

9.10. Exposure scenario 10: Widespread use by professional workers - Use in electrochemical and galvanic plating

Market sector: Electrochemical and galvanic plating

Product category used: PC 14: Metal surface treatment products, including galvanic and electroplating products

Sector of use: SU 14: Manufacture of basic metals, including alloys; SU 15: Manufacture of fabricated metal products, except machinery and equipment

Environment contributing scenario(s):		
CS 1	Use in electrochemical and galvanic plating	ERC 8c
Worker contributing scenario(s):		
CS 2	Handling of preparations at non-dedicated facilities	PROC 8a
CS 3	Small scale handling of preparations	PROC 9
CS 4	Open or semi-closed process	PROC 4
CS 5	Dipping and pouring	PROC 13

Explanation on the approach taken for the ES

During this use, the substance is chemically transformed into gold. Any subsequent handling steps after transformation of the substance are not in the scope of this ES.

9.10.1. Env CS 1: Use in electrochemical and galvanic plating (ERC 8c)

9.10.1.1. Conditions of use

The conditions of use are as described in the generic exposure scenario (GES) below.

9.10.1.2. Releases

The GES and associated risk assessment are concerned with the releases of TCA to waste-water during use by professional workers in electroplating or metal surface treatment. This waste-water is assumed to be treated at a municipal STP before discharge to freshwater. Exposure assessment for the aquatic environment is based on calculation of the maximum safe tonnage (Msafe) of TCA that can be used for electroplating or metal surface treatment by professional workers; modelling of environmental exposure is based on adjustment to release factors (RFs) defined by ERC 8c.

Table 9.86. The generic exposure scenario (GES) for professional use of TCA in electroplating or metal surface treatment

1. Title	
ES10: Use by professional workers - Use in electroplating or metal surface treatment	
Life cycle	Professional use of TCA in electroplating or metal surface treatment
Systematic title based on use descriptor	ERC: ERC 8c
2. Operational conditions and risk management measures	
2.1 Control of environmental exposure	
Environmental related free short title	Use by professional in electroplating or metal surface treatment

Systematic title based on use descriptor (environment)	ERC 8c (Widespread use leading to inclusion into/onto article (indoor))
Processes, tasks, activities covered (environment)	Professional use of TCA for electroplating or metal surface treatment: As defined by ERC 8c release scenario adjusted for monetary value of gold
Environmental Assessment Method	Estimates based on ERC 8c for 'Widespread use leading to inclusion into/onto article (indoor)' adjusted for monetary value of gold are used for calculation of maximum tonnage that can be used safely without risk to the environment.
Product characteristics TCA as aqueous solution. Environmental assessment is based on adjustment to ERC 8c release factors and default characteristics for environmental compartments detailed in the ECHA technical guidance and EUSES model.	
Amounts used	
Maximum annual safe use at a site (Msafe)	130 kg TCA (75 kg Au equivalent)
Frequency and duration of use	
Pattern of release to the environment	220 days per year per site (surface treatment SpERC for industrial setting; this assumes an average working year)
Environment factors not influenced by risk management	
Receiving surface water flow rate	STP: 2,000 m ³ /d (default) Receiving water: 18,000 m ³ /d (default)
Dilution capacity, freshwater	Discharge to freshwater via STP: DF = 10 (default)
Dilution capacity, marine	Not relevant
Other given operational conditions affecting environmental exposure	
None	
Technical conditions and measures at process level (source) to prevent release	
Appropriate process control systems shall be implemented.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Waste water: ES Discharge to freshwater via STP: Release to domestic waste-water and off-site municipal sewage treatment plant (STP) Efficiency 88.7% (based on standard TGD parameters & measured partition coefficient for TCA in relation to SPM normalised to organic carbon) Release factor after on-site treatment: 130,000 g/T (i.e. ERC 8c RF adjusted to 10% for monetary value of Au as detailed in section 9.02)	
Air:	

Release factor after on-site treatment: 15,000 g/T (ERC 8c RF adjusted to 10% based on monetary value of Au as detailed in section 9.02)

Organizational measures to prevent/limit release from site

Safety data sheet and instructions for professional use

Conditions and measures related to municipal sewage treatment plant (if applicable)

Municipal Sewage Treatment Plant (STP)	Yes
Discharge rate of the Municipal STP	2 000 m ³ /d (default)
Fate of the sludge from Municipal STP	Worst case scenario assumed that sludge is applied to land

Conditions and measures related to external treatment of waste for disposal

Not relevant for professional use

Conditions and measures related to external recovery of waste

Not relevant for professional use

3. Exposure and risk estimation

Environment							
ERC 8c							
ES 10 Use by professional worker - Use in electroplating or metal surface treatment							
Compartment	Unit	PNEC	PEC _{regional}	C _{local}	PEC	RCR	Methods for calculation of environmental concentrations
ES Discharge to STP	mg TCA/L	0.2 mg/L	2.05 x10 ⁻⁷ mg/L	1.0 x10 ⁻³ mg/L	1.0 x10 ⁻³ mg/L	0.0050	10% RF for ERC 8c applied to M _{safe} tonnage and dilution factor at municipal STP
ES Freshwater via STP	mg TCA/L	1.04 x10 ⁻³ mg/L	2.05 x10 ⁻⁷ mg/L	7.73 x10 ⁻⁵ mg/L	7.75 x10 ⁻⁵ mg/L	0.075	10% RF for ERC 8c applied to M _{safe} tonnage and value for STP removal efficiency measured on measured partition coefficient. Plus dilution in ultimate receiving water body based on TGD default
Freshwater sediment via STP	mg TCA/kg w.w.	4.5 mg/kg	4.11 x10 ⁻⁴ mg/kg	0.332 mg/kg	0.333 mg/kg	0.74	10% RF for ERC 8c applied to M _{safe} tonnage. Partitioning to SPM/sediment based on measured partition coefficient.
Terrestrial	mg TCA/kg	3.65 mg/kg	1.89 x10 ⁻³ mg/kg	5.32 x10 ⁻⁶ mg/kg	1.89 x10 ⁻³ mg/kg	0.0095	Modelled increase in soil concentrations due to deposition from

	w.w.		mg/kg		mg/kg		atmospheric emissions and application of sewage sludge to land
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4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

Scaling tool: Metals EUSES IT tool (free download: <http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool>)

Scaling of the release to air and water environment includes:

- Refining of the release factor to air and waste water and/or and the efficiency of the air filter and wastewater treatment facility.
- Adjustment of the flow rate for the receiving water body and subsequent dilution factor.

9.10.1.3. Exposure and risks for man via the environment

Not relevant. TCA is used as an aqueous solution in small quantities. Emissions to air are therefore considered to be negligible.

9.10.2. Worker CS 2: Handling of preparations at non-dedicated facilities (PROC 8a)

Task(s) covered with this contributing scenario: Transfer and filling process.

9.10.2.1. Conditions of use

Product (Article) characteristics
<ul style="list-style-type: none"> Physical form of substance: Liquid Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%]
Amount used (or contained in articles), frequency and duration of use/exposure
<ul style="list-style-type: none"> Maximum duration of exposure: 15 - 60 min [Effectiveness Inhalation: 80%, Dermal: 80%] <i>A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure. Please note that whenever a process step with reduced exposure duration needs to be conducted in addition to another process step, the RCRs of these process steps need to be summed up and the result has to be below 1 to demonstrate safe use.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> Pattern of use: Wide dispersive use Pattern of exposure control: Direct handling Contact level: Intermittent
Conditions and measures related to personal protection, hygiene and health evaluation
<ul style="list-style-type: none"> 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 (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i> Gloves: Protective gloves according to EN 374 have to be worn. Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. [Effectiveness Dermal: 90%] 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>

9.10.2.2. 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	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.01 mg/m ³ (MEASE: 1.02.01)	RCR = 0.071
Dermal, systemic, long term	7E-3 mg/kg bw/day (MEASE: 1.02.01)	RCR = 0.175
Combined routes, systemic, long-term		RCR = 0.246

Remarks on exposure data from external estimation tools:

MEASE 1.02.01

Explanations: Dermal, systemic, long term

For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Risk characterisation

Further information on the risk characterisation for local effects or acute systemic effects via inhalation and via the dermal route and local effects to the eyes is given in Section 9.0.4.2.

Under the prescribed conditions of use, exposure is below the DNEL and local effects are not expected. Therefore, risks are adequately controlled.

9.10.3. Worker CS 3: Small scale handling of preparations (PROC 9)

Task(s) covered with this contributing scenario: Transfer and filling process.

9.10.3.1. Conditions of use

Product (Article) characteristics
<ul style="list-style-type: none"> Physical form of substance: Liquid Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%]
Amount used (or contained in articles), frequency and duration of use/exposure
<ul style="list-style-type: none"> Maximum duration of exposure: 15 - 60 min [Effectiveness Inhalation: 80%, Dermal: 80%] <i>A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure. Please note that whenever a process step with reduced exposure duration needs to be conducted in addition to another process step, the RCRs of these process steps need to be summed up and the result has to be below 1 to demonstrate safe use.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> Pattern of use: Wide dispersive use Pattern of exposure control: Direct handling Contact level: Intermittent
Conditions and measures related to personal protection, hygiene and health evaluation
<ul style="list-style-type: none"> 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 (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i> Gloves: Protective gloves according to EN 374 have to be worn. Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. [Effectiveness Dermal: 90%] 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>

9.10.3.2. Exposure and risks for workers

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

Table 9.88. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.01 mg/m ³ (MEASE: 1.02.01)	RCR = 0.071
Dermal, systemic, long term	7E-3 mg/kg bw/day (MEASE: 1.02.01)	RCR = 0.175
Combined routes, systemic, long-term		RCR = 0.246

Remarks on exposure data from external estimation tools:

MEASE 1.02.01

Explanations: Dermal, systemic, long term

For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Risk characterisation

Further information on the risk characterisation for local effects or acute systemic effects via inhalation and via the dermal route and local effects to the eyes is given in Section 9.0.4.2.

Under the prescribed conditions of use, exposure is below the DNEL and local effects are not expected. Therefore, risks are adequately controlled.

9.10.4. Worker CS 4: Open or semi-closed process (PROC 4)

Task(s) covered with this contributing scenario: Mixing and blending.

9.10.4.1. Conditions of use

Product (Article) characteristics
<ul style="list-style-type: none"> Physical form of substance: Liquid Maximum emission potential of the substance: Very low <p><i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i></p> <ul style="list-style-type: none"> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%]
Amount used (or contained in articles), frequency and duration of use/exposure
<ul style="list-style-type: none"> Maximum duration of exposure: 60 - 240 min [Effectiveness Inhalation: 40%, Dermal: 40%] <p><i>A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure. Please note that whenever a process step with reduced exposure duration needs to be conducted in addition to another process step, the RCRs of these process steps need to be summed up and the result has to be below 1 to demonstrate safe use.</i></p>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> Pattern of use: Wide dispersive use Pattern of exposure control: Non-direct handling
Conditions and measures related to personal protection, hygiene and health evaluation
<ul style="list-style-type: none"> Respiratory protective equipment (RPE) as precautionary measure: RPE protecting from local effects via inhalation <p><i>Due to potential adverse effects of the substance to the respiratory tract, RPE (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i></p> <ul style="list-style-type: none"> Gloves: Protective gloves according to EN 374 have to be worn. Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. [Effectiveness Dermal: 90%] Eye protection: Eye protection to be worn to protect from adverse effects to the eyes <p><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></p>

9.10.4.2. Exposure and risks for workers

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

Table 9.89. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.06 mg/m ³ (MEASE: 1.02.01)	RCR = 0.429
Dermal, systemic, long term	2E-4 mg/kg bw/day (MEASE: 1.02.01)	RCR < 0.01
Combined routes, systemic,		RCR = 0.434

Route of exposure and type of effects	Exposure concentration	Risk quantification
long-term		

Remarks on exposure data from external estimation tools:

MEASE 1.02.01

Explanations: Dermal, systemic, long term

For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Risk characterisation

Further information on the risk characterisation for local effects or acute systemic effects via inhalation and via the dermal route and local effects to the eyes is given in Section 9.0.4.2.

Under the prescribed conditions of use, exposure is below the DNEL and local effects are not expected. Therefore, risks are adequately controlled.

9.10.5. Worker CS 5: Dipping and pouring (PROC 13)

9.10.5.1. Conditions of use

Product (Article) characteristics
<ul style="list-style-type: none"> Physical form of substance: Liquid Maximum emission potential of the substance: Very low <i>Only the highest emission potential (EP) is reported. Lower EPs (e.g. if materials of lower dustiness are being handled in parallel) are thus automatically covered in this assessment.</i> Content in preparation: Not restricted [Effectiveness Inhalation: 0%, Dermal: 0%]
Amount used (or contained in articles), frequency and duration of use/exposure
<ul style="list-style-type: none"> Maximum duration of exposure: 15 - 60 min [Effectiveness Inhalation: 80%, Dermal: 80%] <i>A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure. Please note that whenever a process step with reduced exposure duration needs to be conducted in addition to another process step, the RCRs of these process steps need to be summed up and the result has to be below 1 to demonstrate safe use.</i>
Technical and organisational conditions and measures
<ul style="list-style-type: none"> Pattern of use: Wide dispersive use Pattern of exposure control: Direct handling Contact level: Intermittent
Conditions and measures related to personal protection, hygiene and health evaluation
<ul style="list-style-type: none"> 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 (minimum assigned protection factor of 10) is prescribed on a precautionary basis for all workplaces unless inhalation exposure to the substance can be excluded.</i> Gloves: Protective gloves according to EN 374 have to be worn. Gloves have to be changed according to manufacturer's information or when damaged, whatever is the earlier. [Effectiveness Dermal: 90%] 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>

9.10.5.2. Exposure and risks for workers

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

Table 9.90. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, systemic, long term	0.01 mg/m ³ (MEASE: 1.02.01)	RCR = 0.071
Dermal, systemic, long term	6E-3 mg/kg bw/day (MEASE: 1.02.01)	RCR = 0.15
Combined routes, systemic, long-term		RCR = 0.221

Remarks on exposure data from external estimation tools:

MEASE 1.02.01

Explanations: Dermal, systemic, long term

For calculation of systemic exposure, the exposure estimate for total dermal loading as obtained in MEASE (reported in mg/day) is divided by a body weight of 70 kg for workers.

Risk characterisation

Further information on the risk characterisation for local effects or acute systemic effects via inhalation and via the dermal route and local effects to the eyes is given in Section 9.0.4.2.

Under the prescribed conditions of use, exposure is below the DNEL and local effects are not expected. Therefore, risks are adequately controlled.