LEVENOL®
GREEN INGREDIENT TO FORMULATE SUSTAINABLE HOME CARE PRODUCTS

KAO Chemicals Europe
Surfactants for Consumer Applications

October 2013
Content

- EU Trends in Home care
- LEVENOL® range
- LEVENOL®F-200
  - Benefits in formulation
- Summary
EU Trends in Home Care

Towards a sustainable and eco-friendly cleaning ... 

... saving time, energy, water and money.

Source: Mintel Executive summaries 2012-2013.
LEVENOL® range

From nature...

to surface active agents

LEVENOL® are green multifunctional non ionic surfactants

Based on Ethoxylated Glycerine Ester Derivatives

\[
\text{CH}_2\text{O}(-\text{CH}_2\text{-CH}_2\text{-O})_x\text{- R'} \\
\mid \\
\text{CHO} (-\text{CH}_2\text{-CH}_2\text{-O})_y\text{- R'} \\
\mid \\
\text{CH}_2\text{O}(-\text{CH}_2\text{-CH}_2\text{-O})_z\text{- R'}
\]

\[x+y+z = \text{EO number}\]

R’: H or R-CO

R: coconut chain
LEVENOL® range: Product Profile

Product Concentration (100% Act)

Vegetal Origin

Toxicological Profile: NON LABELLED Product

Carbon & Water Food Print Reduction

Eco-toxicological Profile: NON LABELLED Product
LEVENOL® range

<table>
<thead>
<tr>
<th>LEVENOL®</th>
<th>HLB value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-421</td>
<td>10.9</td>
</tr>
<tr>
<td>C-201</td>
<td>12.5</td>
</tr>
<tr>
<td>C-301</td>
<td>13.5</td>
</tr>
<tr>
<td>F-200</td>
<td>15.2</td>
</tr>
</tbody>
</table>

Outstanding hydrotropic properties and ECO-toxicological profile

- Did-list nr 44
- Registered in Bra Miljöval
- Suitable for ECOLABEL formulas
**LEVENOL® F-200**

**Product Properties**
- Liquid Product
- Hydrotropic Ability
- Non Labelled Material

**Benefits in Formulation**
- Energy saving
- Easy to handle even at low T
- Formulation Aid in Concentrated HDLD
  - Solvent reduction or avoidance
- Formulas with better Eco-toxicological profile
  - Advantage to prepare non labelled and ECOLABELL formulations
LEVENOL®F-200: Product Handling

Easy to handle, even at low temperature
Pumpable below 0ºC - COLD Processible
LEVENOL®F-200: Hydrotropic ability

Formulation benefits in liquid Laundry detergents
Good compatibility with other formula ingredients

x3 concentrated HDLD
- Reduction or avoidance of solvents

Market products 8 – 15% solvents

Liquid Tablets
- Glycerine as solvent
- Avoidance of glycols

Market products 20 - 25% solvents - PG present
**LEVENOL®F-200:** Hydrotropic ability

Usage in **x3 concentrated HDLD**
**Non solvent** required to obtain clear formulations

**Formula appearance**

<table>
<thead>
<tr>
<th>Formula characteristics</th>
<th>L.F-200</th>
<th>C1315-7EO</th>
</tr>
</thead>
<tbody>
<tr>
<td>45% active matter</td>
<td>0% PG</td>
<td>0% PG</td>
</tr>
<tr>
<td>ANIONIC 50%</td>
<td>Clear</td>
<td>Clear</td>
</tr>
<tr>
<td>NON IONIC 35%</td>
<td>Turbid paste</td>
<td>8% PG</td>
</tr>
<tr>
<td>Coconut Soap 15%</td>
<td></td>
<td>Clear</td>
</tr>
<tr>
<td>LAS/LES 60/40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other: builders, enzymes, optical brighteners…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH 8.0 – 8.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Market products:**
8 – 15% solvents

With std NI, clear formulas need **hydrotrope addition**
LEVENOL®F-200: Hydrotropic ability

Usage in **x3 concentrated HDLD**
Competitive performance at COLD wash temperature

**Cleaning efficacy at 20°C**

% Soil removal
Dosage: 35ml / wash

Wash conditions:
MIELE Softtronic W5722
Sint/mix, 800 rpm
2kg ballast

**Surfactant effect**

- **Mean value:** E101, E104, E125, E141/2, wfk10D, wfk10TE, wfk20D

**Enzyme activity**

- **Mean value:** E112, E116, E117, E123, E160, E164, E165
LEVENOL® F-200: Hydrotrropic ability

Usage in Liquid Tablets
Non glycols required to obtain clear formulations

Formula appearance

**L.F-200**
- Glycerine: Clear
- Anionic LAS: Clear

**C1315-7EO**
- Glycerine: Phase separation
- Propylene Glycol: Clear

Formula characteristics

- 60 - 65% act. matter
  - LAS: 28%
  - SLES: 31%
- ANIONIC: 28% 31%
- NON IONIC: 42% 54%
- Coconut Soap: 30% 15%
- 18–23% Solvent
- <10% Water
- pH 8.0 – 8.5

Glycol free

With std NI, clear formulas need glycol addition
LEVENOL®F-200: Hydrotropic ability

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Mean value: E101, E104, E125, E141/2, wfk10D, wfk10TE, wfk20D
Mean value: E112, E116, E117, E123, E160, E164, E165
Formulas with better Eco-toxicological profile

Formulation example: neutral pH APC - ECOLABEL

Criterion 1 - Toxicty to aquatic organisms

\[ CDV_{chronic} = \sum_{i}^{n} \frac{weight_i \cdot DF_i}{TF_{chronic}(i)} \]

CDV: Critical dilution volume
DF: Degradation factor
TF\(_{chronic}\): Toxicity factor based on chronic toxicity on aquatic organisms

NON IONIC: 4.5%

pH 7.0 – 7.5

Non ionic contribution

<table>
<thead>
<tr>
<th></th>
<th>C911-9EO</th>
<th>LEVENOL F-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td>0,12</td>
<td>0,00</td>
</tr>
<tr>
<td>TF chronic</td>
<td>0,16</td>
<td>0,12</td>
</tr>
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</table>

LEVENOL®F-200: Non labelled product
LEVENOL® F-200: Non labelled product

Formulas with better Eco-toxicological profile
Formulation example: neutral pH APC - ECOLABEL

Criterion 1 -
Toxicity to aquatic organisms

\[ CDV_{\text{chronic}} = \sum_{i}^{n} \frac{\text{weight}_i \cdot \text{DF}_i}{\text{TF}_{\text{chronic}}(i)} \]

CDV  Critical dilution volume
DF   Degradation factor
TF\text{chronic}  Toxicity factor based on chronic toxicity on aquatic organisms

NON IONIC: 4.5%
pH 7.0 – 7.5

CDV chronic

<table>
<thead>
<tr>
<th>Classification limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>52000 L</td>
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</table>

<table>
<thead>
<tr>
<th>Product as it is</th>
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<tbody>
<tr>
<td>18000 L</td>
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</table>

<table>
<thead>
<tr>
<th>Diluted in water (12g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C911-9EO</td>
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<tr>
<td>LEVENOL F-200</td>
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</table>
Summary

LEVENOL® range

Green ingredient
- Vegetable origin
- 100% concentrated
- Non labelled product

Product handling
- Easy to handle, even at low temperature
- COLD Processible

Hydrotropic ability
- Reduction or avoidance of solvents in concentrated HDLD
- Avoidance of glycols in liquid tablets

Good Eco-toxicological profile
- Suitable for non labelled and ECOLABEL formulations
Thank you very much for your attention.

GREEN INGREDIENT TO FORMULATE

SUSTAINABLE HOME CARE PRODUCTS