Dow Industrial Solutions

Enable electronics processing
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“If we can’t do it better than others, why do it?”

Herbert H. Dow
(1866-1930)
The Dow Chemical Company (Dow) combines science and technology knowledge to develop premier materials science solutions that are essential to human progress. Dow has one of the strongest and broadest toolkits in the industry, with robust technology, asset integration, scale and competitive capabilities that enable it to address complex global issues. Dow’s market-driven, industry-leading portfolio of advanced materials, industrial intermediates, and plastics businesses deliver a broad range of differentiated technology-based products and solutions for customers in high-growth markets such as packaging, infrastructure, and consumer care.
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Dow Industrial Solutions highlights

Integrated production sites and global logistics

Over 1,000 products made in 50 manufacturing facilities on 18 Dow sites around the globe
Customized electronic-grade products and strong quality control

- Focused on electronic market and holistically serving our customers
- Various electronic grade materials to serve diverse needs
- Continuous improvement of processes at all levels of our operations
- Clean room with Inductively Coupled Plasma Mass Spectrometer (ICP-MS)
- Dedicated logistic processes to minimize contamination

Chemical know-how and technical support

- Multiple pilot plants and research labs
- 80+ years of research and application expertise on our core molecules
- Leading analytical capabilities with reliable analytical services
- Real time technical support to optimize the use of Dow materials and make our customers more successful
- Innovative product joint development with strategic customers
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Chemistries to enable electronics processing

Semiconductor
- Ingot cutting
- CMP slurry
- Photoresist coating
- Photolithography
- Etching
- Stripping
- Chips

Display
- Photoresist and color resist
- Photoresist coating
- Photolithography
- Development
- Etching
- Stripping
- Display panel

Printed circuit board
- Polytetrafluoroethylene production
- Epoxy formulation for laminate
- Copper clad laminate
- Resin coating
- Desmear and copper deposition
- Solder resist ink printing
- Soldering and flux removing
- Printed circuit board

Dow Industrial Solutions products highlight
Dow Industrial Solutions combines the power of different product groups, including amines and chelants, oxygenated solvents and polyglycols, surfactants and fluids. We customize selected products to the standard which meet specific electronics application requirements:
- Controlled low metal concentration
- High purity
- Consistent quality control

Our product offerings include, but not limited to, below highlighted products:
- Si cutting fluids
- CMP slurry
- Photoresist coating
- Photolithography
- Etchant
- Stripper
- PTFE dispersion

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Oxygenated solvents

Dow offers the world’s largest portfolio of oxygenated solvents, including a wide selection of alcohols, esters, ketones and ethylene- and propylene glycol ethers. We provide excellent solvency, high dilution ratios, low surface tension and a broad range of evaporation rates, which help you formulate differentiated products for semiconductor, display and printed circuit board industries.

We are capable to supply consistent quality-controlled solvents with low metal concentration and high purity.

Here are some key features of our oxygenated solvents:

- **Low Metal Concentration**: Ensures consistent quality and performance in your applications.
- **High Purity**: Minimizes impurities that can affect the quality of your products.
- **Low Surface Tension**: Facilitates good wetting and spreading, improving adhesion and compatibility.
- **Fast Evaporation Rates**: Allows for rapid drying and curing in applications like electronics processing.
- **Wide Range of Properties**: Supports a variety of applications requiring specific solvency, viscosity, and other properties.

These properties are typical of the product, but should not be confused with, or regarded as, sales specifications. Always consult the latest material safety data sheet (MSDS) or product data sheet for the most accurate and comprehensive information.

### Oxygenated Solvents

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## Amines and chelants

Dow offers versatile family of ethanolamines, isopropanolamines and alkyl alkanolamines, which are diversified, polyfunctional molecules that combine the characteristics of amines and alcohols. They can provide alkalinity, corrosion inhibition, photoresist removal and cleaning function in various formulations. We are capable to provide selected products with strong photoresist removal capability and low corrosion to metal like copper. Our VERSENE™ Chelating Agents neutralize harmful metal ions found in water-based formulations and processes.

<table>
<thead>
<tr>
<th>Amines</th>
<th>Chemical nomenclature</th>
<th>Structural formula</th>
<th>CAS number</th>
<th>Molecular weight, g/mol</th>
<th>Freezing point °C</th>
<th>Boiling point °C at 760mm Hg</th>
<th>Flash point °C</th>
<th>Specific gravity at 20°C/20°C</th>
<th>Viscosity cP at 20°C</th>
<th>Vapor pressure (mm Hg @ 20°C)</th>
<th>Solubility in water at 20°C</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEA</td>
<td>Monoethanolamine</td>
<td>HOC₂H₄NH₂</td>
<td>141-43-5</td>
<td>61.1</td>
<td>10</td>
<td>171</td>
<td>96³</td>
<td>1.01</td>
<td>24</td>
<td>0.50</td>
<td>∞</td>
<td>Strong alkalinity Primary amine</td>
</tr>
<tr>
<td>TEA</td>
<td>Triethanolamine</td>
<td>(HOC₂H₄)₃N</td>
<td>102-71-6</td>
<td>149.2</td>
<td>21</td>
<td>335</td>
<td>208³</td>
<td>1.13</td>
<td>104(30°C)</td>
<td>&lt;0.001</td>
<td>∞</td>
<td>Alkalinity Hygroscopic tertiary amine</td>
</tr>
<tr>
<td>MIPA</td>
<td>Monoisopropanolamine</td>
<td>CH₃CH(ÓH)(CH₂NH₃⁺)</td>
<td>78-96-6</td>
<td>75.1</td>
<td>3</td>
<td>159</td>
<td>73³</td>
<td>0.96</td>
<td>23(25°C)</td>
<td>0.53</td>
<td>∞</td>
<td>Strong alkalinity Primary amine</td>
</tr>
<tr>
<td>MDEA</td>
<td>N-methyldiethanolamine</td>
<td>CH₃NH₂CH₂OH₂⁺</td>
<td>105-59-9</td>
<td>119.2</td>
<td>-21</td>
<td>247</td>
<td>138³</td>
<td>1.04</td>
<td>101</td>
<td>&lt;0.01</td>
<td>∞</td>
<td>Alkalinity Tertiary amine</td>
</tr>
<tr>
<td>NMEA</td>
<td>N-Methylthanolamine</td>
<td>CH₃NHCH₂CH₂OH</td>
<td>109-83-1</td>
<td>75.1</td>
<td>-5</td>
<td>160</td>
<td>73³</td>
<td>0.94</td>
<td>13</td>
<td>0.48</td>
<td>∞</td>
<td>Strong alkalinity Secondary amine</td>
</tr>
<tr>
<td>AEEA</td>
<td>Aminoethylethanolamine</td>
<td>(HOC₂H₄)₂NH(C₂H₄NH₂⁺)</td>
<td>111-41-1</td>
<td>104.2</td>
<td>-45</td>
<td>243</td>
<td>127³</td>
<td>1.03</td>
<td>141</td>
<td>&lt;0.01</td>
<td>∞</td>
<td>Alkalinity</td>
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1 Pensky-Martens Closed Cup  
2 Setaflash Method (Closed Cup)
# Polyglycols, surfactants and fluids

Dow Polyglycols, Surfactants and Fluids include some of the most familiar anionic and nonionic surfactants, polyglycols, EO/PO copolymers and solder assistant fluids. Dow surfactants and polyglycols are known for excellent wetting, emulsification, dispersion, and foam control. Water-soluble UCON™ fluids are well-suited as base solder assist fluids. With Dow polyglycols, surfactants and fluids, you can also receive a wide range of available chemistries, extensive applications expertise, a global technical support network and stable product supply from world-class manufacturing facilities.

<table>
<thead>
<tr>
<th>Nonionic surfactants</th>
<th>Chemical nomenclature</th>
<th>Actives</th>
<th>Form at 25°C</th>
<th>Cloud point (°C, 1 wt% aq)</th>
<th>HLB</th>
<th>Critical micelle concentration (ppm at 25°C)</th>
<th>Surface tension (dynes/cm at 1% actives, 25°C)</th>
<th>Foam height¹</th>
<th>Pour point (°C)</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERGITO™ 15-S-9</td>
<td>Secondary Alcohol Ethoxylate</td>
<td>100%</td>
<td>Liquid</td>
<td>60</td>
<td>13.3</td>
<td>52</td>
<td>30</td>
<td>124/43</td>
<td>9</td>
<td>Excellent detergency, rapid dissolution and good rinseability, low odor, excellent formulation and handling properties</td>
</tr>
<tr>
<td>TRITON™ HW-1000</td>
<td>Secondary Alcohol Ethoxylate</td>
<td>100%</td>
<td>Insoluble</td>
<td>10.8</td>
<td>Insoluble Insoluble Insoluble</td>
<td>10.8</td>
<td>Insoluble</td>
<td>31</td>
<td>60/0</td>
<td>16</td>
</tr>
<tr>
<td>ECOSURF™ EH-9</td>
<td>2-Ethylhexanol Alkoxylate</td>
<td>100%</td>
<td>Liquid</td>
<td>61</td>
<td>12.5</td>
<td>1066</td>
<td>31</td>
<td>60/0</td>
<td>16</td>
<td>Exceptional wetting, low odor, excellent formulation properties, very low aquatic toxicity</td>
</tr>
<tr>
<td>TERGITO™ TMN-6 (90%)</td>
<td>Branched Secondary Alcohol Ethoxylate</td>
<td>90%</td>
<td>Liquid</td>
<td>36</td>
<td>13.1</td>
<td>800</td>
<td>27</td>
<td>130/22</td>
<td>-40</td>
<td>Excellent wetting, penetrating and dispersing agent, narrow gel range</td>
</tr>
<tr>
<td>TRITON™ RW-150</td>
<td>Alkyl Amine Ethoxylate</td>
<td>100%</td>
<td>Liquid</td>
<td>&gt;100</td>
<td>&gt;16</td>
<td>860 (pH=12)</td>
<td>30 (pH=12)</td>
<td>135/15</td>
<td>11</td>
<td>Good detergency and wetting, pH reversible</td>
</tr>
<tr>
<td>TERGITOL™ XD</td>
<td>EO/PO Copolymer</td>
<td>100%</td>
<td>Solid</td>
<td>74</td>
<td>—</td>
<td>38</td>
<td>60/25</td>
<td>34</td>
<td>—</td>
<td>Excellent steric and freeze thaw stabilizer</td>
</tr>
<tr>
<td>TRITON™ GE-110</td>
<td>Alkyl Polyglucoside</td>
<td>60%</td>
<td>Liquid</td>
<td>&gt;100</td>
<td>—</td>
<td>1748</td>
<td>27</td>
<td>105/100</td>
<td>-15</td>
<td>Mild, good detergent and wetter, soluble in highly alkaline solutions</td>
</tr>
<tr>
<td>DOWFAX™ DF-103</td>
<td>Polyether Polyol</td>
<td>100%</td>
<td>Liquid</td>
<td>22</td>
<td>—</td>
<td>Insoluble</td>
<td>Insoluble</td>
<td>1/0</td>
<td>&lt;-20</td>
<td>Long-lasting defoaming efficacy, pH stability (pH 2-12)</td>
</tr>
</tbody>
</table>

**Anionic surfactants**

<table>
<thead>
<tr>
<th>Anionic surfactants</th>
<th>Chemical nomenclature</th>
<th>Actives</th>
<th>Diluent</th>
<th>Form at 25°C</th>
<th>Surface tension (dynes/cm at 1% actives, 25°C)</th>
<th>Foam height¹</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOWFAX™ 2A1</td>
<td>Alkylphenoxide Disulfonate</td>
<td>45%</td>
<td>Water</td>
<td>Liquid</td>
<td>34</td>
<td>35</td>
<td>140/130 145/145</td>
</tr>
<tr>
<td>TRITON™ GR-5M</td>
<td>Dioctyl Sulfo succinate</td>
<td>60%</td>
<td>Isopropanol/ water</td>
<td>Liquid</td>
<td>26</td>
<td>NR¹</td>
<td>190/180 NR¹</td>
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</tbody>
</table>

Footnotes: (1) Ross-Miles foam height: mm at 0.1 wt% actives, 25°C, initial / 5 minute; (2) Actual pH = 7 (distilled water); (3) Actual pH = 12.5 (sodium hydroxide solution); (4) NR = Not recommended; can hydrolyze under some alkaline conditions
For more information about Dow products, please contact Dow Customer Information Group (CIG):

**Asia Pacific**

Toll Free: 400 889 0789 (China)  
800 7776 7776 (except China, Indonesia, and Viet Nam)

Tel: + 86-21-38514988 (China)  
+ 603-7965 5392 (except China)

Fax: + 86-21-5895 4612 (China)  
+ 603-7958 5598 (except China)

**For all other regions**

Tel: + 1-989-832-1556

Fax: + 1-989-832-1465

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