



9.3. Exposure scenario 3: Use at industrial sites - Use of silver chloride mixtures for screen printing

Product category used: PC 33: Semiconductors

Sector of use: SU 16: Manufacture of computer, electronic and optical products, electrical equipment

Environment contributing scenario(s):		
CS 1	Use of silver chloride mixtures for screen printing	ERC 5
Worker contributing scenario(s):		
CS 2	Transfer of the substance at non dedicated facilities	PROC 8a
CS 3	Transfer of the substance	PROC 8b , PROC 9
CS 4	Screen printing	PROC 10
CS 5	Cleaning and maintenance	PROC 28

Subsequent service life exposure scenario(s):

ES4: Service life (consumers) - Article service life of articles containing screen printed silver chloride mixtures

9.3.1. Env CS 1: Use of silver chloride mixtures for screen printing (ERC 5)

Assessment entity group used for the assessment of this contributing scenario: ERA

9.3.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
<ul style="list-style-type: none"> Annual use amount at site: ≤ 1 tonnes/year <i>All the amounts are expressed as Ag as this is the driver for the environmental risk assessment.</i> Daily use amount at site: $\leq 4.55E-3$ tonnes/day <i>The 10th percentile of reported site-specific number of emission days for 97 sites. Default number of emission days are derived from a multi-metal background database of measured site-specific release factors collected under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> On site treatment of off-air: Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter according to the BAT Reference Document in the Non-Ferrous Metals Industry <i>Direct air emissions should be reduced by implementing one or more of the following RMMs (air concentration range for which the RMM is suitable is specified in parenthesis):</i> <ul style="list-style-type: none"> Electrostatic precipitators using wide electrode spacing: $5 - 15 \text{ mg/Nm}^3$ Wet electrostatic precipitators: $< 5 \text{ mg/Nm}^3$ Cyclones, but as primary collector: $< 50 \text{ mg/Nm}^3$ Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values $< 5 \text{ mg/Nm}^3$. Membrane filtration techniques can achieve $< 1 \text{ mg/Nm}^3$ Ceramic and metal mesh filters. PM10 particles are removed: 0.1 mg/Nm^3 Wet scrubbers: $< 4 \text{ mg/Nm}^3$ The substance should not be released to water <i>Emissions to surface water or to the sewage system are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
<ul style="list-style-type: none"> Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<ul style="list-style-type: none"> Particular considerations on the waste treatment operations: No (low concentration) <i>Particular risks from waste treatment unlikely due low concentration of substance in waste stream. Waste disposal according to national/local legislation is sufficient. If the metal content of the waste is elevated enough, internal or external recovery/recycling is considered.</i>
Other conditions affecting environmental exposure



• Discharge rate of effluent: $\geq 2E3$ m³/day

9.3.1.2. Releases

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

Table 9.19. Local releases to the environment

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor	Release factor before on site RMM: 0% Release factor after on site RMM: 0% Local release rate: 0 kg/day Explanation: There are no emissions to water during this use.
Air	Ag dissolved	Estimated release factor (based on SPERC Eurometaux SPERC 5.1.v3)	Release factor before on site RMM: 0.2% Release factor after on site RMM: 0.2% Local release rate: 9.09E-3 kg/day Explanation: release after RMM Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers. The 90th percentile of reported site-specific release factors to air for 97 sites.
Non agricultural soil	Ag dissolved	Estimated release factor	Release factor after on site RMM: 0% Explanation: No direct release to soil.

Releases to waste

Release factor to external waste: 1 %

Default release factors are derived from a multi-metal background database of measured site-specific release factors collected from peer-reviewed EU Risk Assessment Reports under the former Directive of New and Existing Substances and REACH 2010 registration dossiers.

The 90th percentile of reported site-specific release factors to solid waste for 32 downstream user sites covering zinc, nickel, lead, antimony

9.3.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 unless stated otherwise.

Table 9.20. Exposure concentrations and risks for the environment and man via the environment

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	Local PEC: 6.06E-6 mg/L RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	Local PEC: 1.155 mg/kg dw RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	Local PEC: 1.91E-6 mg/L RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	Local PEC: 0.364 mg/kg dw RCR = 8.31E-4	Final RCR < 0.01



Protection target	Assessment entity	Exposure concentration	Risk quantification
Sewage Treatment Plant	Ag dissolved	Local PEC: 0 mg/L RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	Local PEC: 0.096 mg/kg dw RCR = 0.091	Final RCR = 0.091

9.3.2. Worker CS 2: Transfer of the substance at non dedicated facilities (PROC 8a)

Assessment entity group used for the assessment of this contributing scenario: HHRA

9.3.2.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>The physical form "aqueous solution" is used as surrogate in MEASE to reflect the very low exposure potential of AgCl in inks.</i>	MEASE 1.02.01
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Local exhaust ventilation: No	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Face/eye protection: Eye protection	
• Respiratory protection: No	MEASE 1.02.01
Other conditions affecting workers exposure	
• Place of use: Indoor	
• Operating temperature: <= 40 °C	

9.3.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.21. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver chloride	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.062	Final RCR = 0.062
Dermal, systemic, long term	Silver chloride	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.118	Final RCR = 0.118
Combined routes, systemic, long-term			Final RCR = 0.18

9.3.3. Worker CS 3: Transfer of the substance (PROC 8b, PROC 9)



Assessment entity group used for the assessment of this contributing scenario: HHRA

9.3.3.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>The physical form "aqueous solution" is used as surrogate in MEASE to reflect the very low exposure potential of AgCl in inks.</i>	MEASE 1.02.01
• Percentage (w/w) of substance in mixture/article: <= 100 %	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: <= 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Local exhaust ventilation: No	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Face/eye protection: Eye protection	
• Respiratory protection: No	MEASE 1.02.01
Other conditions affecting workers exposure	
• Place of use: Indoor	
• Operating temperature: <= 40 °C	

9.3.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.22. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver chloride	0.01 mg/m ³ (MEASE 1.02.01) RCR = 0.012	Final RCR = 0.012
Dermal, systemic, long term	Silver chloride	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.118	Final RCR = 0.118
Combined routes, systemic, long-term			Final RCR = 0.131

9.3.4. Worker CS 4: Screen printing (PROC 10)

Assessment entity group used for the assessment of this contributing scenario: HHRA

9.3.4.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of the used product: Liquid, including paste/slurry/suspension <i>The physical form "aqueous solution" is used as surrogate in MEASE to reflect the very low exposure potential of AgCl in inks.</i>	MEASE 1.02.01



	Method
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Local exhaust ventilation: No	MEASE 1.02.01
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness ≥ 90%)	MEASE 1.02.01
• Face/eye protection: Eye protection	
• Respiratory protection: No	MEASE 1.02.01
Other conditions affecting workers exposure	
• Place of use: Indoor	
• Operating temperature: ≤ 40 °C	

9.3.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.23. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver chloride	0.05 mg/m ³ (MEASE 1.02.01) RCR = 0.062	Final RCR = 0.062
Dermal, systemic, long term	Silver chloride	0.034 mg/kg bw/day (MEASE 1.02.01) RCR = 0.118	Final RCR = 0.118
Combined routes, systemic, long-term			Final RCR = 0.18

9.3.5. Worker CS 5: Cleaning and maintenance (PROC 28)

Assessment entity group used for the assessment of this contributing scenario: HHRA

Manual cleaning, repair and maintenance operations, removal of residuals from e.g. filters/overspill or as waste

9.3.5.1. Conditions of use

	Method
Product (article) characteristics	
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
• Percentage (w/w) of substance in mixture/article: ≤ 100 %	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: ≤ 8 h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	MEASE 1.02.01
• Generic local exhaust ventilation: Lower confidence limit (industrial use)	MEASE 1.02.01



	Method
[Effectiveness Inhalation: 78%] <i>Standard efficiency</i> Inhalation explanation: <i>Efficiency for industrial use</i>	
• Pattern of use: Non-dispersive use	MEASE 1.02.01
• Pattern of exposure control: Direct handling	MEASE 1.02.01
• Contact level: Extensive	MEASE 1.02.01
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: Chemical resistant dermal protection with basic employee training. (effectiveness >= 90%)	MEASE 1.02.01
• Face/eye protection: Eye protection	
• Respiratory protection: No	MEASE 1.02.01
Other conditions affecting workers exposure	
• Place of use: Indoor	
• Operating temperature: <= 40 °C	

9.3.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9.24. Exposure concentrations and risks for workers

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver chloride	0.11 mg/m ³ (MEASE 1.02.01) RCR = 0.136	Final RCR = 0.136
Dermal, systemic, long term	Silver chloride	0.068 mg/kg bw/day (MEASE 1.02.01) RCR = 0.234	Final RCR = 0.234
Combined routes, systemic, long-term			Final RCR = 0.37

Remarks on exposure data from external estimation tools:

MEASE 1.02.01 for Silver chloride:

Explanation:

As the MEASE 1.02.01 exposure estimation tool for workers does not provide exposure estimates for PROC 28, PROC 8a has been used instead as the input parameter assuming that there are similarities in the exposure.