 5min			At boiling point for 3days		
	Weight change (%)	Linear swell (%)	Extract-ables(%)	Weight change (%)	Linear swell (%)	Extract-ables(%)
Natural rubber	0.2	<0.1	<0.1	-1.4	-1.0	3.6
Urethane rubber	6.4	1.2	<0.1	63.8	16.0	0.1
Isobutylene isoprene rubber	-0.2	<0.1	0.2	-5.6	-1.2	7.1
Chloroprene rubber	<0.1	-0.3	0.4	-4.5	-2.4	6.8
Fluor elastomer	5.7	1.6	<0.1	69.2	21.7	2.3
Chlorosulfonated	<0.1	0.1	0.2	-1.8	-1.1	4.2

plyethylene						
Silicone rubber	5.8	1.3	0.2	18.3	4.3	1.8
Nitrile rubber	0.8	0.2	0.4	-2.0	-1.3	6.2
EPDM	0.2	<0.1	0.2	-0.7	-0.5	1.9

7 Safety

ASAHIKLI AE-3100E is nonflammable. AEL of ASAHIKLIN AE-3000 is 50ppm 8-hrs TWA.

You should refer to the SDS (Safety Data Sheet) .