



## 9.7. Exposure scenario 7: Use at industrial sites - Use of silver nitrate as reactive laboratory reagent

**Product category used:** PC 20: Products such as ph-regulators, flocculants, precipitants, neutralization agents; PC 21: Laboratory Chemicals

**Sector of use:** SU 9: Manufacture of fine chemicals; SU 20: Health services; SU 24: Scientific research and development

Environment contributing scenario(s):		
CS 1	Use of silver nitrate as reactive laboratory reagent	ERC 6a
CS 2	Use of silver nitrate as reactive laboratory reagent	ERC 6b
Worker contributing scenario(s):		
CS 3	Use as laboratory reagent	PROC 15

### 9.7.1. Env CS 1: Use of silver nitrate as reactive laboratory reagent ( ERC 6a )

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

#### 9.7.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Annual use amount at site: <= 1 tonnes/year
• Daily use amount at site: <= 0.05 tonnes/day
Technical and organisational conditions and measures
• 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>
• The substance should not be released to air <i>Emissions to air are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
• Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
• 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 Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i> <i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i> <i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i> <i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i>
Other conditions affecting environmental exposure
• Receiving surface water flow rate: >= 1.8E4 m3/day
• Discharge rate of effluent: >= 2E3 m3/day

#### 9.7.1.2. 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 9.83. Local releases to the environment**

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release factor	<b>Release factor before on site RMM: 0%</b> <b>Release factor after on site RMM: 0%</b> <b>Local release rate: 0 kg/day</b> <b>Explanation:</b> Liquid waste from laboratories is collected and treated separately and not poured down the drain.
Air	Ag dissolved	Estimated release factor	<b>Release factor before on site RMM: 0%</b> <b>Release factor after on site RMM: 0%</b> <b>Local release rate: 0 kg/day</b> <b>Explanation:</b> Small quantities are handled in solutions, due to the low vapour pressure of silver emissions to air are not considered relevant.
Non agricultural soil	Ag dissolved	Estimated release factor	<b>Release factor after on site RMM: 0%</b> <b>Explanation:</b> No direct release to soil.

### 9.7.1.3. 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 9.84. Exposure concentrations and risks for the environment and man via the environment**

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	<b>Local PEC: 6.06E-6 mg/L</b> RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	<b>Local PEC: 1.155 mg/kg dw</b> RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	<b>Local PEC: 1.91E-6 mg/L</b> RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	<b>Local PEC: 0.364 mg/kg dw</b> RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	<b>Local PEC: 0 mg/L</b> RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	<b>Local PEC: 0.096 mg/kg dw</b> RCR = 0.091	Final RCR = 0.091
Man via environment - Inhalation (systemic effects)	Ag dissolved	<b>Concentration in air: 8.53E-8 mg/m<sup>3</sup></b> RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	<b>Exposure via food consumption: 3.84 µg/kg bw/day</b> (Measured data: See section 9.0.3.6) RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

**Remarks on measured exposure:**

See section 9.0.3.6 for Ag dissolved:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food (section 9.0.3.6) was taken forward to the risk characterisation.

The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

## 9.7.2. Env CS 2: Use of silver nitrate as reactive laboratory reagent ( ERC 6b )

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

### 9.7.2.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Annual use amount at site: <= 1 tonnes/year
• Daily use amount at site: <= 0.05 tonnes/day
Technical and organisational conditions and measures
• 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>
• The substance should not be released to air <i>Emissions to air are not allowed in this scenario</i>
Conditions and measures related to biological sewage treatment plant
• Biological STP: None [Effectiveness Water: 0%]
Conditions and measures related to external treatment of waste (including article waste)
<p>• 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 Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the silver content of the waste is elevated enough, internal or external recovery/recycling might be considered.</i></p> <p><i>Appropriate waste codes: 06 05 02*, 08 01 11, 08 03 12*, 09 01 01*, 09 01 03*, 09 01 04*, 09 01 05*, 09 01 06*, 09 01 13*, 10 06 06*, 10 07 01, 10 07 02, 10 07 03, 10 07 04, 10 07 05, 11 01 09*, 15 01 10*, 15 02 02*, 16 01 18, 16 03 03*, 16 08 01, 16 11 04</i></p> <p><i>Suitable disposal: Hazardous waste produced during the manufacture and downstream use is sent to a recycler only marginal amounts are sent to a landfill or an incinerator. Waste containing silver is recycled for almost a 100%</i></p> <p><i>A detailed assessment has been performed on modelled and measured data and is reported in the Waste report (ARCHE, 2013)</i></p>
Other conditions affecting environmental exposure
• Receiving surface water flow rate: >= 1.8E4 m3/day
• Discharge rate of effluent: >= 2E3 m3/day

### 9.7.2.2. 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 9.85. Local releases to the environment**

Release	Assessment entity	Release estimation method	Explanations
Water	Ag dissolved	Estimated release	<b>Release factor before on site RMM: 0%</b>



Release	Assessment entity	Release estimation method	Explanations
		factor	<b>Release factor after on site RMM: 0%</b> <b>Local release rate: 0 kg/day</b> <b>Explanation:</b> Liquid waste from laboratories is collected and treated separately and not poured down the drain.
Air	Ag dissolved	Estimated release factor	<b>Release factor before on site RMM: 0%</b> <b>Release factor after on site RMM: 0%</b> <b>Local release rate: 0 kg/day</b> <b>Explanation:</b> Small quantities are handled in solutions, due to the low vapour pressure of silver emissions to air are not considered relevant.
Non agricultural soil	Ag dissolved	Estimated release factor	<b>Release factor after on site RMM: 0%</b> <b>Explanation:</b> No direct release to soil.

### 9.7.2.3. 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 9.86. Exposure concentrations and risks for the environment and man via the environment**

Protection target	Assessment entity	Exposure concentration	Risk quantification
Fresh water	Ag dissolved	<b>Local PEC: 6.06E-6 mg/L</b> RCR = 0.132	Final RCR = 0.132
Sediment (freshwater)	Ag dissolved	<b>Local PEC: 1.155 mg/kg dw</b> RCR = 2.64E-3	Final RCR < 0.01
Marine water	Ag dissolved	<b>Local PEC: 1.91E-6 mg/L</b> RCR = 2.22E-3	Final RCR < 0.01
Sediment (marine water)	Ag dissolved	<b>Local PEC: 0.364 mg/kg dw</b> RCR = 8.31E-4	Final RCR < 0.01
Sewage Treatment Plant	Ag dissolved	<b>Local PEC: 0 mg/L</b> RCR = 0	Final RCR < 0.01
Agricultural soil	Ag dissolved	<b>Local PEC: 0.096 mg/kg dw</b> RCR = 0.091	Final RCR = 0.091
Man via environment - Inhalation (systemic effects)	Ag dissolved	<b>Concentration in air: 8.53E-8 mg/m<sup>3</sup></b> RCR = 5.69E-7	Final RCR < 0.01
Man via environment - Oral	Ag dissolved	<b>Exposure via food consumption: 3.84 µg/kg bw/day</b> (Measured data: See section 9.0.3.6) RCR = 0.035	Final RCR = 0.035
Man via environment - combined routes			Final RCR = 0.035

#### Remarks on measured exposure:

See section 9.0.3.6 for Ag dissolved:

Identity of the substance used: Ag

Explanation: Worst case exposure of 3.84 µg Ag/kg bw/day from food (section 9.0.3.6) was taken forward to the risk characterisation.



The intake via drinking water calculated with CHESAR was 3-4 orders of magnitudes lower compared to the intake via food and has thus not been taken into account.

### 9.7.3. Worker CS 3: Use as laboratory reagent ( PROC 15 )

Assessment entity group used for the assessment of this contributing scenario: HH RA  
Covers laboratory use both as liquid and solid substance

#### 9.7.3.1. Conditions of use

	Method
Product (article) characteristics	
• Percentage (w/w) of substance in mixture/article: $\leq 100\%$	MEASE 1.02.01
• Physical form of the used product: Solid (material with low dustiness)	MEASE 1.02.01
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: $\leq 8$ h/day	MEASE 1.02.01
Technical and organisational conditions and measures	
• Occupational Health and Safety Management System: Advanced	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 $\geq 90\%$ )	MEASE 1.02.01
• Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <i>Due to potential adverse effects of the substance to the respiratory tract, RPE is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i>	
• Gloves as precautionary measure: Gloves protecting from local effects to the skin (high hazard) <i>Due to the potential adverse effects of the substance to skin, protective gloves according to EN 374 have to be worn at all workplaces. Additionally, face protection is required to be worn as appropriate.</i>	
• Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <i>Due to the adverse effects of the substance to the eyes, direct contact of the eyes with the substance is to be avoided including hand to eye transfer after touching contaminated surfaces. Suitable eye protection equipment (e.g. goggles or visors) must be worn.</i>	
Other conditions affecting workers exposure	
• Place of use: Indoor	

#### 9.7.3.2. Exposure and risks for workers

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

**Table 9.87. Exposure concentrations and risks for workers**

Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Inhalation, systemic, long term	Silver nitrate	0.1 mg/m <sup>3</sup> (MEASE 1.02.01) RCR = 0.104	Final RCR = 0.104
Inhalation, local, long term	Silver nitrate	0.1 mg/m <sup>3</sup> (MEASE 1.02.01)	Qualitative risk



Route of exposure and type of effects	Assessment entity	Exposure concentration	Risk quantification
Dermal, systemic, long term	Silver nitrate	0.017 mg/kg bw/day (MEASE 1.02.01) RCR = 0.05	Final RCR = 0.05
Combined routes, systemic, long-term			Final RCR = 0.154

**Risk characterisation**

Qualitative risk characterisation (Inhalation, local, long term, Inhalation, local, acute, Dermal, local, long term, Dermal, local, acute, Eye, local):

See section 9.0.4.2