

# MMB for Liquid Detergents

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# Applications & Benefits of MMB

	Benefits					
Application	Stabilize & lower viscosity of conc. Formulation	Dilute conc. Formulation smoothly with cold water	Improve cleaning performance	Stable against alkali	Stabilize Cationic surfactant solution	Stable against peroxide
Unit Dose Laundry Detergent	✓	✓		✓		
Concentrated Laundry Detergent	✓	✓		✓		
All Purpose Cleaner			✓	✓		
Fabric Softener					✓	
Bleach						✓
Dilution of surfactants with water in the process of production of detergents	MMB allows dissolution of nonionic surfactants with water in shorter period of time					
Detergents Contains Enzymes	MMB has less damage on activity of Enzymes					

## What's Concentrated liquid detergent

Liquid detergent high in surfactant content and low in water content.

## Benefits of concentrated detergent

- Allow smaller package and lighter weight
  - Reduce Cost of Transportation and Storage
  - Reduce environmental impacts by plastic package
- Allow smaller number of times of Rinse in laundry
  - You can save water and time of rinse
  - Because the detergent is highly soluble with water



# Key factors for Concentrated liquid detergent

## In the process of Manufacturing

- Smooth dilution of surfactants in water
- Low in viscosity of the formulation
- Stable in formulation / no phase separation / precipitation

## In the process of Use

- Smooth dilution with water



MMB contributes to solve all the issues above.

- Nonionic surfactant solutions 6
  - Dissolving time
  - Viscosity
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  - Stability against oxidation
  - Anti-freezing effect
  - Stability against Alkali
  - Abbreviation



# Dissolving time

## Nonionic surfactants with water

Surfactant-1 : POE(6) lauryl ether, HLB = 12.1

	No.1	No.2	No.3
Ingredients	Content (wt%)		
Surfactant	35	35	35
PG	0	6	0
<b>MMB</b>	0	0	<b>6</b>
water	65	59	59
<b>Dissolving time (min)</b>	<b>9.5</b>	<b>2.5</b>	<b>1</b>

Surfactant-2 : POE(5) lauryl ether, HLB = 10.5

	No.4	No.5	No.6
Ingredients	Content (wt%)		
Surfactant	35	35	35
PG	0	6	0
<b>MMB</b>	<b>0</b>	<b>0</b>	<b>6</b>
water	65	59	59
<b>Dissolving time (hrs)</b>	<b>&gt; 4</b>	<b>&gt; 4</b>	<b>1</b>

### Test Method

- Water
- Solvent

Room temp.

- Nonionic Surfactant

Opaque

Transparent



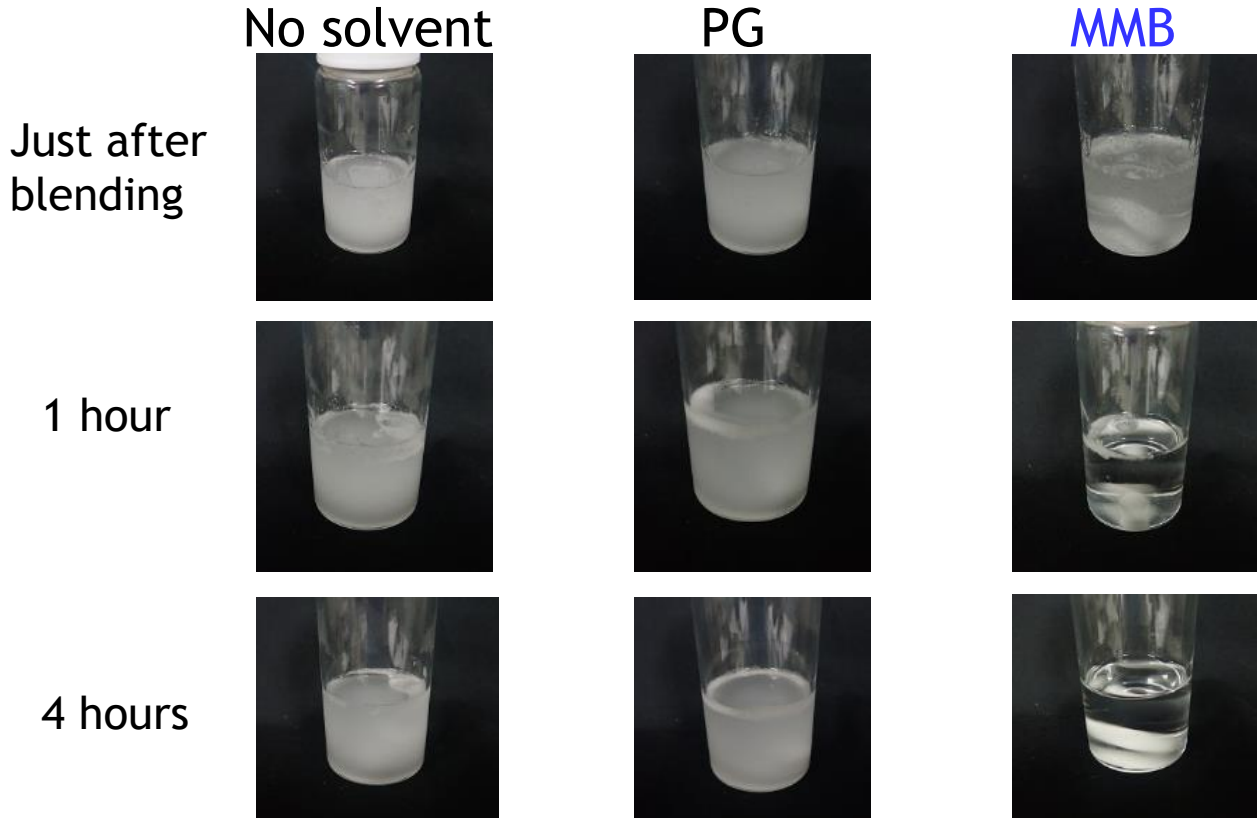
Dissolving time  
was measured

MMB dissolves nonionic surfactants in water in shorter period of time.  
→ MMB improves productivity of detergents.

# Dissolving time

## Nonionic surfactants with water

Surfactant-2 : POE(5) lauryl ether, HLB = 10.5



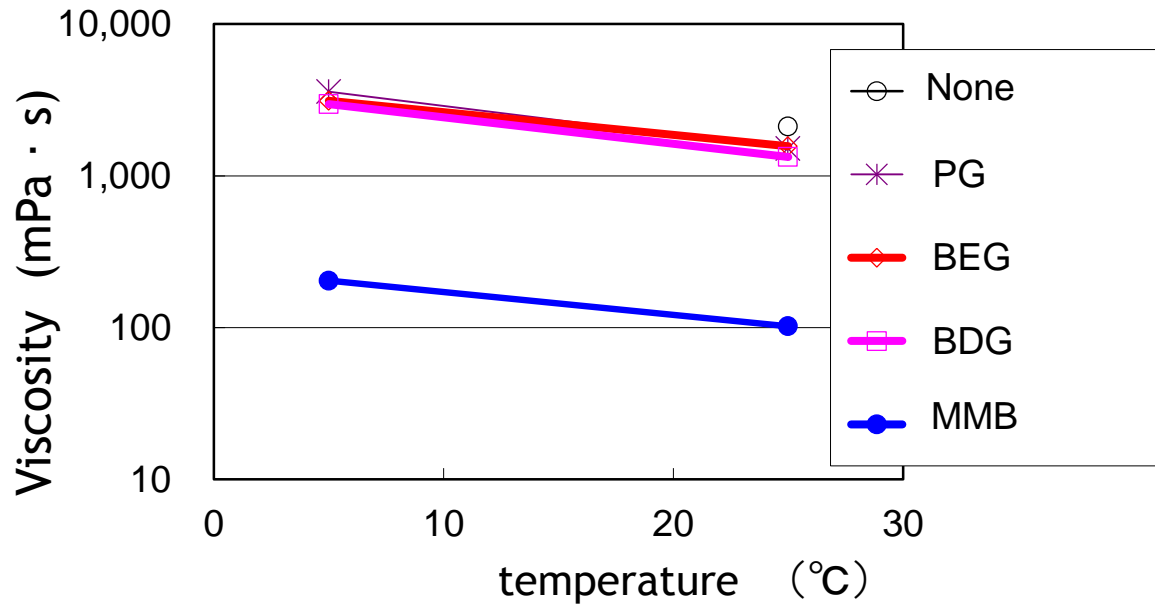
MMB dissolves nonionic surfactants in water in shorter period of time.  
→MMB improves productivity of detergents.

# Viscosity Nonionic surfactant solution

## Formulation

Nonionic surfactant POE(8) Lauryl ether	60 wt%
<b>Solvent</b>	<b>8 wt%</b>
Water	32 wt%

## Results



MMB system was the lowest in viscosity.



# Appearance at low and high temperature Nonionic surfactant solution

## Formulation

Nonionic surfactant POE(8) Lauryl ether	60 wt%
<b>Solvent</b>	<b>8 wt%</b>
Water	32 wt%

2°C (36F)



PG

BEG

BDG

MMB

Cloudy

50°C (122F)



PG

BEG

BDG

MMB

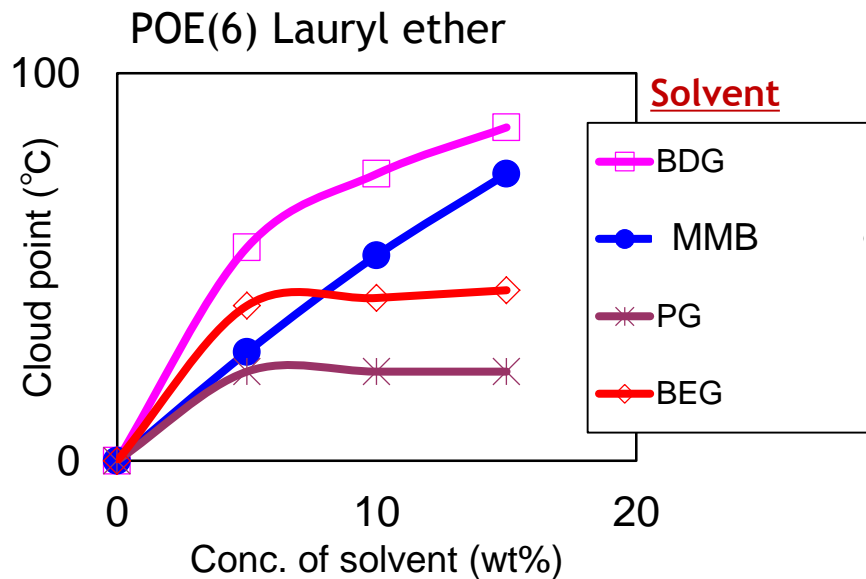
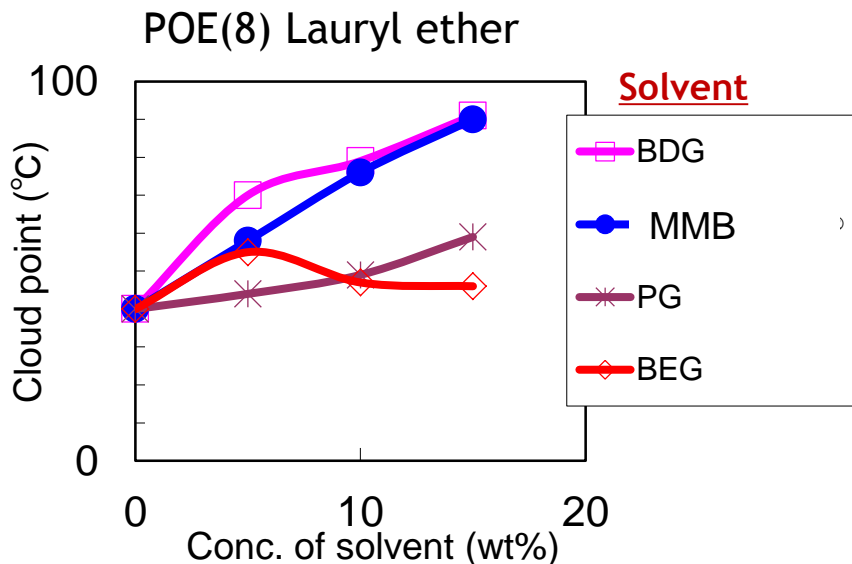
MMB system was stable both at low and high temperature.

# Cloud point Nonionic surfactant solution

## Formulation

Nonionic surfactant	1 wt%
Solvent	0 to 15 wt%
water	rest

## Results



MMB raised cloud point.

→ MMB allows high temperature use and storage of detergents.

# Viscosity

## concentrated Laundry detergent formulation

### Formulation

Source : **LEITAT** Technological Center  
managing your technologies member of TECNIO

Dehydol LT7	Nonionic surfactant	24 wt%	} Surfactant 45 wt%
Petresul 550	Anionic surfactant	14 wt%	
Texapon N70	Anionic surfactant	7 wt%	
Palmiste	Fatty acid	10 wt%	
Monoethanol amine	neutralizer	7 wt%	
Sodium citrate	Detergent acid	1 wt%	
Sokalan HP25	Soil dispersing	0.45 wt%	
Acticide BB	Preservative	23 ppm	
<b>Solvent</b>		<b>15 wt%</b>	
Water		Rest	

### Viscosity

<b>Solvent</b>	<b>PG</b>	<b>BDG</b>	<b>Ethanol</b>	<b>MMB</b>
Viscosity (mPa · s, 20°C)	127	123	52	52

MMB system was the lowest in viscosity.

# Dissolving time concentrated formulation with cold water

## Test Method

Concentrated formation 0.1g

POE(6)Lauryl ether	35wt%
LAS	10wt%
Sodium myristate	5wt%
Mono ethanol amine	5wt%
<b>Solvent</b>	<b>10wt%</b>
Water	35wt%

Cold water 100mL

stirred at 5°C



Dissolving time was measured.

Transparent solution

<u>Solvent</u>	None	PG	BEG	Ethanol	BDG	MMB
Time [sec.]	810	150	120	90	80	60

MMB system was the lowest in dissolving time.

# Viscosity

## Anionic surfactant solution

### Formulation

LAS	20 wt%
Solvent	16 wt%
Water	64 wt%

### Appearance and Viscosity

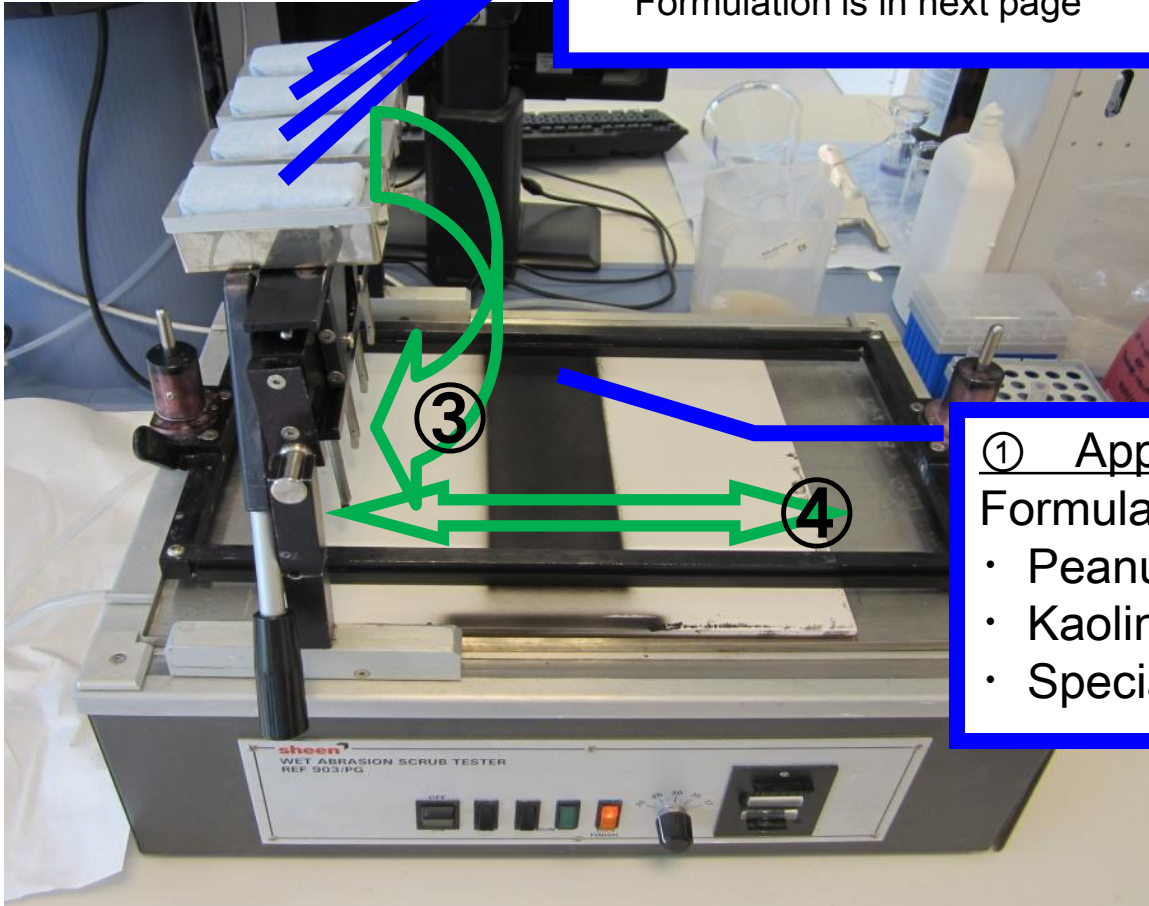
Condition	None	PG	BEG	BDG	DPM	MMB
0°C(32F)	Precipitation	Precipitation	Low	Low	Precipitation	Low
20-25°C(68-77F)	Precipitation	Low	Low	Low	Low	Low

MMB had good compatibility with anionic surfactant.

# Cleaning performance

## All purpose cleaner

### Test Method



② Apply All purpose cleaner formulations on the clothes  
Formulation is in next page

① Apply stain on white-tile  
Formulation of stain

- Peanut oil (75 wt%)
- Kaolin (23 wt%)
- Special Black ( 2 wt%)

Multi-track scrub tester with cloth holder

# Cleaning performance

## All purpose cleaner

Source : **LEITAT** Technological Center  
managing your technologies member of TECNIO

### Formulation

Ingredient	note	CAS#	wt%
Dehydol LT7	nonionic surfactant	68213-23-0	1.5
Petresul 550	anionic surfactant	85536-14-7	9
Palmiste	C16 fatty acid	57-10-3	1
EmulanHE50	nonionic emulsifier	112-25-4	2
Sodium carbonate	neutralizer	497-19-8	0.5
Sodium hydroxide	neutralizer	1 310-73-2	Adj. pH=11
Acticide BB	preservative	55965 - 84 - 9	0.0023
Ethanol/BDG/BEG/MMB <b>Solvent</b>			4~1
Water			82~85
			(balance to 100%)

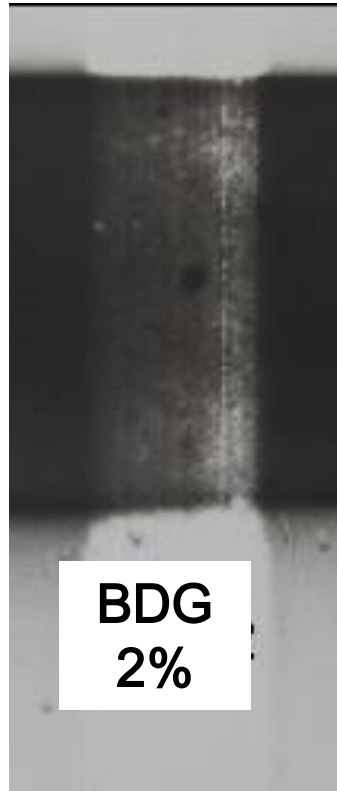
Results

Source : **LEITAT** Technological Center  
managing your technologies member of **TECNIO**

Solvent



**Ethanol**  
4%



**BDG**  
2%



**BEG**  
2%



**MMB**  
1%

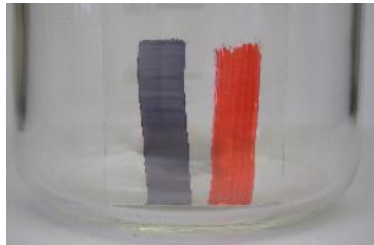
MMB system was the best in cleaning performance  
Even dosage of MMB was the smallest in the detergent formulation.



# Cleaning performance combination with other solvents for All purpose cleaner

**Permanent marker  
on Glass plate was soaked in solvents**

Before



Formulation	1min	After 10 min	Result
d-Limonene (100%)			not completely removed
d-Limonene / MMB (80% / 20%)			not completely removed
d-Limonene / MMB (50% / 50%)			<b>completely removed in 1min</b>
d-Limonene / MMB (20% / 80%)			completely removed in 7 min
MMB (100%)			not completely removed



Combination of hydrocarbon and MMB showed better performance.

# Damage on activity of Enzymes by MMB solutions

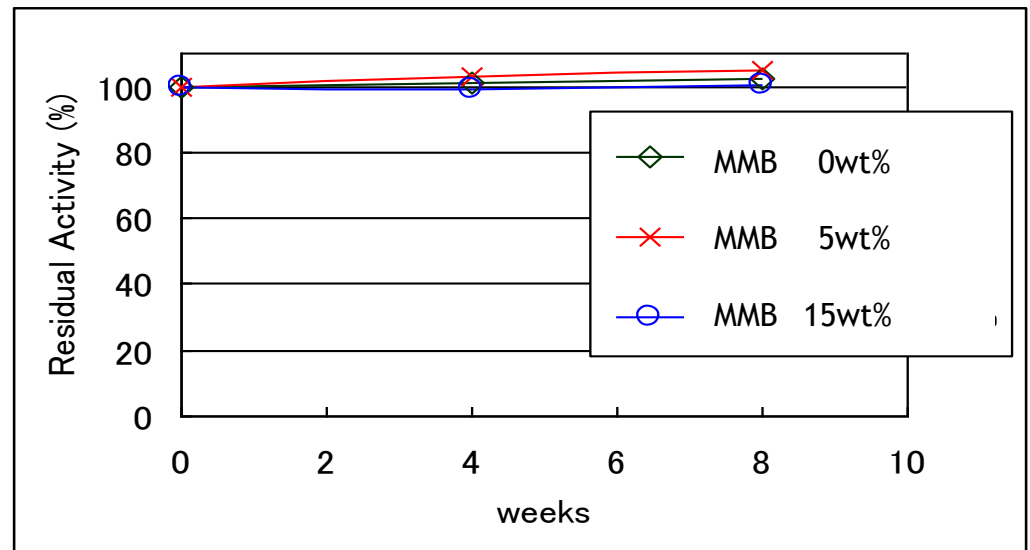
Protease (protein soil removal enzyme)

## Formulation

Liquanase 2.5L	<1wt%
Calcium chloride	1wt%
PG	25wt%
Sodium formate	5wt%
MMB	0,5,15wt%
Water	rest

Condition 30°C (86F)

※conducted by Novozymes



MMB did not inhibit the activity of protease

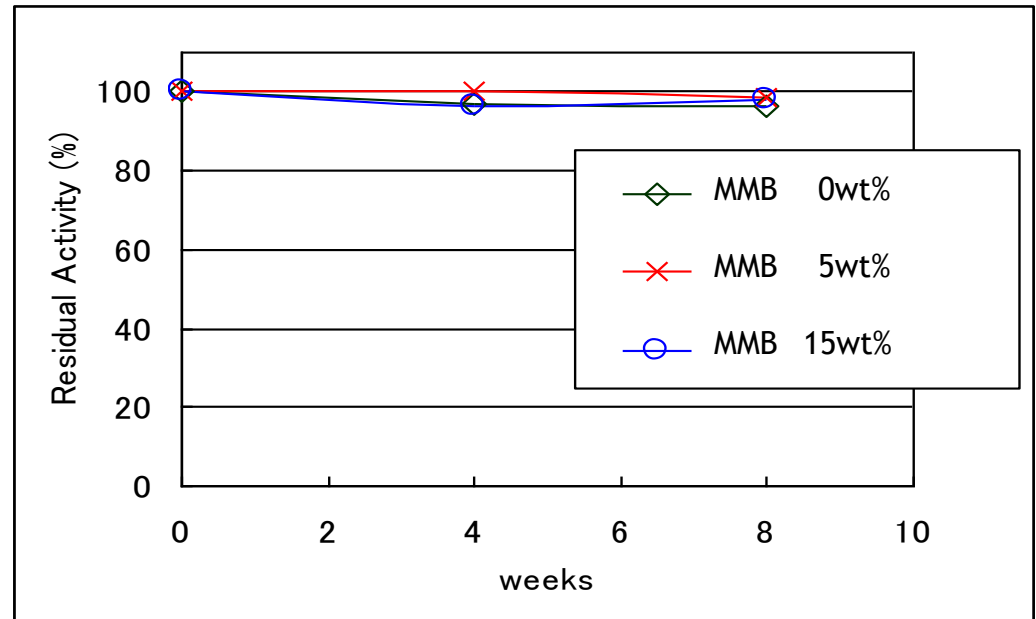
## Amylase (starch soil removal enzyme)

### Formulation

Stainzyme 12L	<1wt%
Calucium chloride	1wt%
PG	25wt%
Sodium formate	5wt%
MMB	0,5,15wt%
Water	rest

Condition 30°C (86F)

※conducted by Novozymes



MMB did not inhibit the activity of amylase

# Damage on activity of Enzymes by Landry detergent formulation with different solvents

## Protease (protein soil removal enzyme)

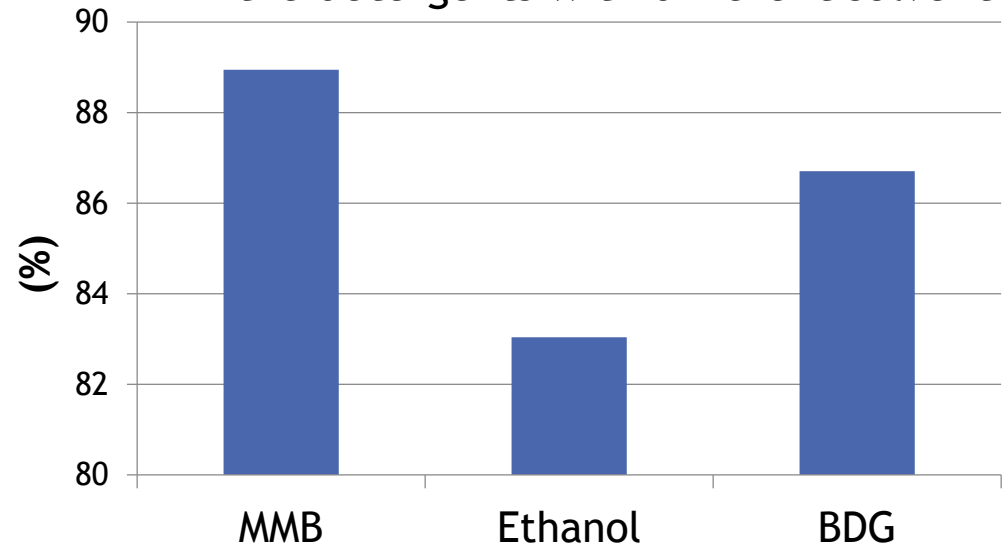
### Formulation

	wt%
27% SUNNOL LMT-1430(AES)	37.0
Dodecylbenzenesulfonic Acid	5
90% LEOFAT LA-110M-90R(MEE)	33
Emulgen 108	5
Monoethanolamine	2
Lauric acid	2
Sokalan HP25	1.2
PPG4000	0.5
Sodiumu lactate	0.5
Sodium benzoate	0.3
Para-toluenesulfonicacid	0.2
Calcium chloride	0.01
Solvent	6
Alcalase 2.5L	0.3
Water	6.99

### Condition

37°C (99F) 1 week

Residual activity of enzyme  
in the detergents with different solvent



Evaluate the activity by measuring the absorbance of Tyrosine released by decomposition of protein

MMB gave less damage on activity of protease.


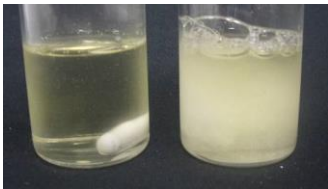
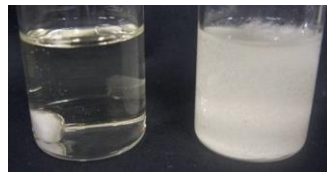

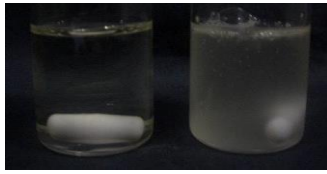
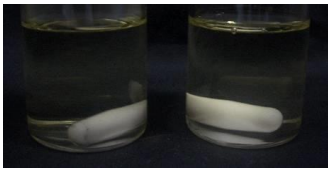
# Stability of Cationic surfactant solutions

## Test

Mixed surfactant solution & MMB or PG. Observed each appearance after 24 hours at low ~ high temperature.

## Formulation

	Wt%
Cationic Surfactant	44
Solvent (MMB or PG)	20
Water	36

	Cationic surfactant -1 Ester type	Cationic surfactant - 2 Amiide type
Low temp 2°C	 MMB PG	 MMB PG
Room temp	 MMB PG	 MMB PG
High temp 50°C	 MMB PG	 MMB PG

MMB system was better in stability of cationic surfactant solution

# Viscosity

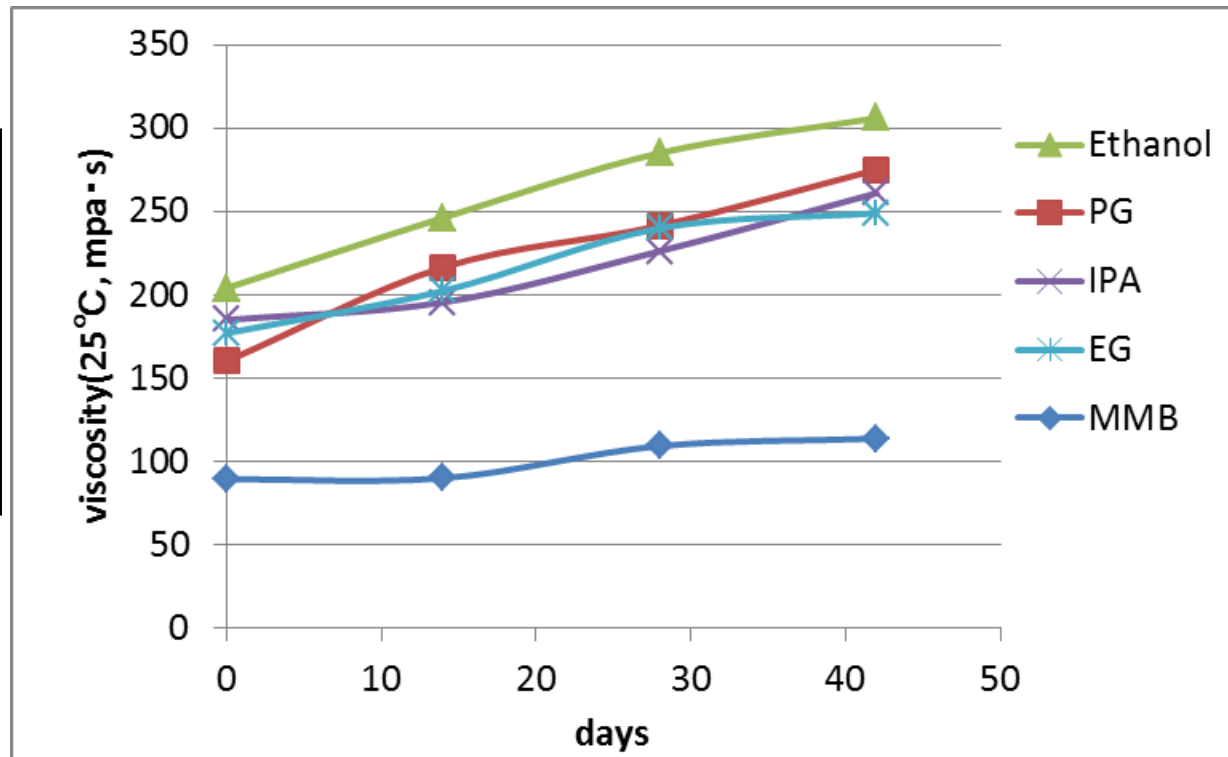
Fabric softener formulations with different solvents

## Formulation

	Wt%
Cationic Surfactant	10
Fragrance	2
Solvent	1
CaCl <sub>2</sub>	0.1
Water	86.9

## Condition

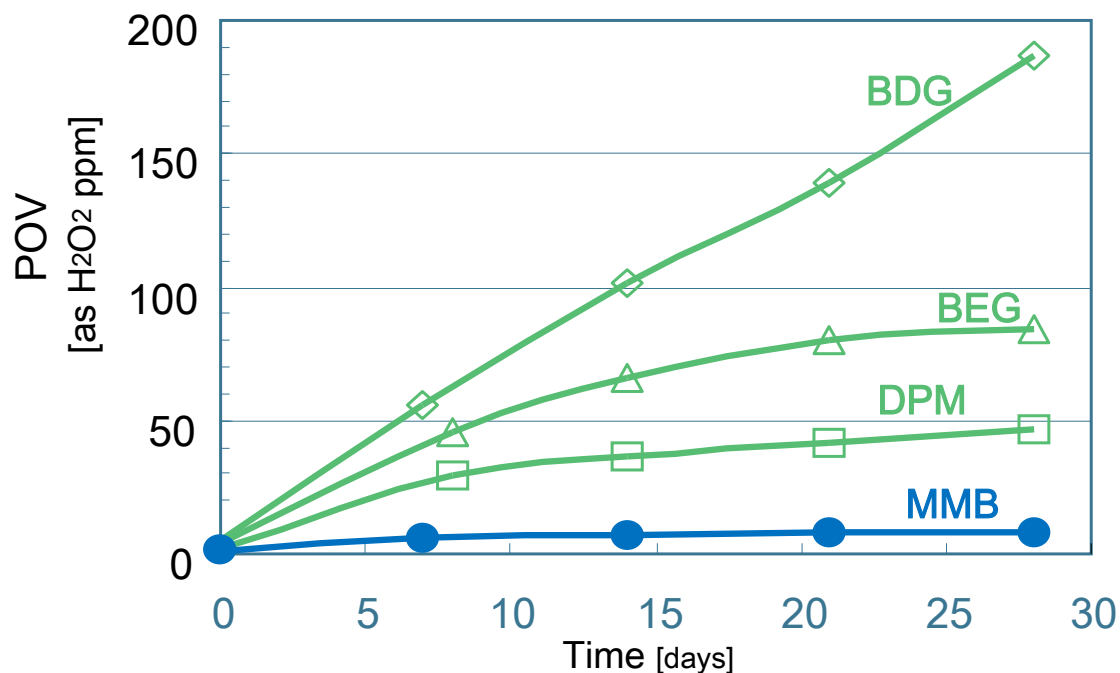
50°C (122F)



MMB system kept viscosity in low level.

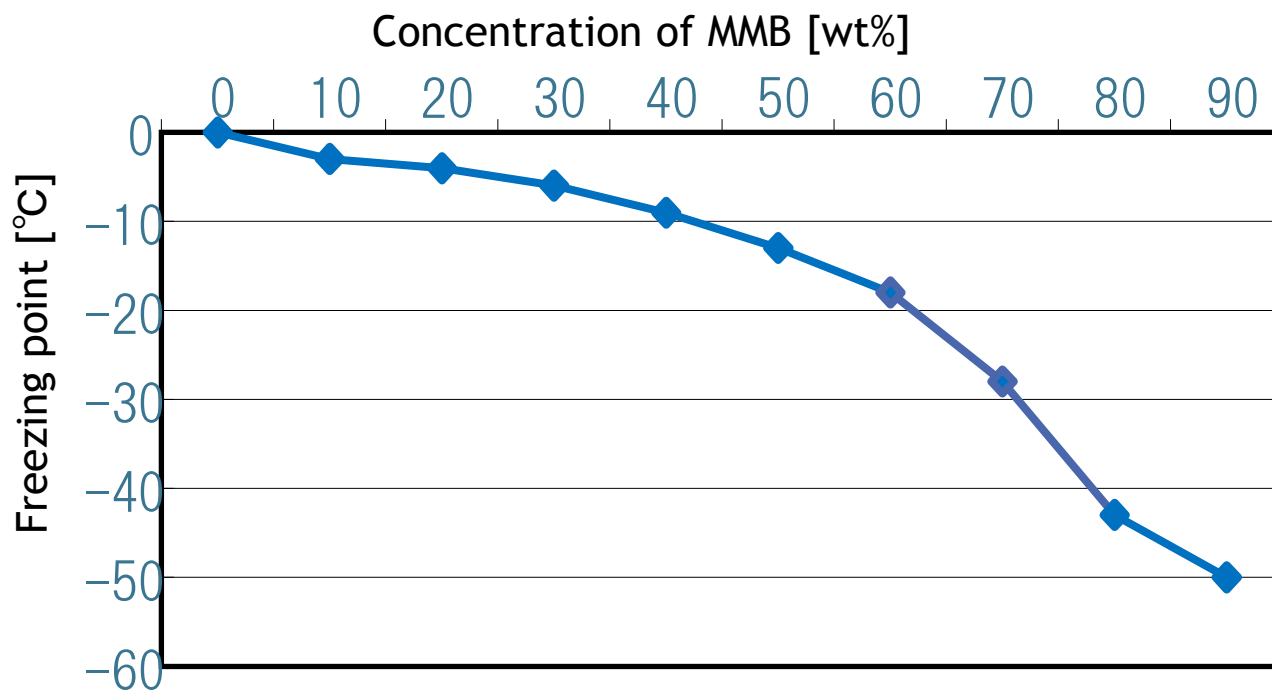
## Test Method

Each solvent (150g) was charged to 300ml tall beaker.  
 The beakers were put on laboratory table  
 Under 18 to 22°C, 30 to 90RH%.  
 POV, Peroxide value, of each solvent was measured.



MMB is stable against Oxidation / Peroxide

# Freezing point MMB solution



MMB works as a anti-freezing agent

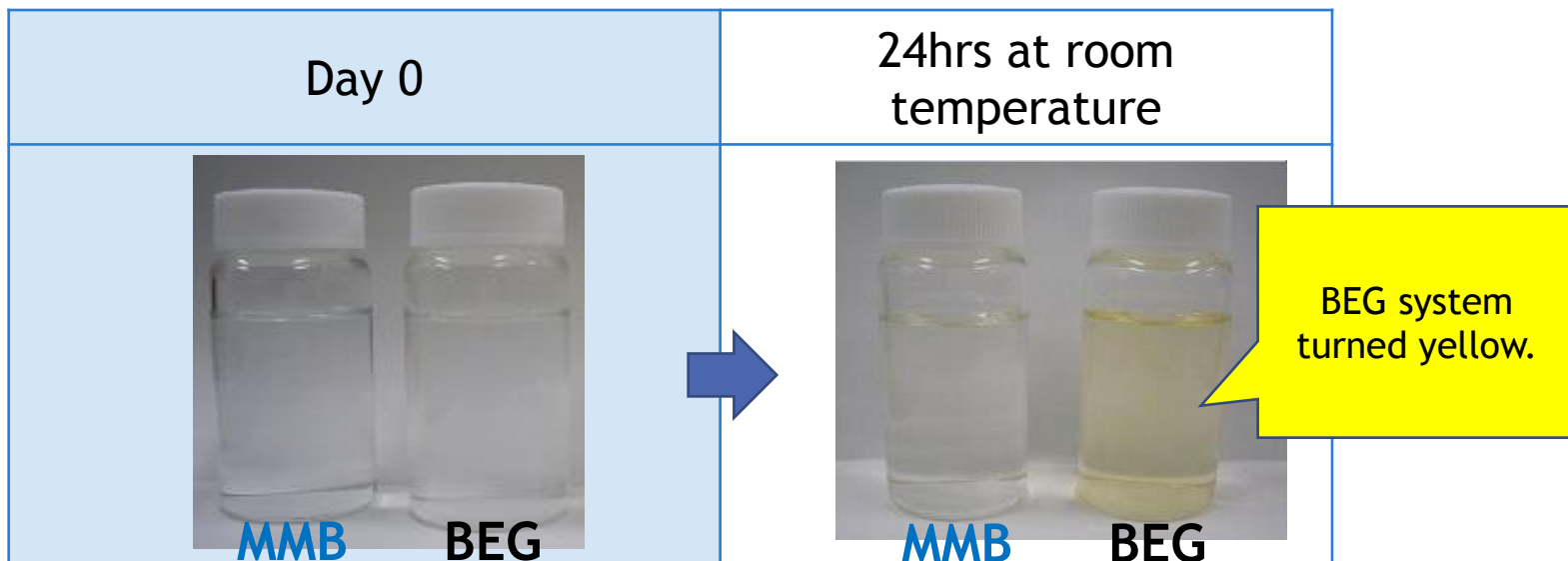


# Stability against alkali pH=14

## Formulation

<b>Solvent</b>	<b>12wt%</b>
POE(10)nonylphenyl ether	5wt%
LAS	10wt%
EDTA-Na	0.2wt%
Calcium hydroxide	<1wt%
Water	Rest

## Appearance



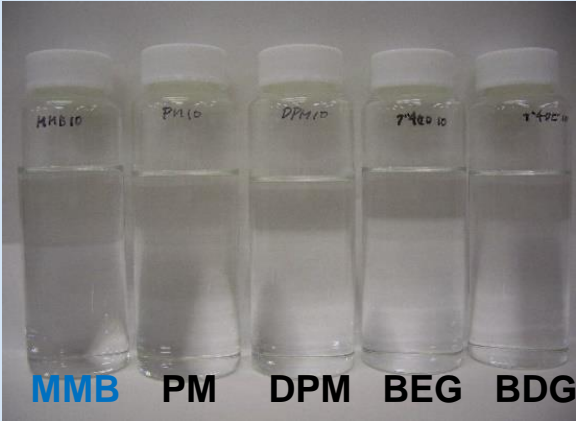
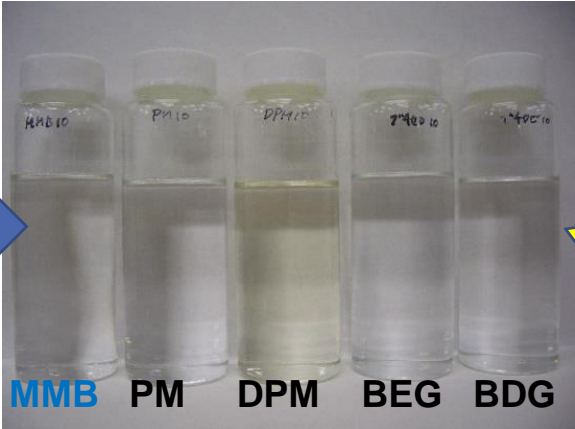
MMB system was stable against Alkali.

# Stability against alkali pH=10

## Formulation

Solvent	50g
carbonate buffer (pH=10)	50g

## Appearance

Day 0	50°C、 after 4week
 <p>MMB PM DPM BEG BDG</p>	 <p>MMB PM DPM BEG BDG</p> <p>DPM system turned yellow.</p> <p>Decomposition of solvents were detected except MMB.</p>

MMB system was stable against Alkali.

PG... Propylene Glycol

BEG... Ethylene Glycol Monobutyl Ether = EB in USA

BDG... Diethylene Glycol Monobutyl Ether = DB in USA

DPM... Dipropylene Glycol Methyl Ether

PM... Propylene Glycol Methyl Ether

POE... Polyoxyethylene

LAS... Linear Alkylbenzene Sulfonate

Merci

Danke schön

**Thank you !!**

Cam on

Gracias

Grazie

謝謝

Obrigado

고맙습니다

ขอบคุณ ครับ

Terima kasih

ありがとうございました