OXFILM 351
OXBLUE DOSX
Next Generation of Coalescing Agents
Non VOC Coalescing Agents

Coalescent agents are used to optimize the film formation process in paints and coatings. With the increasing demand for environmentally-friendly products, coalescent agents which comply with stricter VOC regulations for low odor are widely sought. OXEA’s coalescent agents meet these needs with exceptional performance in commercial formulations used in paints and coatings. Furthermore, OXEA produces its coalescent agents on purpose in EU and China for sales across the globe.

OXFILM 351 is an already established coalescent agent proven by excellent feedback from customers. It is an odorless and non VOC coalescent agent. Any non-VOC remains in a dried film, so OXFILM 351 acts as a permanent plasticizer yielding a slightly softer film. If needed, this can be compensated by a harder polymer.

In addition OXEA introduces OXBLUE DOSX as a bio based alternative for standard coalescent agents. It is low odor, non VOC and is produced from renewable feedstocks. Thus OXBLUE DOSX offers opportunities for formulators who are looking for sustainable additives without compromising on performance and economics.

OXEA coalescent agents are:

- Non VOC
- Low odor
- Low color
- On purpose production
- Bio based (OXBLUE DOSX 100 % biodegradable*)
- *by OECD 301B

Low Odor Coalescent Agents

OXEA Olfactory Analysis
Odor characteristics of chemicals are of high importance for products and processes as well. Residual odors in dried paint or coatings could irritate customers; odor pollution in the course of a manufacturing process of a chemical formulation could impact employees. Correspondingly, odor input by single chemicals in paint or coating formulations should be very low.

OXEA’s coalescent agents OXFILM 351 and OXBLUE DOSX help to frame a formulation that shows ideal odor properties because they add no smell to the final application.

* by OECD 301B
**VOC US Regulation by EPA**

**Definition of VOC by WHO**

VOC’s (Volatile Organic Compounds) are unstable compounds that evaporate into the air and cause environmental risks. It is measured at the temperature at which an organic compound is evaporating. The WHO has defined a VOC as any organic compound whose boiling point is below 260°C.

While Texanol™ boiling point is at 254°C, OXEA’s coalescent agents are non VOC by WHO definition:
- Boiling Point OXFILM 351 @ 351°C
- Boiling Point OXBLUE DOSX @ 298°C

**US Definition of VOC (EPA Method 24)**

Volatile Organic Compound (VOC) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reaction. The VOC content is measured in g_VOC per L_Paint (excluding water and exempts).

**Results by EPA Method 24 Evaporation Loss, Weight-%**

<table>
<thead>
<tr>
<th>Test 1</th>
<th>Texanol™</th>
<th>OXFILM 351</th>
<th>OXBLUE DOSX</th>
<th>TXIB™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 2</td>
<td>Texanol™</td>
<td>OXFILM 351</td>
<td>OXBLUE DOSX</td>
<td>TXIB™</td>
</tr>
</tbody>
</table>

**Results by DIN ISO 16000-6**

Retention Time, min

- n-Hexane (n-C6): 8 min
- n-Hexadecane (n-C16): 24 min

**VOC European Regulation**

**EU Definition of VOC (DIN ISO 16000-6)**

Total VOC content is defined in ISO 16000-6 as the sum of volatile organic compounds, which elute from a non-polar or slightly polar gas chromatographic separation column between n-Hexane and n-Hexadecane (n-C6 and n-C16). This covers any organic compound with a boiling point between 69°C and 287°C.

**Substance Classification**

- **VVOC**: Very Volatile Organic Compounds
  - Substances eluting before n-Hexane (n-C6)
- **VOC**: Volatile Organic Compounds
  - Substances eluting between n-Hexane (n-C6) and n-Hexadecane (n-C16)
- **SVOC**: Semi Volatile Organic Compounds
  - Substances eluting after n-Hexadecane (n-C16)

* GC track available on request
OXEA’s Top performing Coalescing Agents

Technical Data

**OXFILM 351**

- **CAS Number**: 94-28-0
- **EINECS Number**: 202-319-2

**Physical and chemical properties**

- **Formula**: C\(_{22}\)H\(_{42}\)O\(_6\)
- **Molecular Weight**: 402.6 g/mol
- **Boiling Point (@ 1013 hPa)**: 351 °C
- **Density (@ 20°C)**: 0.967 g/cm\(^3\)
- **Solubility in Water (@ 20°C)**: 1.53 mg/L
- **Vapor Pressure (@ 20°C)**: <0.001 hPa
- **Viscosity (@ 20°C)**: 14.3 mPa·s

**Sales Specification**

<table>
<thead>
<tr>
<th>Limit</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Visual Examination</td>
</tr>
<tr>
<td>Ester Content</td>
<td>DIN 51405 (GC) x</td>
</tr>
<tr>
<td>Triethylene glycol mono-2-ethylhexanoate</td>
<td>max 1.5 % (a/a) DIN 51405 (GC) x</td>
</tr>
<tr>
<td>Diethyleneglycol bis- 2-ethylhexanoate</td>
<td>max 0.5 % (a/a) DIN 51405 (GC) x</td>
</tr>
<tr>
<td>Acid Value</td>
<td>max 0.10 mg KOH/g DIN EN ISO 3682 / ASTM D 1613 x</td>
</tr>
<tr>
<td>Peroxide Value</td>
<td>max 1.5 meq O/kg RCH – AL079 x</td>
</tr>
<tr>
<td>Ester Value</td>
<td>236 – 279 mg KOH/g DIN 53401</td>
</tr>
<tr>
<td>Hydroxyl Value</td>
<td>max 5.0 mg KOH/g DIN 53401</td>
</tr>
<tr>
<td>Water</td>
<td>max 0.07 % (w/w) DIN 51777 Part I</td>
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<tr>
<td>BHT Stabilizer</td>
<td>50 mg/kg DIN 51405 (GC), qual. x</td>
</tr>
<tr>
<td>Platinum/Cobalt Color (Hazan/ APHA Color)</td>
<td>max. 30 DIN ISO 6271 x</td>
</tr>
<tr>
<td>Density (@ 20°C)</td>
<td>0.962 – 0.972 g/cm(^3) DIN 51757 Verf. D</td>
</tr>
<tr>
<td>Refractive Index nD25</td>
<td>1.441 – 1.447 DIN 51423 / ASTM D 1747</td>
</tr>
</tbody>
</table>

**OXBLUE DOSX**

- **CAS Number**: 2915-57-3
- **EINECS Number**: 220-836-1

**Physical and chemical properties**

- **Formula**: C\(_{20}\)H\(_{38}\)O\(_4\)
- **Molecular Weight**: 342.51 g/mol
- **Boiling Point (@ 1013 hPa)**: 298 °C
- **Density (@ 20°C)**: 0.933 g/cm\(^3\)
- **Refractive Index (@ 20°C)**: 1.445
- **Viscosity (@ 20°C)**: 12.4 mPa·s

**Sales Specification**

<table>
<thead>
<tr>
<th>Limit</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Visual Examination</td>
</tr>
<tr>
<td>Ester Content</td>
<td>min 97.0 % (a/a) DIN ISO 16000-6 x</td>
</tr>
<tr>
<td>Acid Value</td>
<td>max 0.10 mg KOH/g ASTM D 974 (mod.) x</td>
</tr>
<tr>
<td>Water</td>
<td>max 0.07 mg KOH/g ASTM E 1064 x</td>
</tr>
<tr>
<td>Saponification Value</td>
<td>322 – 328 Calculated from GC x</td>
</tr>
<tr>
<td>Platinum/Cobalt Color (Hazan/ APHA Color)</td>
<td>max. 20 ASTM D 5386 x</td>
</tr>
</tbody>
</table>
OXEA is a global manufacturer of Oxo intermediates and Oxo derivatives, such as alcohols, polyols, carboxylic acids, specialty esters, and amines. These products are used for the production of high-quality coatings, lubricants, cosmetics and pharmaceutical products, flavorings and fragrances, printing inks and plastics. OXEA is owned by Oman Oil Company S.A.O.C.

Oxo chemicals are OXEA's core competency. We produce Oxo intermediates and Oxo derivatives in our plants in Germany, the Netherlands, the USA and China. Our global customer base is served from sales offices in numerous locations, including Europe, North America, Asia and Latin America.

As “The Oxo People”, OXEA has more than 75 years of experience in the production of Oxo chemicals. We are the inventor of the Oxo synthesis process (or “hydroformylation”) as well as several other proprietary technologies for the manufacture of Oxo chemical.