



*Bringing New Value To Chemicals*

Kao's natural fatty alcohols

**KALCOL**

**GLYCERIN**

Kao's quality KALCOL products are made from natural fats and oils using state-of-the-art technology.

## Natural fats and oils



**Coconut trees**



**Coconuts**  
(About 25 to 30cm in size)



**Palm trees**



**Palm nuts**  
(About 4 to 5cm in size)

## Our innovative plants



**Pilipinas Kao Incorporated (Philippines)**



**Fatty Chemicals (Malaysia) Sdn. Bhd.**  
(Malaysia)

Kao's KALCOL product series consists of a variety of alkyl compositions, some of which are solid at normal temperature in granulated form for easy handling. The high quality of each KALCOL product results in the production of surfactants with superior characteristics. These advantages expand utilization of KALCOL in both direct and use as derivatives. Fatty Chemical (Malaysia)'s and Pilipinas Kao's alcohol and glycerin are recognized as KOSHER grade.

## Kao's fatty alcohols **KALCOL**

### Direct Use

|                      |                                         |
|----------------------|-----------------------------------------|
| Plastics             | Additives for polymerization, lubricant |
| Synthetic leather    | Softener                                |
| Shampoo & hair rinse | Base oil                                |
| Ointment & cream     | Base chemicals                          |
| Metals               | Metal rolling agent                     |
| Agrochemicals        | Plant growth regulators                 |

### Derivatives

|                      |                                                                                                     |
|----------------------|-----------------------------------------------------------------------------------------------------|
| Alkyl sulfate        | Detergent, shampoo, dentifrice, emulsifier, scouring and soaping agent for textile, etc.            |
| Alkyl phosphate      | Lubricant for textile processing, antistatic agent, etc.                                            |
| Alkyl etoxylate      | Detergent, shampoo, Lubricant for textile processing, etc.                                          |
| Alkyl dimethyl amine | Intermediate for dye leveling agents, hair rinse, germicide, chemicals for textile processing. etc. |
| Alkyl phthalate      | Plasticizer for plastics.                                                                           |
| Alkyl polyacrylate   | Additive for lubricant.                                                                             |

# 1. List of products

## 1-1 Single cut fatty alcohol

| Product Name | Description                           | Appearance at 25°C              | Alkyl composition (%) |                 |                 |                 |                 |                 |
|--------------|---------------------------------------|---------------------------------|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|              |                                       |                                 | C <sub>8</sub>        | C <sub>10</sub> | C <sub>12</sub> | C <sub>14</sub> | C <sub>16</sub> | C <sub>18</sub> |
| KALCOL 0898  | Caprylyl alcohol<br>(n-Octyl alcohol) | Clear liquid                    | 98 min.               | —               | —               | —               | —               | —               |
| KALCOL 1098  | Capryl alcohol<br>(n-Decyl alcohol)   | Clear liquid                    | —                     | 98 min.         | —               | —               | —               | —               |
| KALCOL 2098  | Lauryl alcohol                        | Colorless liquid to white solid | —                     | —               | 98 min.         | —               | —               | —               |
| KALCOL 4098  | Myristyl alcohol                      | White solid                     | —                     | —               | —               | 98 min.         | —               | —               |
| KALCOL 6098  | Cetyl alcohol                         | White beads or solid            | —                     | —               | —               | —               | 98 min.         | —               |
| KALCOL 8098  | Stearyl alcohol                       | White beads or solid            | —                     | —               | —               | —               | —               | 98 min.         |

| Product Name       | Color (APHA) | Hydroxyl value | Acid value | Saponification value | Iodine value | Melting point (°C) | Moisture (%) | CO (mg/kg) |
|--------------------|--------------|----------------|------------|----------------------|--------------|--------------------|--------------|------------|
| <b>KALCOL 0898</b> | 10 max.      | 424 - 432      | 0.03 max.  | 0.3 max.             | 0.1 max.     | —                  | 0.1 max.     | 100max.    |
| <b>KALCOL 1098</b> | 10 max.      | 345 - 355      | 0.03 max.  | 0.3 max.             | 0.1 max.     | —                  | 0.1 max.     | 100max.    |
| <b>KALCOL 2098</b> | 10 max.      | 298 - 304      | 0.03 max.  | 0.2 max.             | 0.1 max.     | 23.5 - 26.5        | 0.1 max.     | 100max.    |
| <b>KALCOL 4098</b> | 10 max.      | 258 - 264      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 37 - 40            | 0.1 max.     | 100max.    |
| <b>KALCOL 6098</b> | 10 max.      | 228 - 235      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 49 - 52            | 0.1 max.     | 100max.    |
| <b>KALCOL 8098</b> | 10 max.      | 205 - 209      | 0.03 max.  | 0.2 max.             | 0.1 max.     | 58 - 62            | 0.1 max.     | 100max.    |

## 1-2 Blended fatty alcohol

| Product Name       | Description                                | Appearance at 25°C              | Alkyl composition (%) |                 |                 |                 |                 |                 |                 |                 |
|--------------------|--------------------------------------------|---------------------------------|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                    |                                            |                                 | C <sub>8</sub>        | C <sub>10</sub> | C <sub>12</sub> | C <sub>14</sub> | C <sub>16</sub> | C <sub>18</sub> | C <sub>20</sub> | C <sub>22</sub> |
| <b>KALCOL 2455</b> | C <sub>12</sub> - C <sub>16</sub> Alcohols | Colorless liquid to white solid | 3 max.                |                 | 50 - 60         | 30 - 40         | 10 max.         |                 | —               | —               |
| <b>KALCOL 2463</b> | C <sub>12</sub> - C <sub>16</sub> Alcohols | Colorless liquid to white solid | 3 max.                |                 | 60 - 65         | 20 - 25         | 10 - 15         | 3 max.          | —               | —               |
| <b>KALCOL 2465</b> | C <sub>12</sub> - C <sub>16</sub> Alcohols | Colorless liquid to white solid | —                     | 0.5 max.        | 65 - 71         | 23 - 29         | 4 - 8           | 0.5 max.        | —               | —               |
| <b>KALCOL 2470</b> | C <sub>12</sub> - C <sub>16</sub> Alcohols | Colorless liquid to white solid | —                     | 2.0 max.        | 70 - 76         | 24 - 30         | 2 max.          | —               | —               | —               |
| <b>KALCOL 6870</b> | C <sub>12</sub> - C <sub>18</sub> Alcohols | White beads or solid            | —                     | —               | 10 max.         |                 | 60 - 80         | 16 - 26         | —               | —               |
| <b>KALCOL 8665</b> | C <sub>16</sub> - C <sub>18</sub> Alcohols | White solid                     | —                     | —               | 5 max.          |                 | 30 - 40         | 60 - 70         | —               | —               |
| <b>KALCOL 8688</b> | C <sub>16</sub> - C <sub>18</sub> Alcohols | White beads or solid            | —                     | —               | 1 max.          |                 | 10 - 15         | 85 - 90         | —               | —               |

We can meet your request to make any proportion of alcohol in the range of C<sub>8</sub> to C<sub>18</sub>.

| Product Name       | Color (APHA) | Hydroxyl value | Acid value | Saponification value | Iodine value | Melting point (°C) | Moisture (%) |
|--------------------|--------------|----------------|------------|----------------------|--------------|--------------------|--------------|
| <b>KALCOL 2455</b> | 10 max.      | 275 - 285      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 22 - 25            | 0.1 max.     |
| <b>KALCOL 2463</b> | 10 max.      | 276 - 286      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 21 - 24            | 0.1 max.     |
| <b>KALCOL 2465</b> | 10 max.      | 280 - 290      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 21 - 24            | 0.1 max.     |
| <b>KALCOL 2470</b> | 10 max.      | 285 - 293      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 21 - 24            | 0.1 max.     |
| <b>KALCOL 6870</b> | 10 max.      | 225 - 235      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 48 - 51            | 0.1 max.     |
| <b>KALCOL 8665</b> | 10 max.      | 205 - 215      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 52 - 55            | 0.1 max.     |
| <b>KALCOL 8688</b> | 10 max.      | 211 - 221      | 0.03 max.  | 0.3 max.             | 0.1 max.     | 56 - 60            | 0.1 max.     |

### 1-3 Refined glycerin

| Product Name     | Description | Appearance           | Color (APHA) | Density (20/20°C) | Odor            | Glycerin (%) |
|------------------|-------------|----------------------|--------------|-------------------|-----------------|--------------|
| REFINED GLYCERIN |             | Clear Viscous Liquid | 20 max.      | 1.2570 min.       | Almost Odorless | 98.5 min.    |

| Product Name     | Description | Color (ml FeCl <sub>3</sub> /50ml) | Sp. Gr. (at 25°C) | Sulfate (ppm) | Chloride (ppm) | Glycerin (%) | Moisture (%) |
|------------------|-------------|------------------------------------|-------------------|---------------|----------------|--------------|--------------|
| REFINED GLYCERIN | USP grade   | 0.4 max.                           | 1.249 min.        | 20 max.       | 10 max.        | 99-101       | 5 max.       |

| Description | Organic volatile impurities by GC (ppm) |            |             |                    |                   |
|-------------|-----------------------------------------|------------|-------------|--------------------|-------------------|
|             | Benzene                                 | Chloroform | 1,4-Dioxane | Methylene chloride | Trichloroethylene |
| USP grade   | 2 max.                                  | 60 max.    | 380 max.    | 600 max.           | 80 max.           |

| Product Name     | Description | Sugar | Acidity or alkalinity (0.1M NaOH, ml) | Chloride (as Cl, ppm) | Glycerin (%) | Sulphate ash (%) |
|------------------|-------------|-------|---------------------------------------|-----------------------|--------------|------------------|
| REFINED GLYCERIN | BP/EP grade | Pass  | 0.2 max.                              | 10 max.               | 98.0-101.0   | 0.01 max.        |



| Description | Saponification equivalent (meq./100g) | Acidity (meq./100g) | Reducing matter test        | Residue on Ignition(%) |
|-------------|---------------------------------------|---------------------|-----------------------------|------------------------|
|             | 3 max.                                | 0.3 max.            | Within the Limited standard | 0.05 max.              |

| Description | FA & esters (ml of 0.5N NaOH) | Residue ignition (%) | Heavy metal (as Pb, ppm) | Chromatographic purity (%) |          | Chlorinated compound (ppm) |
|-------------|-------------------------------|----------------------|--------------------------|----------------------------|----------|----------------------------|
|             |                               |                      |                          | Individual                 | Total    |                            |
| USP grade   | 1 max.                        | 0.01 max.            | 5 max.                   | 0.1 max.                   | 1.0 max. | 30 max.                    |

| Description | Moisture (%) | Refractive index (at 20°C) | Esters (ml of 0.1M HCl) | Aldehyd & reducing substances (as CH <sub>2</sub> O, ppm) | Heavy metal (as Pb, ppm) | Halogenated compound (as Cl, ppm) |
|-------------|--------------|----------------------------|-------------------------|-----------------------------------------------------------|--------------------------|-----------------------------------|
| BP/EP grade | 2 max.       | 1.470 - 1.475              | 8 min.                  | 5 max.                                                    | 5 max.                   | 35 max.                           |

## 2. Physical properties

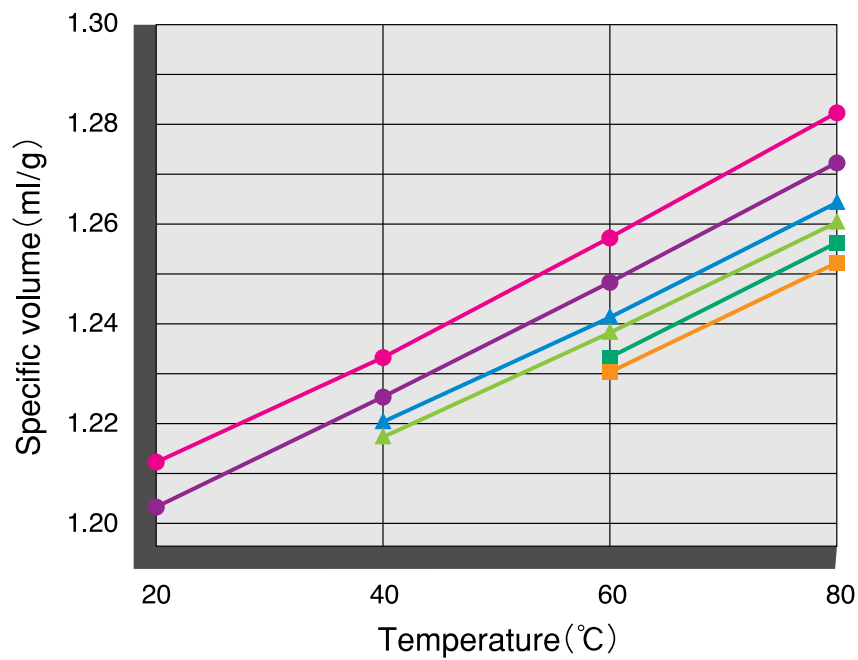
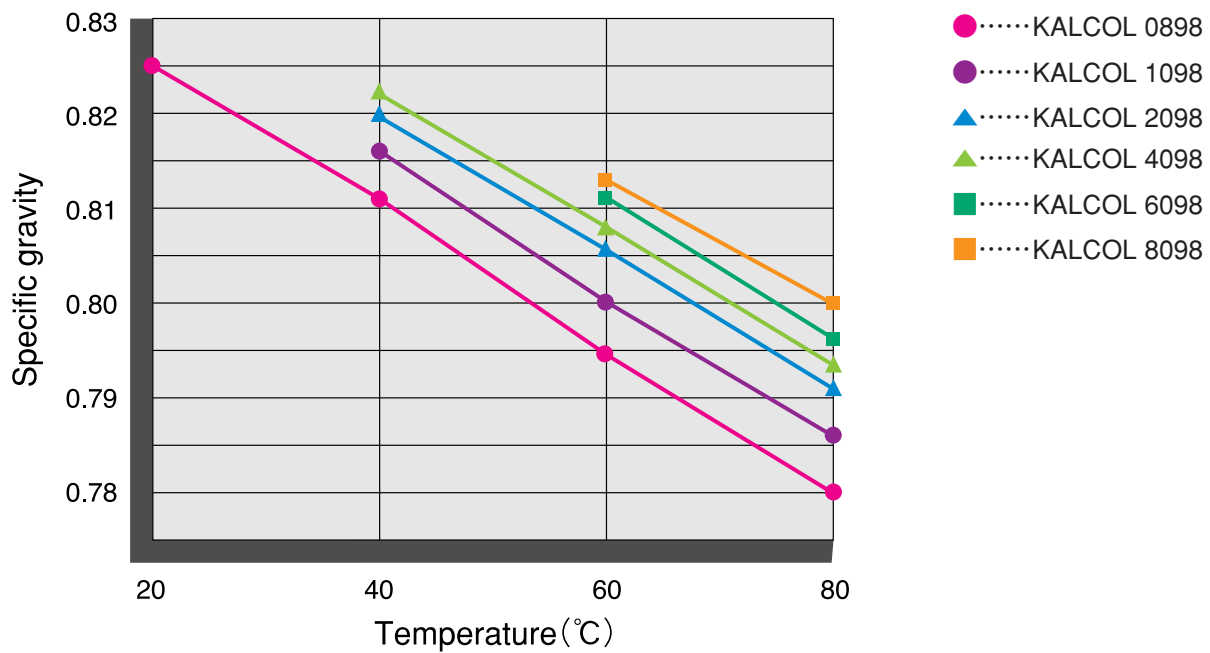
### 2-1 Specific gravity and Flash point

| Product Name | Specific gravity $D_4^t$ (t°C) | Flash point (°C) |
|--------------|--------------------------------|------------------|
| KALCOL 0898  | 0.826 (20)                     | 83 (PM)          |
| KALCOL 1098  | 0.830 (20)                     | 107 (PM)         |
| KALCOL 2098  | 0.826 (30)                     | 136 (COC)        |
| KALCOL 4098  | 0.823 (40)                     | 156 (COC)        |
| KALCOL 6098  | 0.816 (50)                     | 168 (COC)        |
| KALCOL 8098  | 0.814 (60)                     | 183 (COC)        |
| KALCOL 2455  | 0.830 (30)                     | 148 (COC)        |
| KALCOL 2463  | 0.830 (30)                     | 139 (COC)        |
| KALCOL 2465  | 0.828 (30)                     | 144 (COC)        |
| KALCOL 2470  | 0.826 (30)                     | 140 (COC)        |
| KALCOL 6870  | 0.812 (60)                     | 170 (COC)        |
| KALCOL 8665  | 0.813 (60)                     | 172 (PM)         |
| KALCOL 8688  | 0.815 (60)                     | 184 (COC)        |

PM : Flash point is measured with Pensky Martens tester.

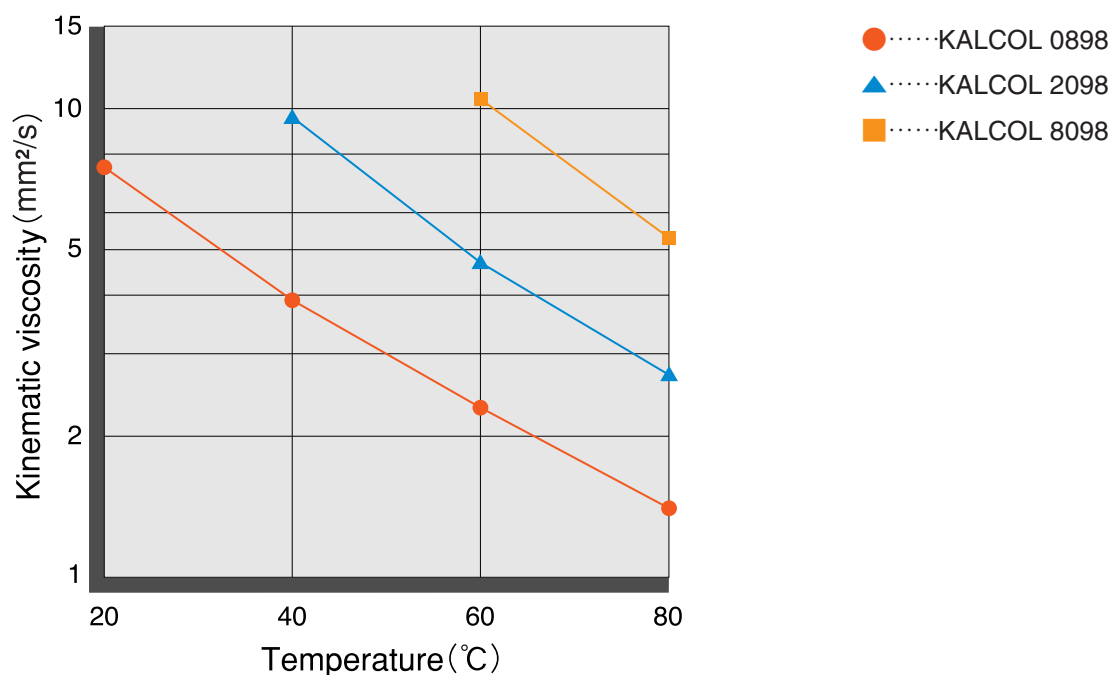
COC : Flash point is measured with Cleavland open cup method.

## 2-2 Change of specific gravity and apecific volume by temperature.



**Measuring methods:** Pycometer for KALCOL 0898 and 2098.  
Baume's hydrometer for KALCOL 8098.

## 2-3 Change of kinematic viscosity by temperature.



## 2-4 Solubility of KALCOL in organic solvents.

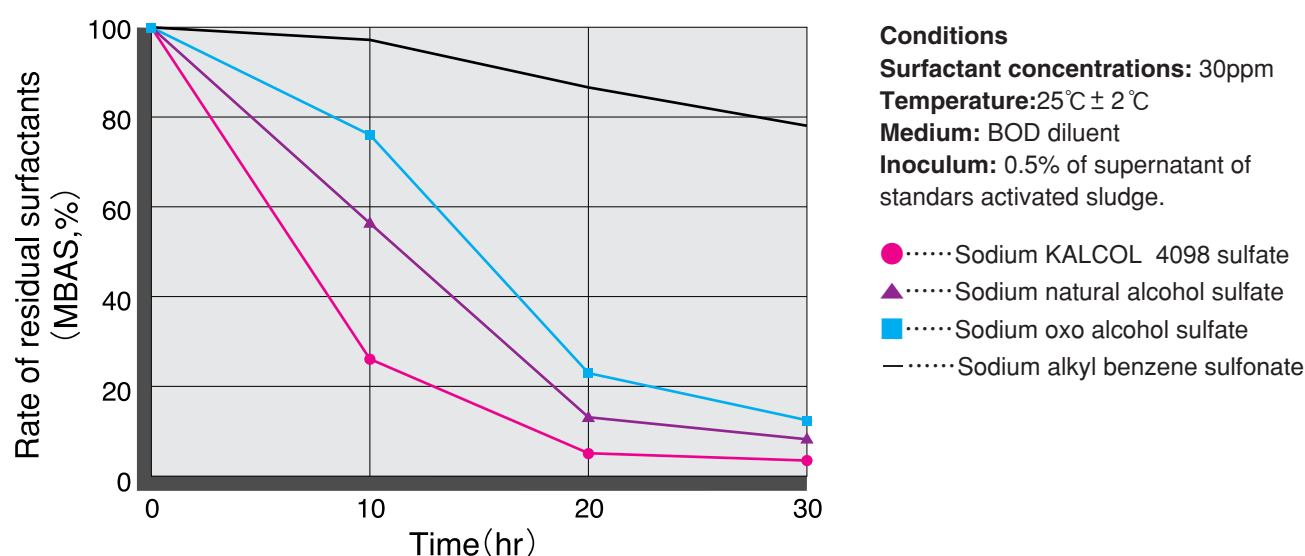
| Product Name       | Solvent           | Solubility (g/100g solvent) |      |      |      |      |      |
|--------------------|-------------------|-----------------------------|------|------|------|------|------|
|                    |                   | 0°C                         | 10°C | 20°C | 30°C | 40°C | 50°C |
| <b>KALCOL 2098</b> | Hexane            | 9.3                         | 96   | 725  | ∞    | —    | —    |
| <b>KALCOL 4098</b> | Hexane            | 0.1                         | 3.7  | 46   | 300  | ∞    | —    |
| <b>KALCOL 6098</b> | 95% Ethyl alcohol | 1.8                         | 5.1  | 15.9 | 89   | 430  | ∞    |
|                    | Methyl alcohol    | 0.3                         | 3.1  | 10   | 105  | 590  | ∞    |
|                    | Hexane            | —                           | 1.0  | 4.8  | 60   | 400  | ∞    |
| <b>KALCOL 8098</b> | 95% Ethyl alcohol | 0.3                         | 0.8  | 5.0  | 22.2 | 120  | ∞    |
|                    | Methyl alcohol    | —                           | —    | 0.4  | 6.6  | 146  | ∞    |
|                    | Hexane            | —                           | —    | 1.2  | 4.7  | 65   | 385  |

### 3. Biodegradability data

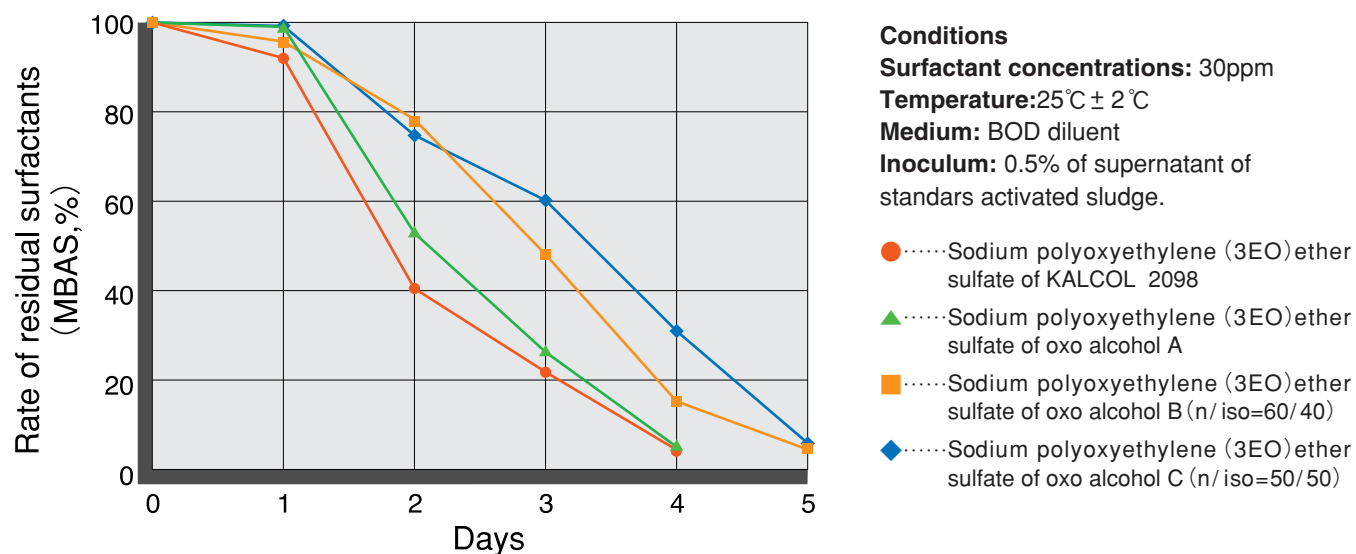
Kao Corporation

Manufactured from occurring triglycerides, KALCOL natural fatty alcohols and their derivatives such as sulfates have excellent biodegradability characteristics.

#### 3-1 Biodegradability of KALCOL sulfate, and its competitions.



#### 3-2 Biodegradability of KALCOL ether sulfate, and its competitions.



## 4. Analytical test methods

| Test parameter                    | Test method |              |                        |        |
|-----------------------------------|-------------|--------------|------------------------|--------|
|                                   | Kao method  | JIS          | AOCS                   | ASTM   |
| Color (APHA)                      | KSTM 20004  | JIS K 0071-1 | Tb 1b-64               | D 1686 |
| Acid value (mg KOH / g)           | KSTM 20045  | JIS K 0070   | Te 1a-64               | D 1639 |
| Saponification value (mg KOH / g) | KSTM 20048  | JIS K 0070   | Tl 1a-64               | D 1962 |
| Hydroxyl value (mg KOH / g)       | KSTM 20046  | JIS K 0070   | Cd 13-60               | D 1957 |
| Iodine value (% I <sub>2</sub> )  | KSTM 20050  | JIS K 0070   | Cd 1b-87 or<br>Cd 1-25 | D 1959 |
| Water content (%)                 | KSTM 20073  | JIS K 0068   | Tb 2-64                | E 203  |
| Melting point (°C)                | KSTM 20037  | JIS K 0064   | (Cc 1-25)              | D 5440 |
| CO (mg/kg)                        | KSTM 30518  | —            | —                      | E 411  |
| C-Chain distribution (%)          | KSTM 30648  | —            | —                      | —      |

## 5. Handling and Storage

- (1) “KALCOL” are as shown in the products list, these are solidifying around 20°C except “KALCOL 0898 and 1098”. It is advisable to do “Nitrogen Sealing”, when you handle under liquid condition (\*).
- (2) Carbon-steel can be used as storage tank's material, “KALCOL” do not have any corrosive effect against carbon steel.
- (3) In case of skin contact, wash material off the skin with plenty of water and soap.  
If irritation persists, get medical attention.

cf : (\*) Storage should be made under the temperature of less than 10°C +melting point.

# Sales of Kao's Chemical Products Business

## ●Americas

|                                      |                                                                                                                                                      |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Kao Specialties Americas, LLC</b> | 243 Woodbine Street, P.O. Box 2316, High Point, NC 27261, USA<br>Phone : +1-336-884-2214 / Fax : +1-336-884-8786                                     |
| <b>Quimi-Kao, S.A.de C.V.</b>        | Km. 22.5 Carr. Guadalajara-El Salto, Apartado Postal 14, C.P.45680<br>El Salto, Jalisco, Mexico<br>Phone : +52-33-3284-1000 / Fax : +52-33-3688-0861 |

## ●Europe

|                             |                                                                                                                     |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Kao Chemicals GmbH</b>   | Kupferstrasse 1, 46446 Emmerich, Germany<br>Phone : +49-2822-7110 / Fax : +49-2822-711201                           |
| <b>Kao Corporation S.A.</b> | Puig dels Tudons, 10, 08210 Barbera del Valles(Barcelona), Spain<br>Phone : +34-93-7399-300 / Fax : +34-93-7399-333 |

## ●Asia

|                                                |                                                                                                                                                       |
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| <b>Kao (Taiwan) Corporation</b>                | 10F, 207, Sec. 3, Pei-Hsin Rd., Hsin-Tien City, 231 Taipei,<br>Taiwan, R.O.C.<br>Phone : +886-2-8665-1978 / Fax : +886-2-8913-1150                    |
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| <b>PT.Kao Indonesia Chemicals</b>              | Jalan Raya Tambun, KM.42, Tambun Bekasi WestJava<br>17510, Indonesia<br>Phone : +62-21-8832-6188 / Fax : +62-21-8832-4452                             |
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#### FOR YOUR PROTECTION

The information and recommendations in this publication are to the best of our knowledge reliable. However, nothing herein is to be construed as a warranty or representation.

Users should make their own tests to determine the applicability of such information or the suitability of any products for their own particular purpose. Statements concerning the use of the products described herein are not to be construed as recommending the infringement of any patent and no liability for infringement arising out of any such use is assumed. All specifications in this publication are subject to change without notice.

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