

Innovative and versatile reaction solvent  
manufactured by Kuraray

**MTHP**

**4-Methyltetrahydropyran**

Product Development Group

Quality Assurance and Product Development Department

Isoprene Chemicals Division

Kuraray Co., Ltd.

# Features of MTHP



- ◆ Good Phase separation from water
- ◆ Higher Boiling Point
- ◆ Good Solvency Power
- ◆ Good stability



THF/H<sub>2</sub>O MTHP/ H<sub>2</sub>O

- ◆ Solvent for
  - ◆ Reaction
  - ◆ Extraction
  - ◆ Polymerization
  - ◆ Coatings

Process Improvement

Solvency Power

Stability

## Product Information

### General Information

- Chemical Name : 4-Methyltetrahydropyran
- Molecular Weight : 100.16 (C<sub>6</sub>H<sub>12</sub>O)
- CAS No. : 4717-96-8
- Package : Pale Can (14kg), Drum (160kg)

### Specifications

- Appearance : Clear Liquid
- Purity (%GC) : > 99.0
- Water (ppm) : < 200
  - Stabilizer : BHT 20ppm

### Regulatory Status

- TSCA : PMN registered with Consent Order
- REACH : Registered (Registered by Kuraray Europe GmbH as importer)
- UN No. : 2924
- HS Code : 2932.99

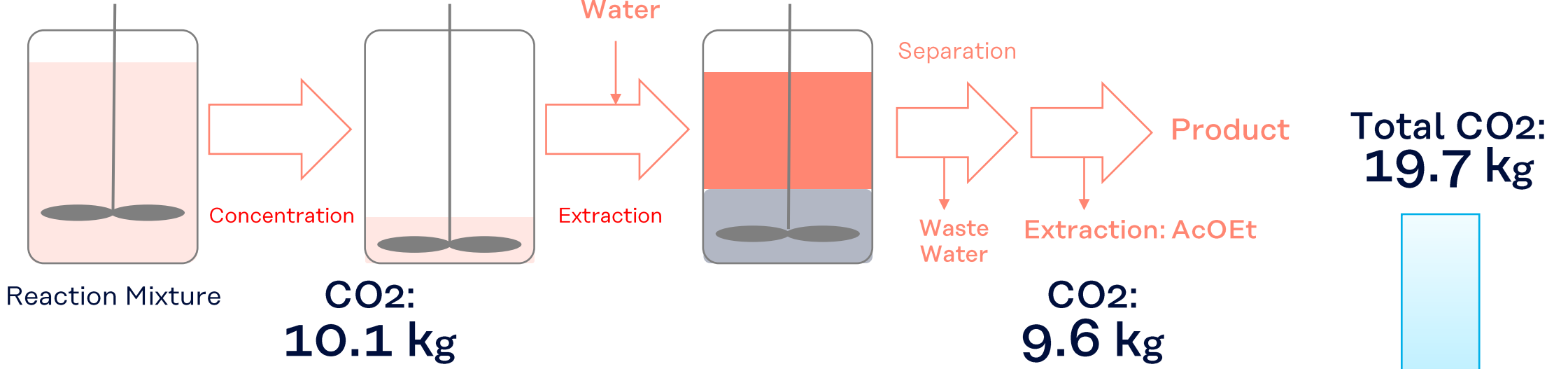
## Physical Properties

	B.P. [°C]	M.P. [°C]	Density (20°C)	Viscosity [cP]	F.P. [°C]	Solubility into Water [wt%]	Solubility into Solvent [wt%]	Azeotropic Point [°C] (H <sub>2</sub> O ratio)	SP Value* [(cal/cm <sup>3</sup> ) ^0.5]
<b>MTHP</b>	<b>105</b>	<b>- 92</b>	<b>0.86</b>	<b>0.78</b>	<b>6.5</b>	<b>1.5</b>	<b>1.4</b>	<b>85 (19wt%)</b>	<b>9.0</b>
THF	65	-109	0.89	0.55	-15	∞	∞	64 (6.0wt%)	9.5
2MTHF	80	-136	0.85	0.60	-11	14	4.4	71 (11wt%)	8.9
CPME	106	-140	0.86	0.55	-1	1.1	0.3	83 (16wt%)	8.4
Toluene	111	- 95	0.87	0.56	4.4		0.05	85 (20wt%)	8.9

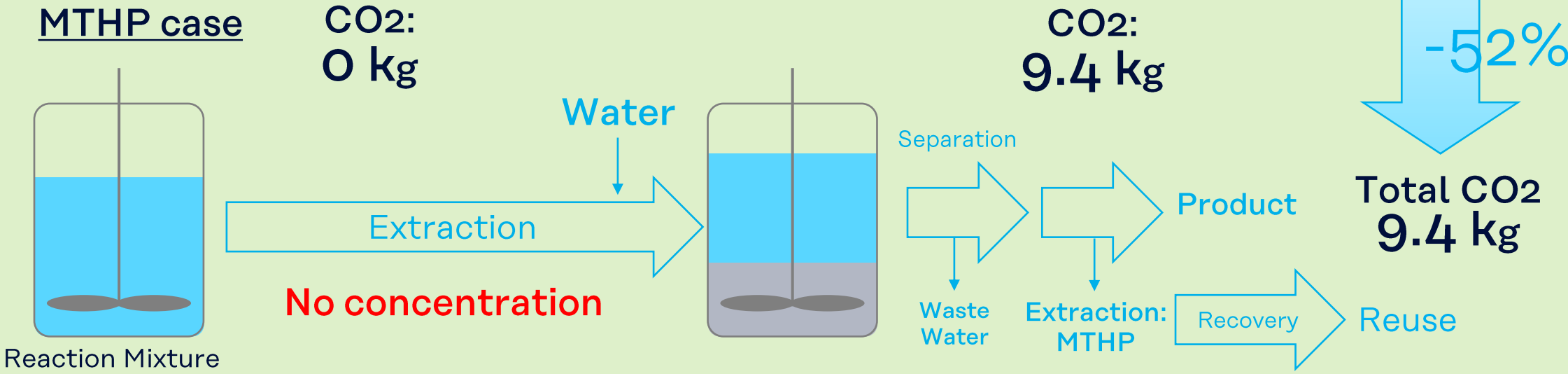
\*Calculated according to “Hansen solubility parameters a user’s handbook 2<sup>nd</sup> edition, CRC Press, ISBN: 0-8493-7248-8”

# Example of Process Improvement and reduction of Carbon footprint

## THF case

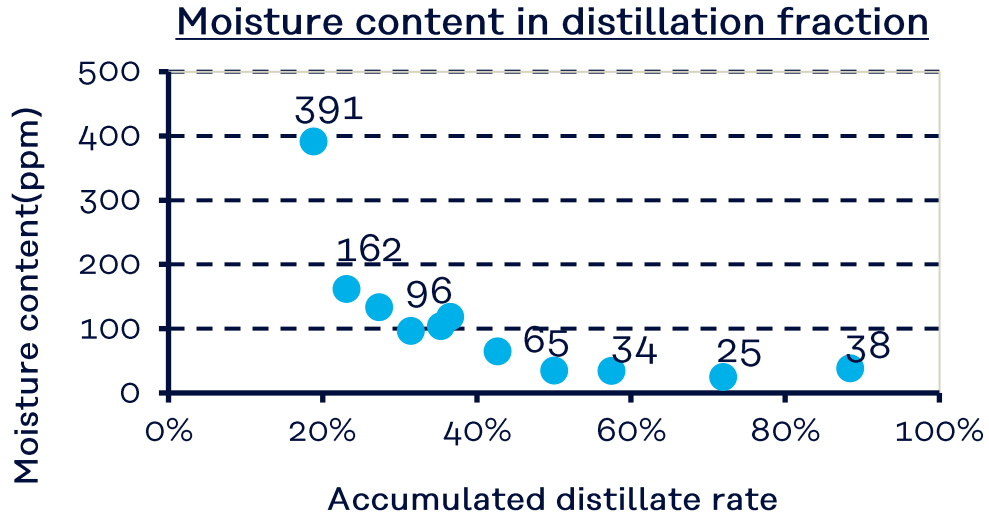


## MTHP case

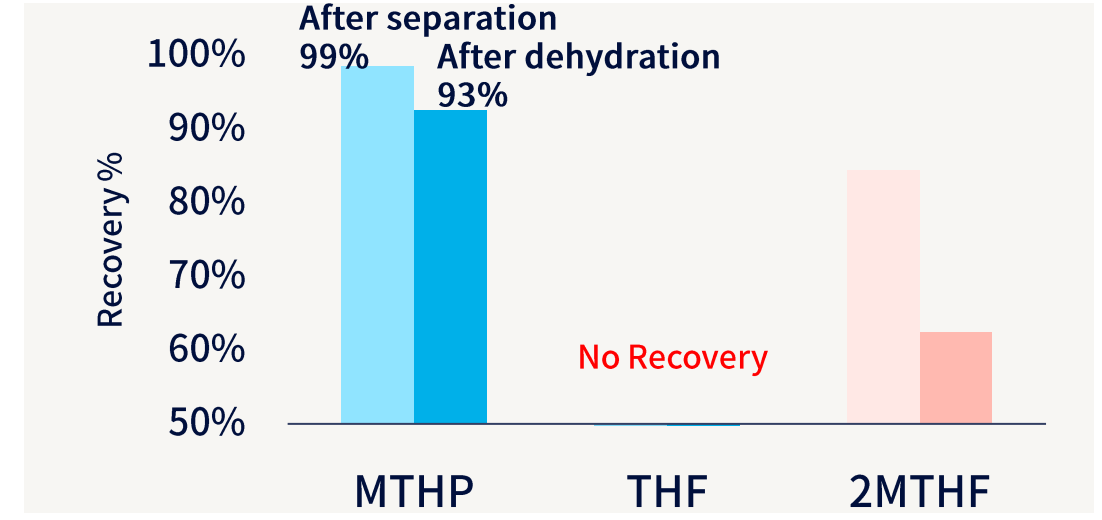
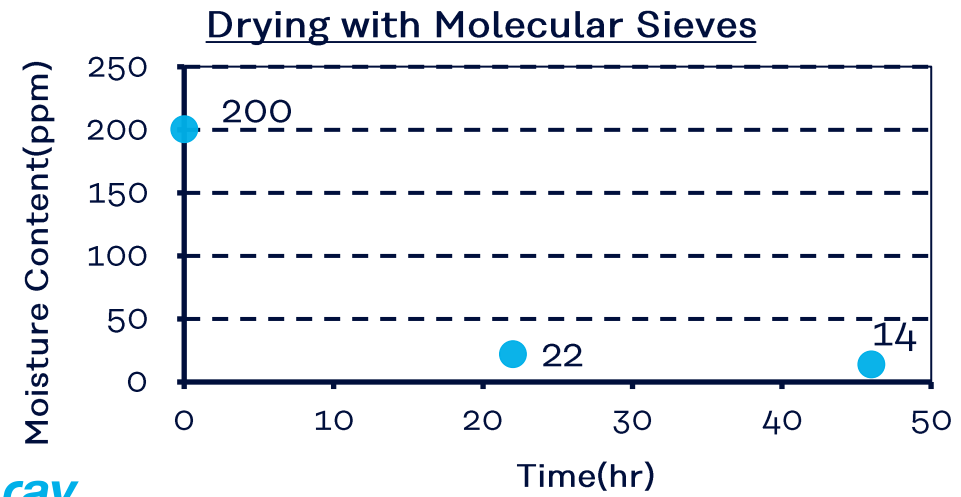
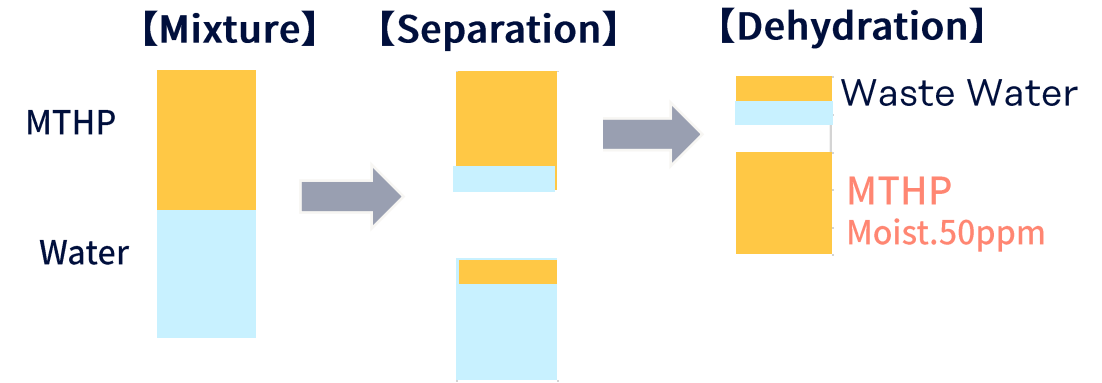


**Process improvement**

- ◆ MTHP can be recovered by simple method and equipment.
- ◆ MTHP can be recovered and reused in a high recovery ratio.



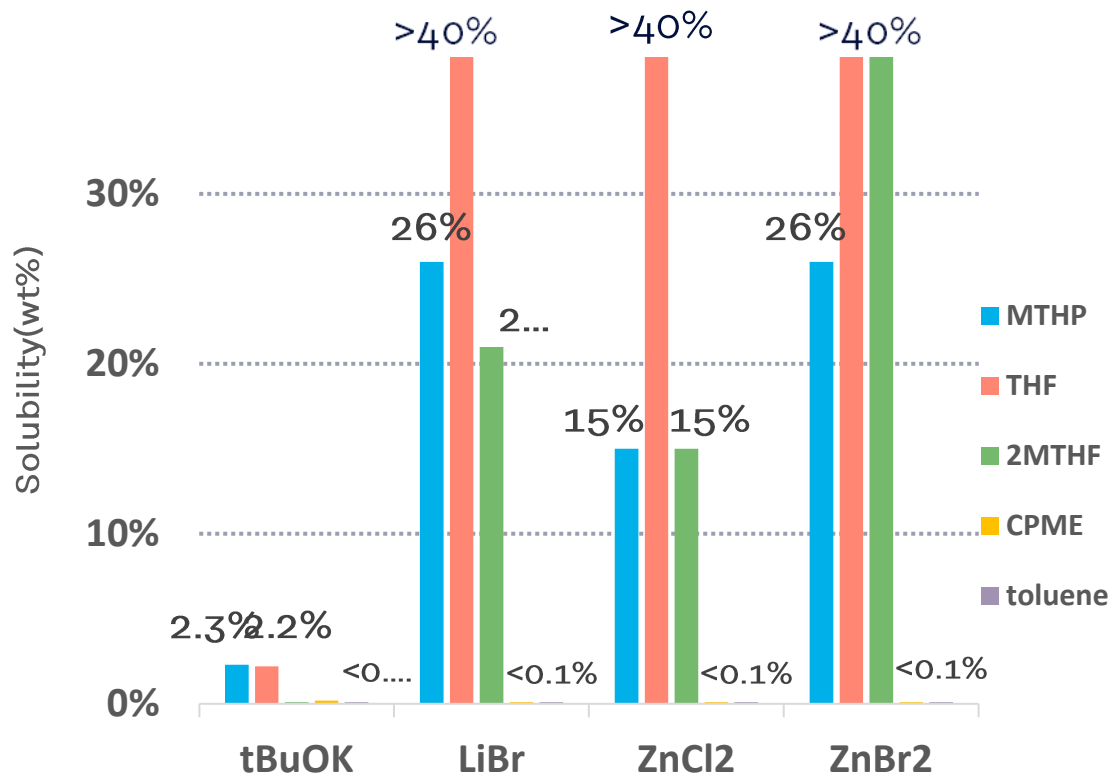
### Recovery of solvent



## Solubility

MTHP has good balance of polarity that allows good compatibility and solvency with broad range of chemicals

### Solubility of Inorganic Salts



<Test Condition>  
 - 10 mL of Solvents  
 - 22°C  
 - Tested in house

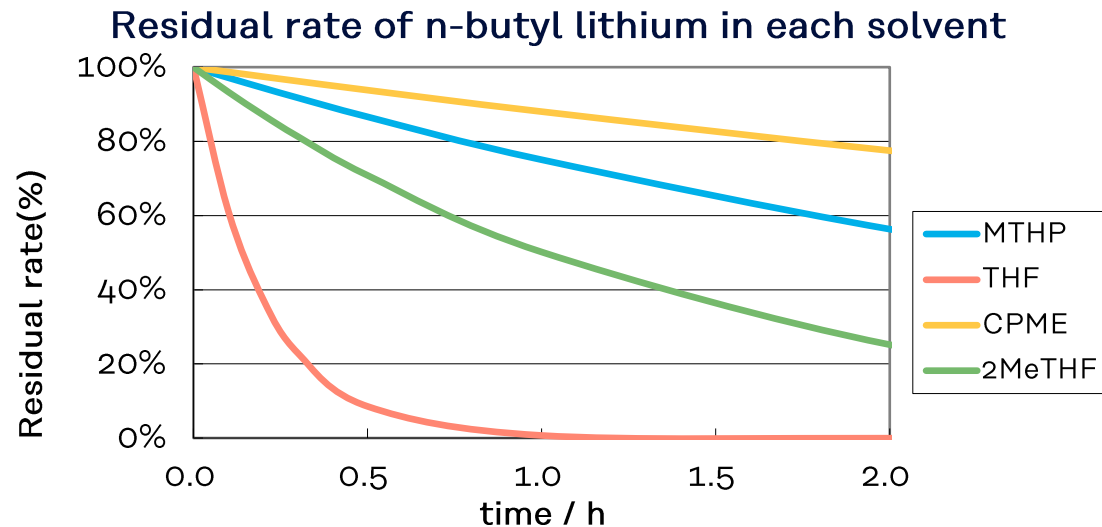
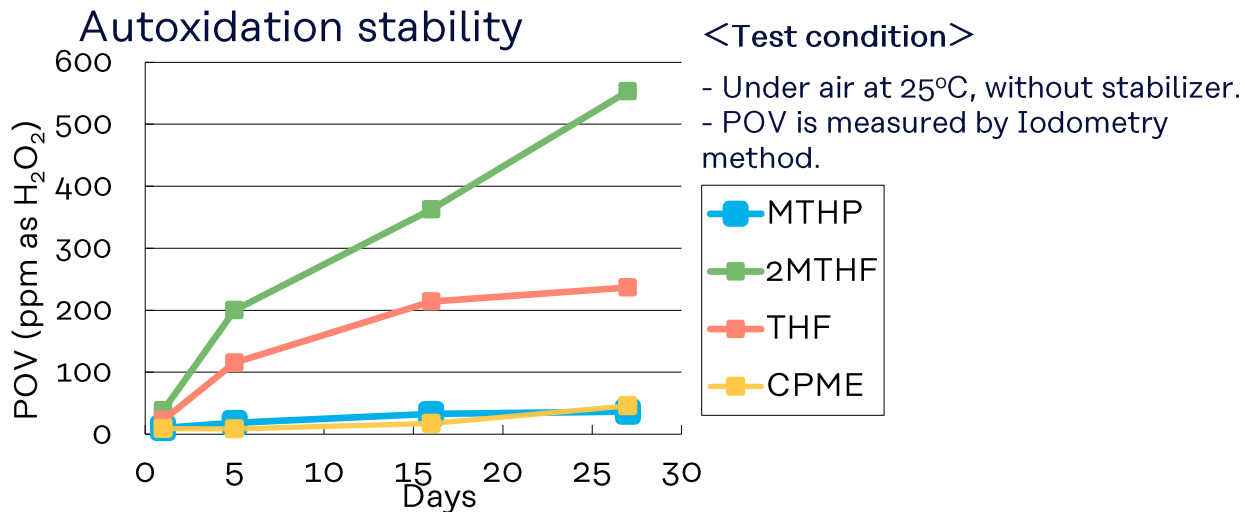
### Solubility of Resins

Resin	MTHP	THF	2MTHF	CPME
ABS	○	○	○	○
Acrylic resin	○	○	○	○
Polystyrene	○	○	○	○
Vinyl chloride (PVC)	○	○	○	△
Polycarbonate (PC)	△	○	○	△
Fluororubber	△	△	○	△
SBR	△	△	○	△
Polyurethane (PU)	△	△	○	△
Butyl rubber	△	×	△	×
Nylon-6	×	×	×	×
Phenol resin	×	×	×	×
Polypropylene (PP)	×	×	×	×
HDPE	×	×	×	×
LDPE	×	×	×	×
Teflon	×	×	×	×

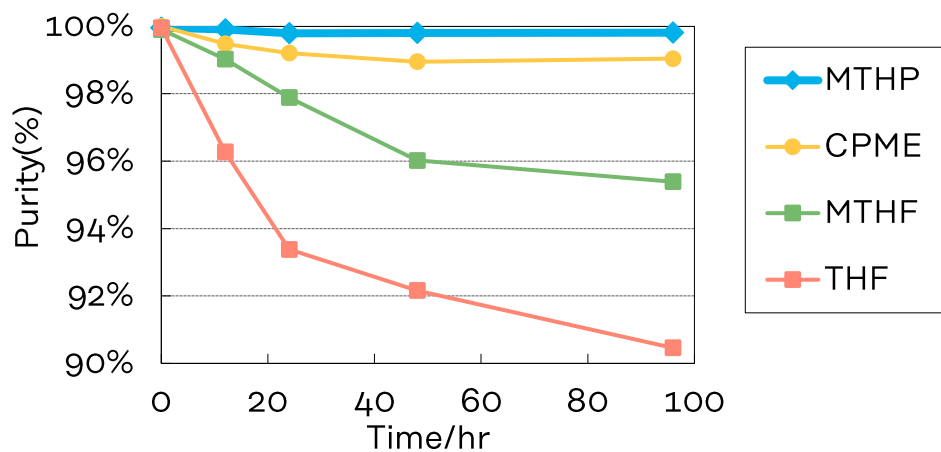
Test panel of resin was dipped into each solvent at 50°C for 7days.  
 After being dipped, size was measured and increasing rate was calculated.  
 ○ : dissolved more than 100%, △ : from 30% to 100%, × : less than 30%

# Stability

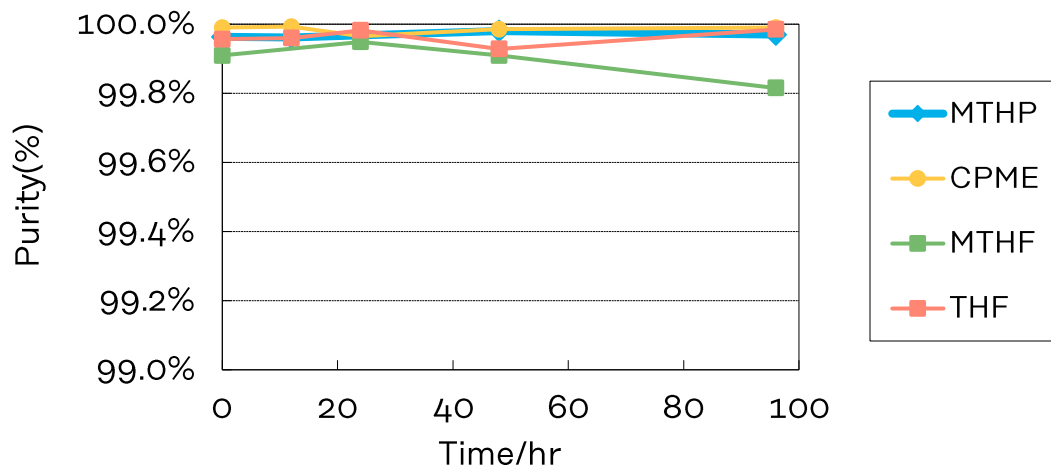
- ◆ MTHP is stable to oxidation
- ◆ MTHP can be used under severe Conditions



Acid condition : 20%HCl/Solvent=1:1(wt.) @50°C



Basic Condition : 20%NaOH/Solvent=1/1(wt.) @50°C





## Reaction Examples

- ❑ Grignard reaction
- ❑ Organometallic reaction
- ❑ Dehydration condensation : esterification, acetalization
- ❑ Wittig reaction
- ❑ Reduction reaction
- ❑ Oxidation reaction
- ❑ Suzuki-Miyaura coupling
- ❑ Olefin metathesis
- ❑ Halogenation, Dehalogenation
- ❑ Michael addition
- ❑ Protecting group

## Regulation Status

Government Inventory list	Status	Remarks
Existing and New Chemical Substances (Japan)	Present	
EU-REACH	Registered	Registrant : Kuraray Europe GmbH (Importer) Tonnage Band : 10-100 MT
TSCA (USA)	Will be listed	PMN (content order)
IECSC (China)	Will be listed	Applied 1-10 MT
K-REACH (Korea)	Registered	OR registration Tonnage Band : 10-100 MT

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