Legal Compliance of Displays:
Update of RoHS 2.0 and REACH SVHC

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Contents

From ‘Gradle to Grave’ of Display Materials

- REACH / REACH SVHC
- RoHS & RoHS 2.0
- WEEE and its Recast *

* (not covered in this presentation)
Merck KGaA is not the same as Merck & Co.

Merck KGaA, Darmstadt, Germany, and the U.S. pharmaceutical company Merck & Co. have been two independent companies since 1917.

Common historical roots:
- 1891 Merck & Co. was founded in New York by Georg Merck, a member of the Merck family
- As a consequence of World War I, Merck & Co. was expropriated and became an independent company.

Today, Merck & Co. holds the rights to the name within North America. Merck operates here as EMD and holds the rights to the name Merck in the rest of the world.

www.emd-pm.com
Merck Products for Displays

- licristal®: Advanced liquid crystal materials for state-of-the-art displays
- livilux®: Materials for OLEDs (Organic Light-Emitting Diodes)
- licrivue®: Reactive mesogens for optical films
- lisicon®: Printable organic semiconductors
- isishape®: Structuring materials
- isiphor®: LED materials for backlighting
- Patinal®: Coatings for touch screens

See us at booth no. 821
Directive 2002/95/EC

European RoHS (RoHS 1.0)

Directive on the **Restriction of Hazardous Substances in Electrical and Electronic Equipment**

- Maximum concentrations in **each homogeneous material**:
  - Lead (Pb) 0.1% = 1000 ppm
  - Mercury (Hg) 0.1% = 1000 ppm
  - Cadmium (Cd) 0.01% = 100 ppm
  - Hexavalent chromium (Cr^{6+}) 0.1% = 1000 ppm
  - Polybrominated biphenyls (PBB) 0.1% = 1000 ppm
  - Polybrominated diphenyl ethers (PBDE) 0.1% = 1000 ppm

- Worldwide RoHSs: Substances and limits are identical, but scopes, exemptions and implementation measures differ considerably.
RoHS 2.0

- Restricted substances:
  - No additional hazardous substances at present
  - Some substances under consideration: Organobromine and organochlorine compounds,
  - Carbon nanotubes and Nanosilver, Arsenic and beryllium, PVC
  - phthalates like HBCDD, DEHP, BBP, DBP and other flame retardants

- Extended scope of electrical and electronic equipment
  - Large and small household appliances
  - IT and telecommunications equipment
  - Consumer equipment
  - Lighting equipment
  - Electrical and electronic tools
  - Toys, leisure and sports equipment
  - Medical devices
  - Monitoring and control instruments
  - Automatic dispensers
  - other EEE not covered above

Open Scope!
RoHS applies to all components, when not defined as exemption
Directive 2011/65/EU

RoHS 2.0

- Transition periods:
  - Medical devices 3 years July 22, 2014
  - Monitoring and control instruments 3 years July 22, 2014
  - In-Vitro diagnostics devices 5 years July 22, 2016
  - Industrial monitoring control instruments 6 years July 22, 2017
  - Other EEE not covered above 8 years July 22, 2019

- Exemptions to RoHS 2.0:
  - Security equipment for member states (arms, munitions)
  - Equipment to be sent into space
  - Large-scale stationary industrial tools (machinery, installed by professionals)
  - Large-scale fixed installations (production lines, escalators, elevators)
  - Photovoltaics
  - Energy-saving light bulbs (temporarily)
  - Specific applications (i.e. Mercury in CCFLs) with fixed expiry dates
Obligations for suppliers (manufacturers, importers, distributors)

- Technical documentation and internal production control procedure
- EU declaration of conformity, obligatory from Jan.02, 2013
- CE labelling of the finished product, obligatory from Jan.02, 2013

Analytical proof of the absence of RoHS substances is **not** required!
REACH
Registration, Evaluation, Authorisation and Restriction of Chemicals

- Substances
- Preparations
- Articles

Displays (LCDs) are considered articles under REACH

- Chemical industry covers these parts as explained before
- Not applicable for displays! Unintended release (i.e., accidental breakage) is not applicable under REACH.
- REACH relevance depends on the content of ‘candidate list’ substances (SVHC).
The REACH Definition of an ‘Article’

Article:

means an object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition.

Typical articles
REACH Candidate* List of SVHCs
(Substances of Very High Concern) Status: Dec. 19, 2012

- Articles are concerned under REACH if they contain any of the currently 138 Substances of Very High Concern from present candidate list.

Oct. 28, 2008  15 substances
Jan. 13, 2010  14 substances
Mar. 30, 2010  1 substance
Jun. 18, 2010  8 substances
Dec. 15, 2010  8 substances
Jun. 20, 2011  7 substances
Dec. 19, 2011  20 substances
Jun. 18, 2012  15 substances
Dec. 19, 2012  54 substances
Mar. 04, 2013  10 substances in consultation

Total: 138 substances

Outlook 2015: > 300 substances

- This list will increase depending on national authority or EU proposals.

Step by step ECHA proposes inclusion into REACH Annex XIV for authorization, currently containing 22 substances.

* means: ‘candidates’ for Annex XIV, then subjected to authorization by ECHA.
**Recently added Candidates of SVHCs**

**Dec. 19, 2012**

<table>
<thead>
<tr>
<th>Substance name</th>
<th>EC-Number</th>
<th>CAS-Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis(pentabromophenyl) ether (decabromodiphenyl ether; DecaBDE)</td>
<td>214-604-9</td>
<td>1163-19-5</td>
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<tr>
<td>Pentacosfluorododecanoic acid</td>
<td>276-745-2</td>
<td>72629-94-8</td>
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<tr>
<td>Tricosfluorododecanoic acid</td>
<td>206-203-2</td>
<td>307-55-1</td>
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<tr>
<td>Henicosfluoroundecanoic acid</td>
<td>218-165-4</td>
<td>2058-94-8</td>
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<tr>
<td>Heptacosfluorotetradecanoic acid</td>
<td>206-803-4</td>
<td>376-06-7</td>
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<tr>
<td>Hexacylomethylphthalic anhydride [1], Hexacylomethylphthalic anhydride [2], Hexacylomethylphthalic anhydride [3], Hexacylomethylphthalic anhydride [4]</td>
<td>247-094-1, 243-072-0, 256-356-4, 260-566-1</td>
<td>25550-51-0, 19438-60-9, 48122-14-1, 57110-29-9</td>
</tr>
<tr>
<td>4-Nonylphenol, branched and linear</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4,1,3,5-Tetramethylbenzylphthalic anhydride, ethoxylated</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Methoxyacetic acid</td>
<td>210-894-6</td>
<td>625-45-6</td>
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<tr>
<td>N,N-Dimethyformamide</td>
<td>200-679-5</td>
<td>68-12-2</td>
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<tr>
<td>Dibutyltin dichloride (DBTC)</td>
<td>121-670-0</td>
<td>1317-36-8</td>
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<tr>
<td>Lead monoxide (Lead oxide)</td>
<td>215-267-0</td>
<td>1314-41-6</td>
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<tr>
<td>Orange lead (Lead tetroxide)</td>
<td>215-235-6</td>
<td>1314-41-6</td>
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<tr>
<td>Lead bis(tetrafluoroborate)</td>
<td>237-486-0</td>
<td>13814-96-5</td>
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<tr>
<td>Trilead bis(carbonate)dihydroxyde</td>
<td>215-290-6</td>
<td>1319-46-6</td>
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<td>Lead titanium trioxide</td>
<td>235-038-9</td>
<td>12060-00-3</td>
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<tr>
<td>Lead titanium zirconium oxide</td>
<td>235-727-4</td>
<td>12626-81-2</td>
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<tr>
<td>Silicic acid, lead salt</td>
<td>234-363-3</td>
<td>11120-22-2</td>
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<tr>
<td>Silicic acid (H4SiO4), barium salt (1:1), lead-doped</td>
<td>272-271-5</td>
<td>68784-75-8</td>
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<tr>
<td>1-Bromopropane (n-propyl bromide)</td>
<td>203-445-0</td>
<td>106-94-5</td>
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<td>Methylxirane (Propylene oxide)</td>
<td>200-879-2</td>
<td>75-56-9</td>
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<tr>
<td>1,2-Benzocarboxylic acid, dipentylester, branched and linear</td>
<td>284-032-2</td>
<td>84777-06-0</td>
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<tr>
<td>Diisopentylphthalate (DIPP)</td>
<td>210-088-4</td>
<td>605-50-5</td>
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<tr>
<td>N-Methylisopentylphthalate</td>
<td>-</td>
<td>776297-69-9</td>
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<tr>
<td>1,2-Diethylenothen</td>
<td>211-076-1</td>
<td>629-14-1</td>
</tr>
</tbody>
</table>
Obligations for Articles Containing SVHCs

- **Obligation 1**
  - **Information** to article recipients
    - If a candidate list substance is >0.1%w/w of the article*
    - then supplier must provide inform. to allow safe use of the article, at least disclose the name of that substance
    - Consumers upon demand: < 45 days

- **Obligation 2**
  - **Notification** to ECHA
    - If a candidate list substance is >0.1%w/w of the article* and
    - if its quantities in the produced /imported article is
      - > 1 ton in total per year per legal entity,
      - then the producer/importer of such an article must notify the ECHA

- Display (article) suppliers do not need to provide analytical proof of SVHC absence.
- Statement letter to customer is sufficient.
- REACH enforcement bodies (different in EU member states) are obliged to proof presence of SVHCs in articles.
- **Merck LC and OLED products fully comply with the standards of REACH SVHC.**
Summary and Outlook

Regulations concerning display materials were extended recently and will be further modified in future.

- **REACH SVHC**
  - SVHC Candidate list has been extended to 138 substances.
  - At present, no critical candidates for display products (LC, OLED, RM, OSC etc.) from Merck.
  - Additional SVHC candidates will be announced in future, > 300 by 2015.

- **RoHS 2.0**
  - Due to the open application range all EEE are included, if not listed as exemption.
  - No additionally regulated substances, however some, e.g. phthalates, nanosilver, carbon nanotubes etc. are under discussion.
Thank you for your kind attention!

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