

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.

Versión: 20

Fecha de revisión: 28/07/2017

Página 1 de 8

Fecha de impresión: 28/07/2017

SECCIÓN 1: IDENTIFICACIÓN DE LA SUSTANCIA Y DE LA SOCIEDAD O LA EMPRESA.

1.1 Identificador del producto.

Nombre del producto: ACIDO CITRICO 1-H ALIM.
Código del producto: 131A1A
Nombre químico: ácido cítrico monohidratado
N. CAS: 5949-29-1
N. CE: 201-069-1
N. registro: 01-2119457026-42-XXXX

1.2 Usos pertinentes identificados de la sustancia y usos desaconsejados.

Aditivo alimentario

Usos desaconsejados:

Usos distintos a los aconsejados.

1.3 Datos del proveedor de la ficha de datos de seguridad.

Empresa: **Barcelonesa de Drogas y Productos Químicos, S.A.**
Dirección: Crom, 14 - P.I. FAMADES
Población: 08940 - Cornellà del Llobregat
Provincia: Barcelona
Teléfono: 93 377 02 08
Fax: 93 377 42 49
E-mail: barcelonesa@barcelonesa.com
Web: www.grupbarcelonesa.com

1.4 Teléfono de emergencia: 704100087 (Disponible 24h)

SECCIÓN 2: IDENTIFICACIÓN DE LOS PELIGROS.

2.1 Clasificación de la sustancia.

Según el Reglamento (EU) No 1272/2008:
Eye Irrit. 2 : Provoca irritación ocular grave.

2.2 Elementos de la etiqueta.

Etiquetado conforme al Reglamento (EU) No 1272/2008:

Pictogramas:



Palabra de advertencia:

Atención

Frases H:

H319 Provoca irritación ocular grave.

Frases P:

P264 Lavarse concienzudamente tras la manipulación
P280 Llevar guantes/prendas/gafas/máscara de protección.
P305+P351+P338 EN CASO DE CONTACTO CON LOS OJOS: Aclarar cuidadosamente con agua durante varios minutos. Quitar las lentes de contacto, si lleva y resulta fácil. Seguir aclarando.
P337+P313 Si persiste la irritación ocular: Consultar a un médico.

Contiene:

ácido cítrico monohidratado

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.



Versión: 20

Fecha de revisión: 28/07/2017

Página 2 de 8

Fecha de impresión: 28/07/2017

2.3 Otros peligros.

En condiciones de uso normal y en su forma original, el producto no tiene ningún otro efecto negativo para la salud y el medio ambiente.

SECCIÓN 3: COMPOSICIÓN/INFORMACIÓN SOBRE LOS COMPONENTES.

3.1 Sustancias.

Nombre químico:	ácido cítrico monohidratado
N. CAS:	5949-29-1
N. CE:	201-069-1
N. registro:	01-2119457026-42-XXXX

3.2 Mezclas.

No Aplicable.

SECCIÓN 4: PRIMEROS AUXILIOS.

4.1 Descripción de los primeros auxilios.

En los casos de duda, o cuando persistan los síntomas de malestar, solicitar atención médica. No administrar nunca nada por vía oral a personas que se encuentre inconscientes.

Inhalación.

Situar al accidentado al aire libre, mantenerle caliente y en reposo, si la respiración es irregular o se detiene, practicar respiración artificial. No administrar nada por la boca. Si está inconsciente, ponerle en una posición adecuada y buscar ayuda médica.

Contacto con los ojos.

En caso de llevar lentes de contacto, quitarlas. Lavar abundantemente los ojos con agua limpia y fresca durante, por lo menos, 10 minutos, tirando hacia arriba de los párpados y buscar asistencia médica.

Contacto con la piel.

Quitar la ropa contaminada. Lavar la piel vigorosamente con agua y jabón o un limpiador de piel adecuado. **NUNCA** utilizar disolventes o diluyentes.

Ingestión.

Si accidentalmente se ha ingerido, buscar inmediatamente atención médica. Mantenerle en reposo. **NUNCA** provocar el vómito.

4.2 Principales síntomas y efectos, agudos y retardados.

Producto Irritante, el contacto repetido o prolongado con la piel o las mucosas puede causar enrojecimiento, ampollas o dermatitis, la inhalación de niebla de pulverización o partículas en suspensión puede causar irritación de las vías respiratorias, algunos de los síntomas pueden no ser inmediatos. Pueden producirse reacciones alérgicas.

4.3 Indicación de toda atención médica y de los tratamientos especiales que deban dispensarse inmediatamente.

En los casos de duda, o cuando persistan los síntomas de malestar, solicitar atención médica. No administrar nunca nada por vía oral a personas que se encuentren inconscientes.

SECCIÓN 5: MEDIDAS DE LUCHA CONTRA INCENDIOS.

El producto NO está clasificado como inflamable, en caso de incendio se deben seguir las medidas expuestas a continuación:

5.1 Medios de extinción.

Medios de extinción recomendados.

Polvo extintor o CO₂. En caso de incendios más graves también espuma resistente al alcohol y agua pulverizada. No usar para la extinción chorro directo de agua.

5.2 Peligros específicos derivados de la sustancia.

Riesgos especiales.

El fuego puede producir un espeso humo negro. Como consecuencia de la descomposición térmica, pueden formarse productos peligrosos: monóxido de carbono, dióxido de carbono. La exposición a los productos de combustión o descomposición puede ser perjudicial para la salud.

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.

Versión: 20

Fecha de revisión: 28/07/2017

Página 3 de 8

Fecha de impresión: 28/07/2017

5.3 Recomendaciones para el personal de lucha contra incendios.

Refrigerar con agua los tanques, cisternas o recipientes próximos a la fuente de calor o fuego. Tener en cuenta la dirección del viento. Evitar que los productos utilizados en la lucha contra incendio pasen a desagües, alcantarillas o cursos de agua.

Equipo de protección contra incendios.

Según la magnitud del incendio, puede ser necesario el uso de trajes de protección contra el calor, equipo respiratorio autónomo, guantes, gafas protectoras o máscaras faciales y botas.

SECCIÓN 6: MEDIDAS EN CASO DE VERTIDO ACCIDENTAL.

6.1 Precauciones personales, equipo de protección y procedimientos de emergencia.

Para control de exposición y medidas de protección individual, ver sección 8.

6.2 Precauciones relativas al medio ambiente.

Evitar la contaminación de desagües, aguas superficiales o subterráneas, así como del suelo.

6.3 Métodos y material de contención y de limpieza.

La zona contaminada debe limpiarse inmediatamente con un descontaminante adecuado. Echar el descontaminante a los restos y dejarlo durante varios días hasta que no se produzca reacción, en un envase sin cerrar.

6.4 Referencia a otras secciones.

Para control de exposición y medidas de protección individual, ver sección 8.

Para la eliminación de los residuos, seguir las recomendaciones de la sección 13.

SECCIÓN 7: MANIPULACIÓN Y ALMACENAMIENTO.

7.1 Precauciones para una manipulación segura.

Para la protección personal, ver sección 8. No emplear nunca presión para vaciar los envases, no son recipientes resistentes a la presión.

En la zona de aplicación debe estar prohibido fumar, comer y beber.

Cumplir con la legislación sobre seguridad e higiene en el trabajo.

Conservar el producto en envases de un material idéntico al original.

7.2 Condiciones de almacenamiento seguro, incluidas posibles incompatibilidades.

Almacenar según la legislación local. Observar las indicaciones de la etiqueta. Almacenar los envases entre 5 y 35 °C, en un lugar seco y bien ventilado, lejos de fuentes de calor y de la luz solar directa. Mantener lejos de puntos de ignición. Mantener lejos de agentes oxidantes y de materiales fuertemente ácidos o alcalinos. No fumar. Evitar la entrada a personas no autorizadas. Una vez abiertos los envases, han de volverse a cerrar cuidadosamente y colocarlos verticalmente para evitar derrames.

El producto no se encuentra afectado por la Directiva 2012/18/UE (SEVESO III).

7.3 Usos específicos finales.

No disponible.

SECCIÓN 8: CONTROLES DE EXPOSICIÓN/PROTECCIÓN INDIVIDUAL.

8.1 Parámetros de control.

El producto NO contiene sustancias con Valores Límite Ambientales de Exposición Profesional. El producto NO contiene sustancias con Valores Límite Biológicos.

8.2 Controles de la exposición.

Medidas de orden técnico:

Proveer una ventilación adecuada, lo cual puede conseguirse mediante una buena extracción-ventilación local y un buen sistema general de extracción.

Concentración:	100 %
Usos:	Aditivo alimentario
Protección respiratoria:	
EPI:	Mascarilla autofiltrante para partículas
Características:	Marcado «CE» Categoría III. Fabricada en material filtrante, cubre nariz, boca y mentón.
Normas CEN:	EN 149



FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.

Versión: 20

Fecha de revisión: 28/07/2017

Página 4 de 8

Fecha de impresión: 28/07/2017

Mantenimiento:	Previo al uso se comprobará la ausencia de roturas, deformaciones, etc. Por ser un equipo de protección individual desechable, se deberá renovar en cada uso.				
Observaciones:	Si no están bien ajustado no protege al trabajador. Se deberán seguir las instrucciones del fabricante respecto al uso apropiado del equipo.				
Tipo de filtro necesario:	P2				
Protección de las manos:					
EPI:	Guantes de protección contra productos químicos				
Características:	Marcado «CE» Categoría III.				
Normas CEN:	EN 374-1, En 374-2, EN 374-3, EN 420				
Mantenimiento:	Se guardarán en un lugar seco, alejados de posibles fuentes de calor, y se evitará la exposición a los rayos solares en la medida de lo posible. No se realizarán sobre los guantes modificaciones que puedan alterar su resistencia ni se aplicarán pinturas, disolventes o adhesivos.				
Observaciones:	Los guantes deben ser de la talla correcta, y ajustarse a la mano sin quedar demasiado holgados ni demasiado apretados. Se deberán utilizar siempre con las manos limpias y secas.				
Material:	PVC (Cloruro de polivinilo)	Tiempo de penetración (min.):	> 480	Espesor del material (mm):	0,35
Protección de los ojos:					
EPI:	Gafas de protección con montura integral				
Características:	Marcado «CE» Categoría II. Protector de ojos de montura integral para la protección contra polvo, humos, nieblas y vapores.				
Normas CEN:	EN 165, EN 166, EN 167, EN 168				
Mantenimiento:	La visibilidad a través de los oculares debe ser óptima para lo cual estos elementos se deben limpiar a diario, los protectores deben desinfectarse periódicamente siguiendo las instrucciones del fabricante.				
Observaciones:	Indicadores de deterioro pueden ser: coloración amarilla de los oculares, arañazos superficiales en los oculares, rasgaduras, etc.				
Protección de la piel:					
EPI:	Ropa de protección con propiedades antiestáticas				
Características:	Marcado «CE» Categoría II. La ropa de protección no debe ser estrecha o estar suelta para que no interfiera en los movimientos del usuario.				
Normas CEN:	EN 340, EN 1149-1, EN 1149-2, EN 1149-3, EN 1149-5				
Mantenimiento:	Se deben seguir las instrucciones de lavado y conservación proporcionadas por el fabricante para garantizar una protección invariable.				
Observaciones:	La ropa de protección debería proporcionar un nivel de confort consistente con el nivel de protección que debe proporcionar contra el riesgo contra el que protege, con las condiciones ambientales, el nivel de actividad del usuario y el tiempo de uso previsto.				
EPI:	Calzado de protección con propiedades antiestáticas				
Características:	Marcado «CE» Categoría II.				
Normas CEN:	EN ISO 13287, EN ISO 20344, EN ISO 20346				
Mantenimiento:	El calzado debe ser objeto de un control regular, si su estado es deficiente se deberá dejar de utilizar y ser reemplazado.				
Observaciones:	La comodidad en el uso y la aceptabilidad son factores que se valoran de modo muy distinto según los individuos. Por tanto conviene probar distintos modelos de calzado y, a ser posible, anchos distintos.				

SECCIÓN 9: PROPIEDADES FÍSICAS Y QUÍMICAS.

9.1 Información sobre propiedades físicas y químicas básicas.

Aspecto: Sólido cristalino blanco

Color: N.D./N.A.

Olor: Inodoro

Umbral olfativo: N.D./N.A.

pH: 1.7 (100 g/l)

Punto de Fusión: 153 °C

Punto/intervalo de ebullición: N.D./N.A.

Punto de inflamación: 345 °C

Tasa de evaporación: N.D./N.A.

Inflamabilidad (sólido, gas): No

Límite inferior de explosión: N.D./N.A.

Límite superior de explosión: N.D./N.A.

Presión de vapor: 2.21 *10⁻⁶ Pa

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.

Versión: 20

Fecha de revisión: 28/07/2017

Página 5 de 8

Fecha de impresión: 28/07/2017

Densidad de vapor: N.D./N.A.
Densidad relativa: 1.665 g/cm³
Solubilidad: N.D./N.A.
Liposolubilidad: Parcialmente soluble en alcoholes
Hidrosolubilidad: 590 g/l
Coeficiente de reparto (n-octanol/agua): - 0.2 - -1.8 log Pow
Temperatura de autoinflamación: N.D./N.A.
Temperatura de descomposición: Se descompone antes de la ebullición °C
Viscosidad: N.D./N.A.
Propiedades explosivas: No
Propiedades comburentes: Combustible

N.D./N.A.= No Disponible/No Aplicable debido a la naturaleza del producto.

9.2 Otros datos.

Punto de Gota: N.D./N.A.

Centelleo: N.D./N.A.

Viscosidad cinemática: N.D./N.A.

N.D./N.A.= No Disponible/No Aplicable debido a la naturaleza del producto.

SECCIÓN 10: ESTABILIDAD Y REACTIVIDAD.

10.1 Reactividad.

El producto no presenta peligros debido a su reactividad.

10.2 Estabilidad química.

Inestable en contacto con:

- Bases.

10.3 Posibilidad de reacciones peligrosas.

Puede producirse una neutralización en contacto con bases.

A altas temperaturas puede producirse pirólisis y deshidrogenación.

10.4 Condiciones que deben evitarse.

Evitar las siguientes condiciones:

- Calentamiento.
- Alta temperatura.
- Evitar el contacto con bases.

10.5 Materiales incompatibles.

Evitar los siguientes materiales:

- Ácidos.
- Bases.
- Agentes oxidantes.

10.6 Productos de descomposición peligrosos.

Dependiendo de las condiciones de uso, pueden generarse los siguientes productos:

- Vapores o gases corrosivos.

En caso de incendio se pueden generar productos de descomposición peligrosos, tales como monóxido y dióxido de carbono, humos y óxidos de nitrógeno.

SECCIÓN 11: INFORMACIÓN TOXICOLÓGICA.

PREPARADO IRRITANTE. Salpicaduras en los ojos pueden causar irritación de los mismos.

11.1 Información sobre los efectos toxicológicos.

El contacto repetido o prolongado con el producto, puede causar la eliminación de la grasa de la piel, dando lugar a una dermatitis de contacto no alérgica y a que se absorba el producto a través de la piel.

Las salpicaduras en los ojos pueden causar irritación y daños reversibles.

Información Toxicológica.

Nombre	Toxicidad aguda		
	Tipo	Ensayo	Especie

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.



Versión: 20

Fecha de revisión: 28/07/2017

Página 6 de 8

Fecha de impresión: 28/07/2017

ácido cítrico monohidratado N. CAS: 5949-29-1 N. CE: 201-069-1	Oral	LD50	Mousse	5040 mg/kg
	Cutánea			
	Inhalación			

a) toxicidad aguda;

Datos no concluyentes para la clasificación.

b) corrosión o irritación cutáneas;

Datos no concluyentes para la clasificación.

c) lesiones oculares graves o irritación ocular;

Producto clasificado:

Irritación ocular, Categoría 2: Provoca irritación ocular grave.

d) sensibilización respiratoria o cutánea;

Datos no concluyentes para la clasificación.

e) mutagenicidad en células germinales;

Datos no concluyentes para la clasificación.

f) carcinogenicidad;

Datos no concluyentes para la clasificación.

g) toxicidad para la reproducción;

Datos no concluyentes para la clasificación.

h) toxicidad específica en determinados órganos (STOT) - exposición única;

Datos no concluyentes para la clasificación.

i) toxicidad específica en determinados órganos (STOT) - exposición repetida;

Datos no concluyentes para la clasificación.

j) peligro por aspiración;

Datos no concluyentes para la clasificación.

SECCIÓN 12: INFORMACIÓN ECOLÓGICA.

12.1 Toxicidad.

Nombre	Ecotoxicidad			
	Tipo	Ensayo	Especie	Valor
ácido cítrico monohidratado N. CAS: 5949-29-1 N. CE: 201-069-1	Peces	LC50	Leuciscus	440-760 mg/l (96h)
	Invertebrados acuáticos	CE50	Dafnia magna	120 mg/l (72h)
	Plantas acuáticas			

12.2 Persistencia y degradabilidad.

No existe información disponible sobre la persistencia y degradabilidad del producto.

12.3 Potencial de Bioacumulación.

No se dispone de información relativa a la Bioacumulación.

12.4 Movilidad en el suelo.

No existe información disponible sobre la movilidad en el suelo.

No se debe permitir que el producto pase a las alcantarillas o a cursos de agua.

Evitar la penetración en el terreno.

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.

Versión: 20

Fecha de revisión: 28/07/2017

Página 7 de 8

Fecha de impresión: 28/07/2017

12.5 Resultados de la valoración PBT y mPmB.

No existe información disponible sobre la valoración PBT y mPmB del producto.

12.6 Otros efectos adversos.

No existe información disponible sobre otros efectos adversos para el medio ambiente.

SECCIÓN 13: CONSIDERACIONES RELATIVAS A LA ELIMINACIÓN.

13.1 Métodos para el tratamiento de residuos.

No se permite su vertido en alcantarillas o cursos de agua. Los residuos y envases vacíos deben manipularse y eliminarse de acuerdo con las legislaciones local/nacional vigentes.

Seguir las disposiciones de la Directiva 2008/98/CE respecto a la gestión de residuos.

SECCIÓN 14: INFORMACIÓN RELATIVA AL TRANSPORTE.

No es peligroso en el transporte. En caso de accidente y vertido del producto actuar según el punto 6.

14.1 Número ONU.

No es peligroso en el transporte.

14.2 Designación oficial de transporte de las Naciones Unidas.

Descripción:

ADR: No es peligroso en el transporte.

IMDG: No es peligroso en el transporte.

ICAO: No es peligroso en el transporte.

14.3 Clase(s) de peligro para el transporte.

No es peligroso en el transporte.

14.4 Grupo de embalaje.

No es peligroso en el transporte.

14.5 Peligros para el medio ambiente.

No es peligroso en el transporte.

14.6 Precauciones particulares para los usuarios.

No es peligroso en el transporte.

14.7 Transporte a granel con arreglo al anexo II del Convenio MARPOL y del Código IBC.

No es peligroso en el transporte.

SECCIÓN 15: INFORMACIÓN REGLAMENTARIA.

15.1 Reglamentación y legislación en materia de seguridad, salud y medio ambiente específicas para la sustancia.

El producto no está afectado por el Reglamento (CE) nº 1005/2009 del Parlamento Europeo y del Consejo, de 16 de septiembre de 2009, sobre las sustancias que agotan la capa de ozono.

Compuesto orgánico volátil (COV)

Contenido de COV (p/p): 0 %

Contenido de COV: 0 g/l

El producto no se encuentra afectado por la Directiva 2012/18/UE (SEVESO III).

El producto no está afectado por el Reglamento (UE) No 528/2012 relativo a la comercialización y el uso de los biocidas.

El producto no se encuentra afectado por el procedimiento establecido en el Reglamento (UE) No 649/2012, relativo a la exportación e importación de productos químicos peligrosos.

15.2 Evaluación de la seguridad química.

No se ha llevado a cabo una evaluación de la seguridad química del producto.

Se dispone de Escenario de Exposición del producto.

FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2015/830)

131A1A-ACIDO CITRICO 1-H ALIM.



Versión: 20

Fecha de revisión: 28/07/2017

Página 8 de 8

Fecha de impresión: 28/07/2017

SECCIÓN 16: OTRA INFORMACIÓN.

Códigos de clasificación:

Eye Irrit. 2 : Irritación ocular, Categoría 2

Secciones modificadas respecto a la versión anterior:

1,8,9,10,16

Se aconseja realizar formación básica con respecto a seguridad e higiene laboral para realizar una correcta manipulación del producto.

Se dispone de Escenario de Exposición del producto.

Abreviaturas y acrónimos utilizados:

CEN: Comité Europeo de Normalización.

EC50: Concentración efectiva media.

EPI: Equipo de protección personal.

LC50: Concentración Letal, 50%.

LD50: Dosis Letal, 50%.

Principales referencias bibliográficas y fuentes de datos:

<http://eur-lex.europa.eu/homepage.html>

<http://echa.europa.eu/>

Reglamento (UE) 2015/830.

Reglamento (CE) No 1907/2006.

Reglamento (EU) No 1272/2008.

La información facilitada en esta ficha de Datos de Seguridad ha sido redactada de acuerdo con el REGLAMENTO (UE) 2015/830 DE LA COMISIÓN de 28 de mayo de 2015 por el que se modifica el Reglamento (CE) no 1907/2006 del Parlamento Europeo y del Consejo, relativo al registro, la evaluación, la autorización y la restricción de las sustancias y mezclas químicas (REACH), por el que se crea la Agencia Europea de Sustancias y Preparados Químicos, se modifica la Directiva 1999/45/CE y se derogan el Reglamento (CEE) nº 793/93 del Consejo y el Reglamento (CE) nº 1488/94 de la Comisión así como la Directiva 76/769/CEE del Consejo y las Directivas 91/155/CEE, 93/67/CEE, 93/105/CE y 2000/21/CE de la Comisión.

La información de esta Ficha de Datos de Seguridad del Producto está basada en los conocimientos actuales y en las leyes vigentes de la CE y nacionales, en cuanto que las condiciones de trabajo de los usuarios están fuera de nuestro conocimiento y control. El producto no debe utilizarse para fines distintos a aquellos que se especifican, sin tener primero una instrucción por escrito, de su manejo. Es siempre responsabilidad del usuario tomar las medidas oportunas con el fin de cumplir con las exigencias establecidas en las legislaciones.

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Annex to extended safety data sheet (eSDS)

Exposure scenario

Substance / User identity													
Registration number(s)	01-2119457026-42-0004												
Substance identity	CAS#77-92-9; EC#201-069-1												
1	Short title of the exposure scenario	1、 Production of citric acid											
	Processes and activities covered by the exposure scenario	PROC 1, PROC 2, PROC 3, PROC 4, PROC 8b, SU 3,SU 8,											
2	Operational conditions and risk management measures												
	Duration an frequency of use												
	Worker All applicable PROCs	>4h											
	Physical form of substance:	Solid.											
	Concentration of substance in preparation or article	90%											
Other relevant operational conditions of use	<p>No measured data are available for releases of citric acid to air and waste water for the generic production site. Releases are therefore estimated on the basis of other information.</p> <p>Releases to air: Due to the very low vapour pressure of the key intermediates and of citric acid itself, losses to air are considered to be zero.</p> <p>Releases to waste water: The key production stage is the precipitation of calcium citrate. This substance is of low solubility, although a small quantity of citric acid could remain dissolved, a fraction of 0.0001, or 2.86 kg/d over 350 days.</p> <p>There could be losses during handling and packaging processes, but when around 30 tonnes per day are handled these processes are highly automated. It can be anticipated that occasional spillages can occur due to small levels of leakage, amounting to at most 1 kg per day passing to aqueous waste.</p> <p>The total passing to aqueous waste water is 3.86 kg/d.</p>												
Risk management measures:													
2.1	Control of worker exposure												
	Operational conditions related to respiration and skin contact	<table border="1"> <thead> <tr> <th>Information type</th> <th>Data field</th> <th>Explanation</th> </tr> </thead> <tbody> <tr> <td>Respiration volume under conditions of use</td> <td>10 m³/d</td> <td>Default for workers, light activity</td> </tr> <tr> <td rowspan="2">Area of skin contact with the substance under conditions of use</td> <td>240 cm²</td> <td>ECETOC TRA default: PROC 1: palm of one hand</td> </tr> <tr> <td>480 cm²</td> <td>PROC 2: palms of both hands</td> </tr> </tbody> </table>	Information type	Data field	Explanation	Respiration volume under conditions of use	10 m ³ /d	Default for workers, light activity	Area of skin contact with the substance under conditions of use	240 cm ²	ECETOC TRA default: PROC 1: palm of one hand	480 cm ²	PROC 2: palms of both hands
		Information type	Data field	Explanation									
Respiration volume under conditions of use	10 m ³ /d	Default for workers, light activity											
Area of skin contact with the substance under conditions of use	240 cm ²	ECETOC TRA default: PROC 1: palm of one hand											
	480 cm ²	PROC 2: palms of both hands											

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		240 cm ²	PROC 3: palm of one hand	
		480 cm ²	PROC4: palms of both hands	
		480 cm ²	PROC8b: palms of both hands	
	Body weight	70 kg	Default	
Technical fate of substance and losses from process/use to waste, waste water and air	Information type	Data field	Explanation	
	Fraction of applied amount lost from process/use to waste gas	0 kg/kg	See text	
	Fraction of applied amount lost from process/use to waste water	0.0001 kg/kg	See text	
Engineering controls:				
Personal protective equipment (PPE)	Information type	Data field	Explanation	
	Containment plus good work practice required	Yes		
	Local exhaust ventilation required plus good work practise	Yes	Typical practice of chemical industry. Not applicable for PROC1.	
	Skin protection	Protective gloves		
	Eye protection	Safety glasses		
	Respiratory protection	Dust mask. In case of open handling of larger quantities or accidental release: particle mask or respirator with independent air supply		
	Clothing	Working clothing worn.		

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Information type	Data field	Explanation
Risk management measures related to environmental emissions from industrial sites	Onsite pre-treatment of waste water	Yes	Neutralisation
	Resulting fraction of initially applied amount in waste water released from site to the external sewage system		On-site biological waste treatment is expected to remove a high proportion of citric acid, as the substance is highly biodegradable.
	Air emission abatement	No measured data	
	Resulting fraction of applied amount in waste gas released to environment	No measured data	
	Onsite waste treatment	No measured data	Secondary biological treatment
	Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	No measured data	
	Municipal or other type of external waste water treatment	None	None
	Effluent (of the waste water treatment plant) discharge rate	1 x 10 ⁷ l/d	Default for a large industrial site
	Recovery of sludge for agriculture or horticulture	Yes	Dried sludge may be sold as an approved agricultural fertiliser
	Frequency and duration of use		

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		Information type	Data field	Explanation			
Use per site Duration of emission Waste water flow Dilution factor		Used amount of substance per day	30 tonnes				
		Duration of exposure per day at workplace [for one worker]	>4 hours (all PROCs)	REACH default used as a work exposure times may be s			
		Frequency of exposure at workplace [for one worker]	Once per day				
		Annual amount used per site	10,000 tonnes				
		Emission days per site	350				
		Information on estimated exposure and Downstream-user guidance					
3	Exposure estimation and reference to its source:						
	Dermal exposure estimates (based on ECETOC TRA model)	Process category	Description	LEV present?	Predicted exposure ($\mu\text{g}/\text{cm}^2/\text{day}$)	Exposed skin surface area (cm^2)	Dermal exposure ($\text{mg}/\text{kg}/\text{day}$)^a
		PROC1	Use in closed process, no likelihood of exposure	No	100	240	0.3
		PROC2	Use in closed, continuous process with occasional controlled exposure (e.g. sampling)	Yes	20	480	0.14
		PROC3	Use in closed batch process (synthesis or formulation)	Yes	10	240	0.03
		PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	Yes	100	480	0.69
		PROC8b	Transfer from/to large vessels	Yes	100	480	0.69

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		(dedicated)				
		<p>a) Calculated assuming a default bodyweight of 70 kg for worker.</p> <p>b) In the ECETOC TRA model, LEV is not considered relevant for PROC1.</p>				
Inhalation exposure estimates (based on ECETOC TRA model)	Process category	Description	LEV present?	Predicted exposure (ppm)	Predicted exposure (mg/m³)^c	Inhalation exposure (mg/kg/day)^d
	PROC1	Use in closed process, no likelihood of exposure	No ^b	0.001	0.01	0.001
	PROC2	Use in closed, continuous process with occasional controlled exposure (e.g. sampling)	Yes	0.01	0.1	0.01
	PROC3	Use in closed batch process (synthesis or formulation)	Yes	0.01	0.1	0.01
	PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	Yes	0.31	2.5	0.36
	PROC8b	Transfer from/to large vessels(dedicated)	Yes	0.16	1.25	0.18
		<p>b) In the ECETOC TRA model, LEV is not considered relevant for PROC1.</p> <p>c) Results are calculated as mg/m³ for solids and ppm for non-solids</p> <p>d) Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift</p>				

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Summary of long-term exposure concentration to workers	<table border="1"> <thead> <tr> <th>Routes of exposure</th> <th>Concentrations</th> <th>Justification</th> </tr> </thead> <tbody> <tr> <td>Dermal local exposure (in µg/cm²)</td> <td>0.6</td> <td>ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.</td> </tr> <tr> <td>Dermal systemic exposure (in mg/kg bw/d)</td> <td>0.004</td> <td>ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.</td> </tr> <tr> <td>Inhalation exposure (in mg/m³)/8h workday</td> <td>2.5</td> <td>ECETOC TRA prediction for PROC8b</td> </tr> <tr> <td>Inhalation exposure (in mg/kg/d)/8h workday</td> <td>0.36</td> <td>ECETOC TRA prediction for PROC8b</td> </tr> </tbody> </table>	Routes of exposure	Concentrations	Justification	Dermal local exposure (in µg/cm ²)	0.6	ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.	Dermal systemic exposure (in mg/kg bw/d)	0.004	ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.	Inhalation exposure (in mg/m ³)/8h workday	2.5	ECETOC TRA prediction for PROC8b	Inhalation exposure (in mg/kg/d)/8h workday	0.36	ECETOC TRA prediction for PROC8b							
Routes of exposure	Concentrations	Justification																						
Dermal local exposure (in µg/cm ²)	0.6	ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.																						
Dermal systemic exposure (in mg/kg bw/d)	0.004	ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.																						
Inhalation exposure (in mg/m ³)/8h workday	2.5	ECETOC TRA prediction for PROC8b																						
Inhalation exposure (in mg/kg/d)/8h workday	0.36	ECETOC TRA prediction for PROC8b																						
4	<p>Environmental releases</p> <p>Predicted environmental release</p>	<p>Predicted environmental release estimates have been used for releases during production. No measured data are available for the concentration of citric acid in any environmental compartment. The releases have been estimated using the exposure scenario for production (section 9.1.1.2 and 9.1.1.6) and Predicted Environmental Concentrations have been determined using EUSES 2.1.1. The EUSES program implements the environmental exposure models described in REACH Technical Guidance Chapter R16. Default model parameters have been used unless stated below.</p> <p>The basis of local and regional production tonnages is to consider the sizes of the largest sites in the EU relative to the total tonnage as follows: Production volume in EU: 100 000 tonnes Regional tonnage: 10 000 tonnes Fraction of main local source: 1 Local tonnage: 29 tonnes per day Number of days: 350</p> <p>The contribution of local releases to the regional concentration has been considered using the appropriate calculation in EUSES 2.1.1.</p>																						
	Summary of Predicted Exposure Concentrations	<table border="1"> <thead> <tr> <th></th> <th>PEC</th> <th>unit</th> </tr> </thead> <tbody> <tr> <td colspan="3">AIR</td> </tr> <tr> <td>Annual average local PEC in air (total)</td> <td>3.50 x 10⁻¹⁶</td> <td>[mg m⁻³]</td> </tr> <tr> <td colspan="3">WATER, SEDIMENT</td> </tr> <tr> <td>Local PEC in surface water during emission episode (dissolved)</td> <td>0.0153</td> <td>[mg l⁻¹]</td> </tr> <tr> <td>Annual average local PEC in surface water (dissolved)</td> <td>0.0153</td> <td>[mg l⁻¹]</td> </tr> <tr> <td>Local PEC in fresh-water sediment during emission episode</td> <td>0.261</td> <td>[mg kg wwt⁻¹]</td> </tr> </tbody> </table>			PEC	unit	AIR			Annual average local PEC in air (total)	3.50 x 10 ⁻¹⁶	[mg m ⁻³]	WATER, SEDIMENT			Local PEC in surface water during emission episode (dissolved)	0.0153	[mg l ⁻¹]	Annual average local PEC in surface water (dissolved)	0.0153	[mg l ⁻¹]	Local PEC in fresh-water sediment during emission episode	0.261	[mg kg wwt ⁻¹]
	PEC	unit																						
AIR																								
Annual average local PEC in air (total)	3.50 x 10 ⁻¹⁶	[mg m ⁻³]																						
WATER, SEDIMENT																								
Local PEC in surface water during emission episode (dissolved)	0.0153	[mg l ⁻¹]																						
Annual average local PEC in surface water (dissolved)	0.0153	[mg l ⁻¹]																						
Local PEC in fresh-water sediment during emission episode	0.261	[mg kg wwt ⁻¹]																						

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Local PEC in seawater during emission episode (dissolved)	1.80 x 10 ⁻³	[mg l ⁻¹]
	Annual average local PEC in seawater (dissolved)	1.78 x 10 ⁻³	[mg l ⁻¹]
	Local PEC in marine sediment during emission episode	0.0307	[mg kg wwt ⁻¹]
	SOIL, GROUNDWATER		
	Local PEC in agric. soil (total) averaged over 30 days	0.0227	[mg kg wwt ⁻¹]
	Local PEC in agric. soil (total) averaged over 180 days	7.43 x 10 ⁻³	[mg kg wwt ⁻¹]
	Local PEC in grassland (total) averaged over 180 days	2.97 x 10 ⁻³	[mg kg wwt ⁻¹]
	Local PEC in pore water of agricultural soil	1.12 x 10 ⁻⁴	[mg l ⁻¹]
	Local PEC in pore water of grassland	4.48 x 10 ⁻⁵	[mg l ⁻¹]
	Local PEC in groundwater under agricultural soil	1.12 x 10 ⁻⁴	[mg l ⁻¹]

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity				
Registration number(s)	01-2119457026-42-0004			
Substance identity	CAS#77-92-9; EC#201-069-1			
1	Short title of the exposure scenario	2. Use of citric acid as a chemical intermediate		
	Processes and activities covered by the exposure scenario	SU3 (Industrial uses), SU8, SU9, PROC 1, PROC 2, PROC 3, PROC 4, PROC 8b,		
2	Operational conditions and risk management measures			
	Duration an frequency of use			
	Worker All applicable PROCs	>4h		
	Physical form of substance:	solid <input type="text"/>		
	Concentration of substance in preparation or article			
	Other relevant operational conditions of use			
Risk management measures:				
2.1	Control of worker exposure			
	Containment and local exhaust ventilation	Information type	Data field	Explanation
		Containment plus good work practice required	Yes	
	Local exhaust ventilation required plus good work practise	Yes	Typical practice of chemical industry. Not applicable for PROC1.	
	Personal protective equipment (PPE)	Information type	Data field	Explanation
		Skin protection	Protective gloves	
		Eye protection	Safety glasses	
		Respiratory protection	Dust mask. In case of open handling of larger quantities or accidental release: particle mask or respirator with independent air supply	
	Clothing	Working clothing worn.		

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Risk management measures related to environmental emissions from industrial sites:	Information type	Data field	Explanation	
		Onsite pre-treatment of waste water	Yes	Neutralisation	
		Resulting fraction of initially applied amount in waste water released from site to the external sewage system		On-site biological waste treatment is expected to remove a high proportion of citric acid, as the substance is highly biodegradable.	
		Air emission abatement	No measured data		
		Resulting fraction of applied amount in waste gas released to environment	No measured data		
		Onsite waste treatment	No measured data	Secondary biological treatment	
		Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	No measured data		
		Municipal or other type of external waste water treatment	None	None	
		Effluent (of the waste water treatment plant) discharge rate	1x 10 ⁷ l/d	Default for a large industrial site	
		Recovery of sludge for agriculture or horticulture	Yes	Dried sludge may be sold as an approved agricultural fertiliser	
2.2	Control of environmental exposure				
	Frequency and duration of use				
	Duration, frequency and amount	Information type	Data field	Explanation	

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Used amount of substance per day	10,000 kg/d	Generic information	
	Duration of exposure per day at workplace [for one worker]	>4 hours (all PROCs)	REACH default used as a worst case; actually exposure times may be significantly less	
	Frequency of exposure at workplace [for one worker]	Once per day	In situations where the duration of exposure is lower, frequency of exposure may be higher	
	Annual amount used per site	3,000 tpa	Generic information	
	Emission days per site	300 d/y	REACH default number of days for high volumes	
	Other operational conditions of use			
Releases to air	Due to the very low vapour pressure of the key intermediates and of citric acid itself, losses to air are considered to be zero.			
Releases to water	The REACH ERC 6A (Industrial use of intermediate) release default estimates to waste water is 2%.			
Technical conditions and measures at process level (source) to prevent release	No specific measures are considered			
Technical onsite conditions and measures to reduce or limit discharges, air emissions	<p>The default TGD (TGD ESD part IV) release rate from processing of synthetic intermediate is 0.7% by weight for a wet process and 0% for a dry (water-free) process. Processing of citric acid is a wet-process. On-site waste water treatment at the plant (e.g. activated carbon, precipitation and so on) is already included in the emission factors.</p> <p>The default loss of 70 kg/d (EU TGD 0.7% default) from the processing of 30 t/d of citric acid is not considered to be realistic. Realistic losses to waste water from the processing of citric acid at a typical industrial site are expected to come from:</p> <ul style="list-style-type: none"> • Substance washout from ventilation systems • Minor routine spillages • Occasional equipment loss/leakages <p>Given that a solid is precipitated efficiently it is considered that 7 kg/d is a more realistic estimate.</p> <p>Citric acid is highly degradable and on-site waste water treatment is expected to mean that little of the substance is released to the wider environment.</p> <p>It can be assumed that this process will be taking place at a large industrial site with waste water passing to a larger-than-default WWTP with a flow rate of 10,000 m³/day.</p>			
Technical fate of substance and losses from process/use to waste, waste	Information type	Data field	Explanation	

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

	water and air	Fraction of applied amount lost from process/use to waste gas	0 kg/kg	See text			
		Fraction of applied amount lost from process/use to waste water	0.007 kg/kg	See text			
Information on estimated exposure and Downstream-user guidance							
3	Exposure estimation and reference to its source:						
	Dermal	Process category	Description	Dermal exposure?	Predicted exposure ($\mu\text{g}/\text{cm}^2/\text{day}$)	Exposed skin surface area (cm^2)	Dermal exposure ($\text{mg}/\text{kg}/\text{day}$) ^a
		PROC1	Use in closed process, no likelihood of exposure	Yes	100	240	0.3
		PROC2	Use in closed, continuous process with occasional controlled exposure	Yes	20	480	0.14
		PROC3	Use in closed batch process (synthesis or formulation)	Yes	10	240	0.03
		PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	Yes	100	480	0.69
		PROC8b	Transfer from/to large vessels (dedicated)	Yes	100	480	0.69
a) Calculated assuming a default bodyweight of 70 kg for worker b) In the ECETOC TRA model, LEV is not considered relevant for PROC1.							

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Inhalation	Process category	Description	LEV present?	Predicted exposure (ppm)	Predicted exposure (mg/m ³) ^c	Inhalation Exposure (mg/kg/day) ^d
	PROC1	Use in closed process, no likelihood of exposure	No ^b	0.001	0.01	0.001
	PROC2	Use in closed, continuous process with occasional controlled exposure	Yes	0.01	0.1	0.01
	PROC3	Use in closed batch process (synthesis or formulation)	Yes	0.01	0.1	0.01
	PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	Yes	0.31	2.5	0.36
	PROC8b	Transfer from/to large vessels (dedicated)	Yes	0.16	1.25	0.18
	<p>b) In the ECETOC TRA model, LEV is not considered relevant for PROC1.</p> <p>c) Results are calculated as mg/m³ for solids and ppm for non-solids</p> <p>d) Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift</p>					
long-term exposure concentration to workers	Routes of exposure		Concentrations		Justification	
	Dermal local exposure (in µg/cm ²)		0.6		ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.	
	Dermal systemic exposure (in mg/kg bw/d)		0.004		ECETOC TRA prediction for PROC8b, multiplied by an uptake factor of 0.006.	
	Inhalation exposure (in mg/m ³)/8h workday		2.5		ECETOC TRA prediction for PROC8b	
	Inhalation exposure (in mg/kg/d)/8h workday		0.36		ECETOC TRA prediction for PROC8b	

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Predicted Environmental Concentrations	PEC	unit
	AIR	
Annual average local PEC in air (total)	5.45 x 10 ⁻¹⁶	[mg m ⁻³]
WATER, SEDIMENT		
Local PEC in surface water during emission episode (dissolved)	0.0154	[mg l ⁻¹]
Annual average local PEC in surface water (dissolved)	0.0154	[mg l ⁻¹]
Local PEC in fresh-water sediment during emission episode	0.263	[mg kg wwt ⁻¹]
Local PEC in seawater during emission episode (dissolved)	0.0084	[mg l ⁻¹]
Annual average local PEC in seawater (dissolved)	0.00716	[mg l ⁻¹]
Local PEC in marine sediment during emission episode	0.144	[mg kg wwt ⁻¹]
SOIL, GROUNDWATER		
Local PEC in agric. soil (total) averaged over 30 days	0.0411	[mg kg wwt ⁻¹]
Local PEC in agric. soil (total) averaged over 180 days	0.0135	[mg kg wwt ⁻¹]
Local PEC in grassland (total) averaged over 180 days	0.00539	[mg kg wwt ⁻¹]
Local PEC in pore water of agricultural soil	0.000203	[mg l ⁻¹]
Local PEC in pore water of grassland	0.0000813	[mg l ⁻¹]
Local PEC in groundwater under agricultural soil	0.000203	[mg l ⁻¹]

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity				
	Registration number(s)	01-2119457026-42-0004		
	Substance identity	CAS#77-92-9; EC#201-069-1		
1	Short title of the exposure scenario	3、 Formulation of citric acid into preparations		
	Processes and activities covered by the exposure scenario	SU3, 10, SU5, SU13, 20 PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC15, PROC19		
2	Operational conditions and risk management measures			
	Duration an frequency of use			
	Worker All applicable PROCs	>4h		
	Physical form of substance:	solid		
	Concentration of substance in preparation or article			
	Other relevant operational conditions of use	<p>The citrates used in the formulation of products are generally solids which may be mixed with other solids or dissolved in aqueous solution. There is some potential for airborne release of citric acid (or citrate) particulates on charging (transfer, dosing) to the process equipment used, especially if containment is not good. However, the most likely release will be to waste water via clean out or spillage. Taking the HERA figure of approx. 100 000 tpa [HERA, 2005] for total use of citrates in detergents, and realistic values of 10% formulated in a single region, and 60% of that at a single location, gives a volume of 6,000 tpa citrates formulated at a single location.</p> <p>For this generic site, the daily loss rate to waste water is $6000 \text{ t} \times 1000 \text{ kg/t} \times 0.0009 / 300 \text{ d} = 18 \text{ kg/d}$.</p> <p>The tonnage to be covered is now 150 000 tpa, but the site size is retained. The loss rate is considered to be a reasonable worst case for a large site. At smaller formulation sites the amount handled per day would be lower and the controls could be less, but overall rates per day would be similar.</p>		
Risk management measures:				
2.1	Control of worker exposure			
	Containment and local exhaust ventilation	Information type	Data field	Explanation
		Containment plus good work practice required	Yes	General good hygiene and housekeeping
		Local exhaust ventilation required plus good work practice.	Yes	Typical practice of chemical industry.
	Personal protective equipment (PPE)	Information type	Data field	Explanation
		Skin protection	Protective gloves	
		Eye protection	Safety glasses	
		Clothing	Working clothing worn.	
	Risk management measures related to environmental emissions from industrial sites:	Information type	Data field	Explanation
		Onsite pre-treatment of waste water	Yes	Removal of solids in settling tanks
		Resulting fraction of initially applied amount	No measured data	

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

		in waste water released from site to the external sewage system		
		Air emission abatement	No measured data	
		Resulting fraction of applied amount in waste gas released to environment	No measured data	See text
		Onsite waste treatment	No	Worst-case assumption as no specific information available.
		Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	No measured data	
		Municipal or other type of external waste water treatment	Yes	Typical practise in the chemical industry
		Effluent (of the waste water treatment plant) discharge rate	1 * 10 ⁷ L/d	Default for a large industrial site.
		Recovery of sludge for agriculture or horticulture	Yes	Worst-case assumption as no specific information available.
2.2	Control of environmental exposure			
	Frequency and duration of use			
	Duration, frequency and amount	Information type	Data field	Explanation
		Used amount of substance per day	6000 tonnes	
		Duration of exposure per day at workplace [for one worker]	>4 hours (all PROCs)	For some applications/setting exposure times may be significantly less
		Frequency of exposure at workplace [for one worker]	Once per day	For some applications/settings with shorter duration exposures, multiple exposures may occur in

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

						a single day	
		Annual amount used per site	20 tonnes				
		Emission days per site	300 days				
Information on estimated exposure and Downstream-user guidance							
3	Exposure estimation and reference to its source:						
	Occupational exposure:						
	Dermal	Process category	Description	Dermal exposure?	Predicted exposure ($\mu\text{g}/\text{cm}^2/\text{day}$)	Exposed skin surface area (cm^2)	Dermal exposure ($\text{mg}/\text{kg}/\text{day}$) ^a
		PROC1	Use in closed process, no likelihood of exposure	Yes	100	240	0.3
		PROC2	Use in closed, continuous process with occasional controlled exposure (e.g. sampling)	Yes	20	480	0.14
		PROC3	Use in closed batch process (synthesis or formulation)	Yes	10	240	0.034
		PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	Yes	100	480	0.69
		PROC5	Mixing or blending in batch processes (multistage and/or significant contact)	Yes	200	480	1.37
		PROC7	Industrial spraying	Yes	200	1500	4.29
		PROC8a	Transfer from/to large vessels (non-dedicated).	Yes	100	960	1.37
		PROC8b	Transfer from/to large vessels (dedicated)	Yes	100	480	0.69
		PROC9	Transfer to small containers	Yes	100	480	0.69
		PROC13	Treatment of articles by dipping and pouring	Yes	100	480	0.69

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		PROC14	Production of preparations or articles by tableting, compression, extrusion, pelletisation	Yes	50	480	0.34	
		PROC15	Use of laboratory reagents in small scale laboratories	Yes	10	240	0.034	
		PROC19	Hand-mixing with intimate contact (only PPE available)	Yes	500	1980	14.1	
Inhalation		Process category	Description	LEV present ?	Predicted exposure (ppm)	Predicted exposure (mg/m ³) ^c	Inhalation Exposure (mg/kg/day) ^d	
		PROC1	Use in closed process, no likelihood of exposure	No ^b	0.0013	0.01	0.0014	
		PROC2	Use in closed, continuous process with occasional controlled exposure (e.g. sampling)	Yes	0.0125	0.1	0.014	
		PROC3	Use in closed batch process (synthesis or formulation)	Yes	0.0125	0.1	0.014	
		PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	Yes	0.31	2.5	0.36	
		PROC5	Mixing or blending in batch processes (multistage and/or significant contact)	Yes	0.31	2.5	0.36	
		PROC7	Industrial spraying	Yes	1.25	10	1.43	
		PROC8a	Transfer from/to large vessels (non-dedicated)	Yes	0.63	5	0.71	
		PROC8b	Transfer from/to large vessels (dedicated)	Yes	0.31	2.5	0.36	
		PROC9	Transfer to small	Yes	0.25	2	0.29	

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		containers					
		PROC13	Treatment of articles by dipping and pouring	Yes	0.0013	0.01	0.0014
		PROC14	Production of preparations or articles by tableting, compression, extrusion, pelletisation	Yes	0.13	1	0.14
		PROC15	Use of laboratory reagents in small scale laboratories	Yes	0.063	0.5	0.071
		PROC19	Hand-mixing with intimate contact (only PPE available)	Yes	0.0063	0.05	0.0071
		b) Results are calculated as mg/m ³ for solids and ppm for non-solids c) Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m ³ , light activity, for an 8 hour work shift					
	long-term exposure concentration to workers	Routes of exposure	Concentration	Justification			
		Dermal local exposure (in µg/cm ²)	3	ECETOC TRA prediction for PROC19, multiplied by an uptake factor of 0.006.			
		Dermal systemic exposure (in mg/kg bw/d)	0.08	ECETOC TRA prediction for PROC19, multiplied by an uptake factor of 0.006.			
		Inhalation exposure (in mg/m ³)/8h workday	10	ECETOC TRA prediction for PROC7			
		Inhalation exposure (in mg/kg/d)/8h workday	1.43	ECETOC TRA prediction for PROC7			
	Predicted Exposure Concentrations (PEC)		PEC	unit			
		AIR					
		Annual average local PEC in air (total)	1.4 x 10 ⁻¹⁵	[mg.m ⁻³]			
		WATER, SEDIMENT					
		Local PEC in surface water during emission episode (dissolved)	0.0158	[mg l ⁻¹]			
		Annual average local PEC in surface water (dissolved)	0.0157	[mg l ⁻¹]			
		Local PEC in fresh-water sediment during emission episode	0.27	[mg kg wwt ⁻¹]			

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Local PEC in seawater during emission episode (dissolved)	0.0194	[mg l ⁻¹]
	Annual average local PEC in seawater (dissolved)	0.0162	[mg l ⁻¹]
	Local PEC in marine sediment during emission episode	0.331	[mg kg ww ⁻¹]
	SOIL, GROUNDWATER		
	Local PEC in agric. soil (total) averaged over 30 days	0.106	[mg kg ww ⁻¹]
	Local PEC in agric. soil (total) averaged over 180 days	0.347	[mg kg ww ⁻¹]
	Local PEC in grassland (total) averaged over 180 days	0.0139	[mg kg ww ⁻¹]
	Local PEC in pore water of agricultural soil	5.23 x 10 ⁻⁴	[mg l ⁻¹]
	Local PEC in pore water of grassland	2.09 x 10 ⁻⁴	[mg l ⁻¹]
	Local PEC in groundwater under agricultural soil	5.23 x 10 ⁻⁴	[mg l ⁻¹]

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
	Registration number(s) 01-2119457026-42-0004	
	Substance identity CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario 4. Personal care use	
	Processes and activities covered by the exposure scenario SU20,SU21,SU22, PROC 10, PROC 11, PROC 19	
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	solid
	Concentration of substance in preparation or article	
	Other relevant operational conditions of use	<p>The EU TGD A-Table A4.1 gives the releases of cosmetics to air and wastewater as 0 and 100% respectively. This seems reasonable, given that citrates are non-volatile and highly water soluble. It is also in agreement with Colipa's assessment of the fate of non-volatile components of cosmetics (Colipa 2008).</p> <p>The TGD defaults and REACH environmental release category (ERC8a) assume that if a substance is used widely across the EU, the fraction of the production volume used in the standard EU Region is 10%. For cosmetics, the fraction of the main local source (fmainsource) is 0.0005 (HERA, 2005, page 27). This is equivalent to saying that use in a region is evenly distributed. The number of days of use is 365 per year. Therefore, for 7500 tpa of citric acid in personal care products used widely across the EU, the estimated release of citric acid to a particular default-sized local waste water treatment plant is at most:</p> $7\ 500\ 000\ \text{kg/y} \times 0.1 \times 0.0005 / 365\ \text{d/y} = 1.03\ \text{kg/d}$
Risk management measures:		
2.1	Control of worker exposure	
	Technical conditions and measures at process level (source) to prevent release	No risk management measures are possible for personal care use in respect of the environment.
	Technical conditions and measures to control dispersion from source towards the worker	No risk management measures are possible for personal care use in respect of the environment.
	Engineering controls:	No risk management measures are possible for personal care use in respect of the environment.
	Organisational measures to prevent/limit releases, dispersion and exposure	No risk management measures are possible for personal care use in respect of the environment.
	Conditions and measures related to personal protection, hygiene and health evaluation	No risk management measures are possible for personal care use in respect of the environment.
Information on estimated exposure and Downstream-user guidance		
3	Environmental releases	Predicted Environmental Concentrations have been determined using EUSES 2.1.1. The EUSES program implements the environmental exposure models described in REACH Technical Guidance Chapter R16. Default model parameters

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		<p>have been used with the following exceptions: The basis of local and regional production tonnages is to consider the sizes of the largest sites in the EU relative to the total tonnage as follows: Production volume in EU: 7,500,000 tonnes</p> <p>Regional tonnage: 750,000 tonnes Fraction of main local source: 0.0005 Local tonnage: 1.03 tonnes per day Number of days: 365</p> <p>The contribution of local releases to the regional concentration has been considered using the appropriate calculation in EUSES 2.1.1. Table 9.33 shows the Predicted Environmental Concentrations. Due to the ready-biodegradability of citric acid it has not been considered necessary to define a PEC. The low log Kow and ready biodegradability indicate that bioaccumulation is not a concern for citric acid. Therefore, the assessment of secondary poisoning is not considered further.</p>		
	Summary of Predicted Exposure Concentrations		PEC	unit
AIR				
Annual average local PEC in air (total)		5.45 x 10 ⁻¹⁶	[mg.m ⁻³]	
WATER, SEDIMENT				
Local PEC in surface water during emission episode (dissolved)		1.59 x 10 ⁻²	[mg l ⁻¹]	
Annual average local PEC in surface water (dissolved)		1.59 x 10 ⁻²	[mg l ⁻¹]	
Local PEC in fresh-water sediment during emission episode		2.71 x 10 ⁻¹	[mg kg wwt ⁻¹]	
Local PEC in seawater during emission episode (dissolved)		1.48 x 10 ⁻³	[mg l ⁻¹]	
Annual average local PEC in seawater (dissolved)		1.48 x 10 ⁻³	[mg l ⁻¹]	
Local PEC in marine sediment during emission episode		2.53 x 10 ⁻²	[mg kg wwt ⁻¹]	
SOIL, GROUNDWATER				
Local PEC in agric. soil (total) averaged over 30 days		3.02 x 10 ⁻²	[mg kg wwt ⁻¹]	
Local PEC in agric. soil (total) averaged over		9.89 x 10 ⁻³	[mg kg wwt ⁻¹]	

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

	180 days		
	Local PEC in grassland (total) averaged over 180 days	3.95×10^{-3}	[mg kg wwt ⁻¹]
	Local PEC in pore water of agricultural soil	1.49×10^{-4}	[mg l ⁻¹]
	Local PEC in pore water of grassland	5.97×10^{-5}	[mg l ⁻¹]
	Local PEC in groundwater under agricultural soil	1.49×10^{-4}	[mg l ⁻¹]
Other environmental releases	<p>The EUSES model uses the Simple Treat sewage treatment model to predict the fate of a substance in the STP, based on the physicochemical and biodegradation properties. For citric acid, SimpleTreat predicts the following:</p> <p>12.6 % to water:</p> <p>0.112 % to air:</p> <p>0.0154 % to sludge:</p> <p>87.3 % degraded.</p> <p>Sludge from WWTPs may be spread on agricultural soil.</p> <p>The dilution factor of 900 and 1000 (in the receiving water) have been applied for fresh water and marine water respectively, as there is no information on specific hydrodynamic conditions.</p> <p>There is no direct release to the terrestrial compartment on a local scale as biosludge from on-site waste water treatment is disposed of via incineration or landfill. However, due to use of municipal WWTP by some EU production sites, spreading of sludge on agricultural soil is included as a reasonable worst case.</p>		

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity											
Registration number(s)	01-2119457026-42-0004										
Substance identity	CAS#77-92-9; EC#201-069-1										
1	Short title of the exposure scenario	5. Use of citric acid in cleaning products									
	Processes and activities covered by the exposure scenario	SU3, SU21, SU22, PROC1, PROC 2, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC 9, PROC 10, PROC 11, PROC 13, PROC 19									
2	Operational conditions and risk management measures										
	Duration an frequency of use										
	Worker All applicable PROCs	>4h									
	Physical form of substance: under conditions of use it is used as a liquid.	May be liquid or solid.									
	Concentration of substance in preparation or article										
	Other relevant operational conditions of use	<p>No measured data are available for releases to air and waste water during the use of citric acid in cleaning products. Releases are therefore estimated on the basis of information in the public domain.</p> <p>Citric acid and citrates are used in a variety of cleaning products but generally in aqueous solution. The most likely release route will, therefore, be to waste water via rinsing to drain in-use, spillage, clean out or discharge of cleaning baths or liquors. Indeed, releases to waste water can be assumed to be 100%, since all the citric acid/citrate will eventually be washed to drain. This may be an overestimate since it does not allow for any of the substance to be either released to air (extremely unlikely) during the process or to adsorb to a surface on drying or to a cleaning implement (e.g., cloth) which may be landfilled.</p> <p>The release of citrates from use in cleaning products in industrial, professional and consumer use can be estimated. The TGD defaults and REACH environmental release category (ERC8a) assume that if a substance is used widely across the EU, the fraction of the production volume used in the standard EU Region is 10%. For cleaning products, the fraction of the regional tonnage discharging to a particular waste water treatment plant can be estimated as 0.0005 (HERA, 2005). The number of days of use is 365 per year. Therefore, for 100,000 tpa of citric acid in cleaning products used widely across the EU, the estimated release of citrates to a particular default-sized local waste water treatment plant is at most:</p> $100,000,000 \text{ kg/y} \times 0.1 \times 0.0005 / 365 \text{ d/y} = 13.7 \text{ kg/d}$ <p>= (Amount of citrates used in cleaning products per year x fraction to water x fraction in the region x fraction of main local source) / number of days per year</p> <p>The research carried out by the HERA project was thorough and accepted by the EU authorities as valid.</p>									
Risk management measures:											
2.1	Control of worker exposure										
	Containment and local exhaust ventilation	<table border="1"> <thead> <tr> <th>Information type</th> <th>Data field</th> <th>Explanation</th> </tr> </thead> <tbody> <tr> <td>Containment plus good work practice required</td> <td>Yes</td> <td>General good hygiene and housekeeping</td> </tr> <tr> <td>Local exhaust ventilation required plus good work practise</td> <td>No</td> <td></td> </tr> </tbody> </table>	Information type	Data field	Explanation	Containment plus good work practice required	Yes	General good hygiene and housekeeping	Local exhaust ventilation required plus good work practise	No	
		Information type	Data field	Explanation							
Containment plus good work practice required	Yes	General good hygiene and housekeeping									
Local exhaust ventilation required plus good work practise	No										

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Personal protective equipment (PPE)	Information type	Data field	Explanation
		Skin protection	Protective gloves	
		Eye protection	Safety glasses	
		Clothing	Working clothing worn.	
	Other risk management measures related to workers	N/A		
	Risk management measures related to environmental emissions from industrial sites	Information type	Data field	Explanation
		Onsite pre-treatment of waste water	Yes	Neutralisation
		Resulting fraction of initially applied amount in waste water released from site to the external sewage system		On-site biological waste treatment is expected to remove a high proportion of citric acid, as the substance is highly biodegradable.
		Air emission abatement	No measured data	
		Resulting fraction of applied amount in waste gas released to environment	No measured data	
		Onsite waste treatment	No measured data	Secondary biological treatment
		Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	No measured data	
		Municipal or other type of external waste water treatment	None	None
		Effluent (of the waste water treatment plant) discharge rate	2000000 l/d	Default for a standard WWTP
		Recovery of sludge for agriculture or horticulture	Yes	Dried sludge may be sold as an approved agricultural fertiliser
		Onsite pre-treatment of waste water	Yes	Neutralisation
2.2	Control of environmental exposure			

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Frequency and duration of use			
Duration, frequency and amount	Information type	Data field	Explanation
	Used amount of substance per day	200,000 kg/d	Generic information
	Duration of exposure per day at workplace [for one worker]	>4 hours (all PROCs)	For some applications/setting exposure times may be significantly less
	Frequency of exposure at workplace [for one worker]	Once per day	For some applications/settings with shorter duration exposures, multiple exposures may occur in a single day
	Annual amount used per site	10 kg/d	0.00005 (10% in region, plus 0.0005 fraction of main local source from HERA)
	Emission days per site	365 d/y	Default for ERC8
Information on estimated exposure and Downstream-user guidance			
3	Exposure estimation and reference to its source:		

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Dermal exposure estimates (based on ECETOC TRA model) for cleaning and maintenance	Process category	Description	Predicted exposure (µg/cm ² /day)	Exposed skin surface area (cm ²)	Dermal exposure (mg/kg/day) ^a
	PROC8a	Transfer from/to large vessels (non-dedicated)	1000	960	13.7
	PROC8b	Transfer from/to large vessels(dedicated)	1000	480	6.9
	PROC9	Transfer to small containers	1000	480	6.9
	PROC7	Industrial spraying	100	1500	2.14
	PROC10	Roller application or brushing	2000	960	27.4
	PROC13	Dipping or pouring	2000	480	13.7
	(a) Calculated assuming a default bodyweight of 70 kg for workers				

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Inhalation exposure estimates (based on ECETOC TRA model) for cleaning and maintenance products	Process category	Description	Predicted exposure (µg/cm ² /day)	Exposed skin surface area (cm ²)	Dermal exposure (mg/kg/day) ^a
		PROC8a	Transfer from/to large vessels (non-dedicated)	0.063	0.5	0.07
		PROC8b	Transfer from/to large vessels (dedicated)	0.012	0.1	0.014
		PROC9	Transfer to small containers	0.012	0.1	0.01
		PROC7	Spraying in industrial settings and applications	0.63	5	0.71
		PROC10	Roller application or brushing	0.063	0.5	0.07
		PROC13	Dipping or pouring	0.012	0.1	0.014
			Summary of long-term exposure concentration to workers	Routes of exposure	Concentrations	Justification
Dermal local exposure (in µg/cm ²)	12			ECETOC TRA prediction for PROC10; multiplied by a dermal uptake factor of 0.006.		
Dermal systemic exposure (in mg/kg bw/d)	0.16			ECETOC TRA prediction for PROC10; multiplied by a dermal uptake factor of 0.006.		
Inhalation exposure (in mg/m ³)/8h workday	5			ECETOC TRA prediction for PROC7		
Inhalation exposure (in mg/kg/d)/8h workday	0.71			ECETOC TRA prediction for PROC7		
4	Operational conditions related to available dilution capacity and characteristics of exposed humans					
	Occupational exposure Operational conditions related to respiration and skin contact	Information type	Data field	Explanation		
		Respiration volume under conditions of use	10 m ³ /d	Default for workers, light activity		

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		Area of skin contact with the substance under conditions of use	480 cm ² 1500 cm ² 960 cm ² 480 cm ² 480 cm ² 960 cm ² 1500 cm ² 480 cm ² 1980 cm ²	ECETOC TRA default: PROC5: PROC7: PROC8a: PROC8b: PROC9 PROC10 PROC11 PROC13 PROC19
		Body weight	70 kg	Default for workers
Operational conditions related to respiration, skin contact and ingestion for the general public	Information type	Data field		Explanation
	Skin contact area	960 cm ²		ConsExpo default
	Mouth contact area	-		Not applicable – no oral exposure
	Respiration volume under conditions of use	26 m ³		Default: Light activity 26 m ³ /24 h
	Room size and ventilation rate	20m ³ ; exchange per hour 0.6 h ⁻¹		ConsExpo defaults
	Body weight	65 kg		Default adult bodyweight
Predicted Exposure Concentrations of Environmental releases		PEC		unit
	AIR			
	Annual average local PEC in air (total)	1.30 x 10 ⁻¹⁵		[mg.m ⁻³]
	WATER, SEDIMENT			
	Local PEC in surface water during emission episode (dissolved)	2.48 x 10 ⁻²		[mg l ⁻¹]
	Annual average local PEC in surface water (dissolved)	2.48 x 10 ⁻²		[mg l ⁻¹]
	Local PEC in fresh-water sediment during emission episode	4.23 x 10 ⁻¹		[mg kg wwt ⁻¹]
	Local PEC in seawater during emission episode (dissolved)	2.37 x 10 ⁻³		[mg l ⁻¹]
	Annual average local PEC in seawater (dissolved)	2.37 x 10 ⁻³		[mg l ⁻¹]
	Local PEC in marine sediment during	4.05 x 10 ⁻²		[mg kg wwt ⁻¹]

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		emission episode		
		SOIL, GROUNDWATER		
		Local PEC in agric. soil (total) averaged over 30 days	4.02×10^{-1}	[mg kg wwt ⁻¹]
		Local PEC in agric. soil (total) averaged over 180 days	1.32×10^{-1}	[mg kg wwt ⁻¹]
		Local PEC in grassland (total) averaged over 180 days	5.27×10^{-2}	[mg kg wwt ⁻¹]
		Local PEC in pore water of agricultural soil	1.99×10^{-3}	[mg l ⁻¹]
		Local PEC in pore water of grassland	7.95×10^{-4}	[mg l ⁻¹]
		Local PEC in groundwater under agricultural soil	1.99×10^{-3}	[mg l ⁻¹]

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
	Registration number(s)	01-2119457026-42-0004
	Substance identity	CAS#77-92-9; EC#201-069-1
1	Short title of the exposure scenario	6. Use in paper
	Processes and activities covered by the exposure scenario	SU3, SU6 PROC 5, PROC 8a
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	solid
	Concentration of substance in preparation or article	
	Other relevant operational conditions of use	N/A
Risk management measures:		
2.1	Control of worker exposure	Following the REACH descriptor system, the following product type is covered by this generic scenario: Paper and board dye, finishing and impregnation products: including bleaches and other processing aids (PC26).
	Technical conditions and measures at process level (source) to prevent release	N/A
	Technical conditions and measures to control dispersion from source towards the worker	N/A
	Engineering controls:	N/A
	Organisational measures to prevent/limit releases, dispersion and exposure	N/A
	Conditions and measures related to personal protection, hygiene and health evaluation	N/A
2.2	Control of environmental exposure	
	Frequency and duration of use	
	Waste water flow	N/A
	Dilution factor	
	Emission factor to waste water Release fraction	N/A
	Conditions and measures related to external recovery of waste	N/A

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Information on estimated exposure and Downstream-user guidance	
3	Exposure estimation and reference to its source: N/A
4	Guidance to DU to evaluate whether he works inside the boundaries set by the ES Occupational exposure N/A
	<p>Environmental emissions</p> <p>Citric acid is used in the cleaning of papermaking machines and to prevent build up of deposits. It is added to the pulp slurry prior to bleaching to control paper staining by sequestering metal ions. Cleaning applications are covered under another exposure scenario; this document covers use of citrate as a processing aid in the paper-making industry.</p> <p>This generic scenario makes use of the following documents: OECD Emission Scenario Documents on Kraft, Non-Integrated and Recovered Pulp Mills.</p> <p>This covers the use of citrate as a process aid in the paper-making industry. It is possible that a small amount of citrate is incorporated into the finished paper products. However, it is considered that the amount of citrate that ends up in articles and could be released (resulting in consumer exposure) is likely to be negligible.</p> <p>The amount of citric acid believed to be used in this application is at most 1000 tpa. The industrial use per site is unknown. However, a default approach would be to consider 10 paper mills in a single region, operating over 300 days per year. The substance is not mixed into pulp, but is applied to machinery. A loss of 2% is a realistic maximum.</p> <p>This gives a daily release of $100 \text{ t} \times 1000 \text{ kg/t} \times 0.02 / 300 \text{ d} = 6.7 \text{ kg/d}$</p> <p>For the environment, the amounts passing to waste are very likely to be less than those from the ES 1-5. Therefore there is no need to complete an exposure assessment at a local scale with full details of PEC values etc.</p> <p>However, a regional release of 67 kg/d to waste water will be added to the model.</p> <p>For human health worker exposure at paper mills will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.</p>

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	7. Use in construction
	Processes and activities covered by the exposure scenario	SU3, SU21, SU22, SU2, SU10, SU19, PROC 2, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC 10, PROC 11. PROC 13, PROC 14, PROC 19, PROC 21, PROC 24
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	solid
	Concentration of substance in preparation or article	N/A
	Other relevant operational conditions of use	N/A
Risk management measures:		
2.1	Control of worker exposure	<p>Following the REACH descriptor system, the following product types are covered by this generic scenario: PC10 (Building and construction preparations not covered elsewhere).</p> <p>The following substances are used in construction materials: citric acid and trisodium citrate.</p> <p>Citrates can be used to retard the setting rate of cement and reduce the amount of water needed. They may therefore be added to concrete, mortar, plaster and render formulations. The concentration in these products is generally low (<1%).</p>
	Technical conditions and measures at process level (source) to prevent release	N/A
	Conditions and measures related to personal protection, hygiene and health evaluation	N/A
2.2	Control of environmental exposure	
	Frequency and duration of use	
	Use per site	N/A
	Duration of emission	
	Waste water flow	
	Dilution factor	
	Emission factor to waste water	N/A
Release fraction		
Environment factors not influenced by	N/A	

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	risk management	
	Other given operational conditions affecting environmental exposure	
	Technical conditions and measures at process level (source) to prevent release	No specific measures are considered.
	Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	N/A
	Organizational measures to prevent/limit release from site	N/A
	Conditions and measures related to municipal sewage treatment plant	N/A
	Conditions and measures related to external treatment of waste for disposal	N/A
	Conditions and measures related to external recovery of waste	none
Information on estimated exposure and Downstream-user guidance		
3	Exposure estimation and reference to its source:	
	Occupational exposure: Dermal Inhalation	N/A
4	Guidance to DU to evaluate whether he works inside the boundaries set by the ES	
	Occupational exposure	N/A
	Environmental emissions	<p>This document provides an environmental generic exposure scenario for substances used in construction materials. This generic scenario makes use of the following documents:</p> <p align="center">EU Technical Guidance Document (TGD) emission scenario document. REACH Technical Guidance.</p> <p>The amount of citric acid believed to be used in this application is at most 1500 tpa. The industrial use per site is unknown, but should be considered as a widely dispersed use. In the worst case a release of the entire tonnage to the region could be included, i.e. 1500 tpa. Of this, part will be released to industrial soil (90%) and part to waste water (10%).</p> <p>A regional release of $150 \times 1000/365 = 411$ kg/d to waste water will be added to the model, and 3699 kg/d to industrial soil will be included.</p> <p>For human health worker exposure at construction sites will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.</p>

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	8. Use in polymers and plastics
	Processes and activities covered by the exposure scenario	SU3,SU11,SU12, PROC 3, PROC 5, PROC 8a, PROC 8b
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Physical form of substance: under conditions of use it is used as a liquid.	solid
	Concentration of substance in preparation or article	N/A
	Other relevant operational conditions of use	<p>Please also note that under acidic conditions (pH<7), sulfur dioxide can be formed. Please ensure compliance with the existing occupational exposure limit as recommended by SCOEL (2008) for sulfur dioxide of 0.5 ppm (TWA, 8h) respectively 1 ppm (STEL, 15 min).</p> <p>Polyolefin foams are used for a variety of applications such as automotive, construction, food packaging, sport and leisure, and many other industrial and consumer uses. They usually have a high strength to weight ratio and are manufactured in a variety of processes and in low density (25 - 250 kg/m³) or high density (250 - 700 kg/m³) versions, or even in densities as low as 16 kg/m³ for polystyrene. All current extrusion processes involve the following steps: melting, mixing with blowing agents, cooling of melt, expansion and degassing/aging. The steps in this process can be realized in different configurations of equipment, e.g., with long single-screw extruders, twin-screw extruders, or tandem extruder lines.</p> <p>Both citric acid (or citrate salt) and (bi)carbonate may be surface-treated with, for example, a fatty acid ester to make them compatible with the polyolefin. A concentrated master batch of the formulated foaming agent in polymer at loading levels of from about 5% to about 50% actives may then be prepared. The master batch is added to the polymer melt which is to be foamed such that the blowing agents are at 0.1 to 2.0% active levels in the final formulation [US 5,302,455 and refs. therein].</p> <p>By-products of this reaction are mono-, di-, and/or trisodium citrate, in combination with other sodium salts, which will still be present within the foamed polymer. These residues are typically present at around 50 wt.% of the initial foaming agent formulation, which is equivalent to <1 wt.% of the total foamed polymer in most cases [RAPRA, 2004].</p>
Risk management measures:		
2.1	Control of worker exposure	
	Technical conditions and measures at process level (source) to prevent release	N/A
	Technical conditions and measures to control dispersion from source towards the worker	N/A
	Engineering controls:	
	Organisational measures to prevent/limit releases, dispersion and	N/A

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

	exposure	
	Conditions and measures related to personal protection, hygiene and health evaluation	
2.2	Control of environmental exposure	
	Use per site Duration of emission Waste water flow Dilution factor	N/A
	Release of citric acid	<p>Losses from conversion, service life and disposal for chemical blowing agents are considered to be zero as the additive is destroyed during the conversion process. Thus, for 200 tpa of citrates used in plastics applications, assumed to be used at 10 sites across Europe, the local losses to water air and solid waste are:</p> <p>The REACH defaults for ERC6d are for the production on 300 days per year if the tonnage of the product is >5000 tpa [ECHA, 2009]. Citrate is present at <1% in plastics applications (see Section 2.1.1), therefore, the total production volume is approx. 100,000 tpa. Therefore, the maximum daily releases are as follows:</p> <p>Water: $20 \text{ t} \times 1000 \text{ kg/t} \times (0.0065) / 300 = 0.43 \text{ kg/d}$</p> <p>Air: 0</p> <p>For the environment, the amounts passing to waste are very likely to be less than those from the ES 1-5. Therefore there is no need to complete an exposure assessment at a local scale with full details of PEC values etc.</p> <p>However, a regional release of 0.35 kg/d to waste water will be added to the model, and similarly 3.18 kg/d to the continental scale.</p>
	Environment factors not influenced by risk management	N/A
	Other given operational conditions affecting environmental exposure	N/A
	Technical conditions and measures at process level (source) to prevent release	N/A
	Conditions and measures related to external recovery of waste	none
Information on estimated exposure and Downstream-user guidance		
3	Exposure estimation and reference to its source:	
	Occupational exposure: Dermal Inhalation	Not relevant
4	Guidance to DU to evaluate whether he works inside the boundaries set by the ES	
	Occupational exposure	For human health worker exposure at construction sites will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.



Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Environmental emissions	N/A
--	-------------------------	-----

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity	
	Registration number(s) 01-2119457026-42-0004
	Substance identity CAS#77-92-9; EC#201-069-1
1	Short title of the exposure scenario 9. Use in the oil industry
	Processes and activities covered by the exposure scenario SU3, SU2 PROC 3, PROC 4, PROC 5,
2	Operational conditions and risk management measures
	Duration an frequency of use
	Physical form of substance: under conditions of use it is used as a liquid. solid
	Concentration of substance in preparation or article 20-50%
	Other relevant operational conditions of use In the oil industry, citric acid is often used for oil-well acidizing to prevent the formation of iron hydroxide [APAC]. Oil well acidizing is the term used for the application of hot hydrochloric acid (93-149°C) to remove tough wellbore scale [McGraw-Hill]. Oxidation reactions, which occur in wells injected with HCl, cause formation of insoluble iron hydroxide. The pumping operations are thus interrupted by these gels, and hence, citric acid is added to prevent gel formation [APAC]. Oil producing well formations can become plugged with acid soluble minerals and restrict production [Gewanter, Herman L. et al]. Production can be increased by forcing acid down the well to dissolve the minerals [Gewanter, Herman L. et al]. The acids readily dissolve the iron and iron hydroxide from the well casing and the formation [Gewanter, Herman L. et al]. However, water and carbon dioxide are produced in the formation, which allows for the re-precipitation of the iron to ferric hydroxide above the well [Gewanter, Herman L. et al]. Certain chemicals must be added at this point to maintain it in a soluble state [Gewanter et al].
Risk management measures:	
2.1	Control of consumers exposure Not relevant
	Human factors not influenced by risk management Not relevant
	Other given operational conditions affecting consumers exposure Not relevant
	Conditions and measures related to information and behavioural advice to consumers Not relevant
	Conditions and measures related to personal protection, hygiene and health evaluation Not relevant
2.2	Control of environmental exposure
	Frequency and duration of use
	waste water Release Control of the re-precipitation of iron and the pH, as the acid is spent, can be achieved by the sequestration by organic chelants and the reduction to soluble ferrous iron [Gewanter, Herman L. et al]. Citric acid is a useful organic chelant and is used for this purpose [Gewanter, Herman L. et al]. Other chelants may include gluconic acid, the tetrasodium salt of ethylenediaminetetraacetic acid (EDTA), and the trisodium salt of nitrilotriacetic acid (NTA) [Gewanter, Herman L. et al]. This is a widely dispersed use but in the worst case it can be envisaged that the

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		entire tonnage could pass to surface marine water. This equates to 100 t x 1000 kg/t /365 = 274 kg/d to the regional surface water 900 t x 1000 kg/t /365 = 2740 kg/d to the continental surface water
	Environment factors not influenced by risk management	None
	Conditions and measures related to external treatment of waste for disposal	None
	Conditions and measures related to external recovery of waste	none
Information on estimated exposure and Downstream-user guidance		
3	Exposure estimation and reference to its source:	
	Human exposure:	For human health worker exposure at oil production sites will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.
4	Guidance to DU to evaluate whether he works inside the boundaries set by the ES	
	Consumer exposure	N/A
	Environmental emissions	N/A

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity				
	Registration number(s)	01-2119457026-42-0004		
	Substance identity	CAS#77-92-9; EC#201-069-1		
1	Short title of the exposure scenario	10. Use in textiles		
	Processes and activities covered by the exposure scenario	SU3,SU5 PROC8a,PROC8b, PROC10, PROC13, PROC22		
2	Operational conditions and risk management measures			
	Duration an frequency of use			
	Worker All applicable PROCs	>4h		
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.		
	Concentration of substance in preparation or article			
	Other relevant operational conditions of use	<p>No measured data are available for releases of citric acid to air and waste water from textile production sites. Releases are therefore estimated on the basis of information in the public domain.</p> <p>Potential exposure to humans and especially the environment is dependent on the intended function of the substance, as well as the substrates and processes used. Functional finishing agents and other chemically reactive substances are intended to be consumed during use, therefore the amount released is related to efficiency of the process. On the other hand, non-reacting substances (e.g. processing aids) are not consumed and will ultimately be lost to air or waste water, depending on their function and physicochemical properties. In virtually all cases, it is expected that citric acid or citrate salts, as process aids, will be lost to waste water.</p> <p>The annual tonnage of 300 t is considered to be used at 40% in the region. The largest site is estimated to use around 6 tpa. If all passed to waste water this is:</p> <p>$6 \text{ t} \times 1000 \text{ kg/t} / 300 = 20 \text{ kg/d.}$</p>		
Risk management measures:				
2.1	Control of worker exposure	For human health worker exposure at textile production sites will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.		
	Risk management measures for industrial site	Information type	Data field	Explanation
		Onsite pre-treatment of waste water	Yes	Neutralisation
	Resulting fraction of initially applied amount in waste water released from site to the external sewage system		On-site biological waste treatment (where present) is expected to remove a high proportion of citric acid, as the substance is highly biodegradable. However, on-site biological waste treatment is not assumed as it is not known that this is always present.	

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		Air emission abatement	No measured data	
		Resulting fraction of applied amount in waste gas released to environment	No waste gases	
		Onsite waste treatment	No measured data	Secondary biological treatment may be present but this is not assumed in the scenario
		Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite waste water and waste gas treatment.	No measured data	
		Municipal or other type of external waste water treatment	None	None
		Effluent (of the waste water treatment plant) discharge rate	2000000 l/d	Default for a standard WWTP
		Recovery of sludge for agriculture or horticulture	Yes	
	Personal protective equipment (PPE)	N/A		
	Other risk management measures related to workers	N/A		
2.2	Control of environmental exposure			
	Frequency and duration of use			
	Duration, frequency and amount			
Information on estimated exposure and Downstream-user guidance				
3	Exposure estimation and reference to its source:			
	Releases to air	As the citrates are solids with high water solubility, losses to air are considered to be negligible.		

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

	Releases to waste water	Citric acid and citrates are used in textile and leather treatment in aqueous solution. The most likely release route will be to waste water via spillage, clean out and discharge of spent treatment baths and liquors recovered in handling fabrics after treatment. Indeed, releases to waste water can be assumed to be 100%, since all the citric acid/citrate may be washed to drain.		
Technical fate of substance and losses from process/use to waste, waste water and air	Information	Data field	Explanation	
	Fraction of applied amount lost from process/use to waste gas	0 kg/kg	See text	
	Fraction of applied amount lost from process/use to waste water	1 kg/kg	See text	
Predicted Exposure Concentrations of Environmental releases		PEC	unit	
	AIR			
	Annual average local PEC in air (total)	1.56 x 10 ⁻¹⁵	[mg.m ⁻³]	
	WATER, SEDIMENT			
	Local PEC in surface water during emission episode (dissolved)	2.92 x 10 ⁻²	[mg l ⁻¹]	
	Annual average local PEC in surface water (dissolved)	2.67 x 10 ⁻²	[mg l ⁻¹]	
	Local PEC in fresh-water sediment during emission episode	4.98 x 10 ⁻¹	[mg kg wwt ⁻¹]	
	Local PEC in seawater during emission episode (dissolved)	1.01 x 10 ⁻¹	[mg l ⁻¹]	
	Annual average local PEC in seawater (dissolved)	8.35 x 10 ⁻²	[mg l ⁻¹]	
	Local PEC in marine sediment during emission episode	1.73	[mg kg wwt ⁻¹]	
	SOIL, GROUNDWATER			
	Local PEC in agric. soil (total) averaged over 30 days	5.87 x 10 ⁻¹	[mg kg wwt ⁻¹]	
	Local PEC in agric. soil (total) averaged over 180 days	1.93 x 10 ⁻¹	[mg kg wwt ⁻¹]	

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

	Local PEC in grassland (total) averaged over 180 days	7.70×10^{-2}	[mg kg wwt ⁻¹]
	Local PEC in pore water of agricultural soil	2.91×10^{-3}	[mg l ⁻¹]
	Local PEC in pore water of grassland	1.16×10^{-3}	[mg l ⁻¹]
	Local PEC in groundwater under agricultural soil	2.91×10^{-3}	[mg l ⁻¹]
Exposure concentration in sewage treatment plants (STP)	<p>No measured data are available for the concentration of citric acid in sewage treatment plants (STP). The concentration of the citrate has been estimated using EUSES 2.1.1. The EUSES model uses the Simple Treat sewage treatment model to predict the fate of a substance in the STP, based on the physicochemical and biodegradation properties. For citric acid, SimpleTreat predicts the following:</p> <p>12.6 % to water: 0.112 % to air: 0.0154 % to sludge: 87.3 % degraded. Sludge from WWTPs may be spread on agricultural soil.</p>		

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	11. Use in paints and coatings
	Processes and activities covered by the exposure scenario	SU3, SU21, SU22, SU17, SU18, SU19 PROC 7, PROC 8a, PROC 8b, PROC 10, PROC 11, PROC 19, PROC 21, PROC 24
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	Other relevant operational conditions of use	N/A
Formulation of exposure scenario:		
2.1	Formulation of exposure scenario	<p>A paint factory formulating 10000 tpa of formulated paint could need around 10000 x 0.001 = 10 tpa of citric acid. Paint formulation is a widespread activity and this estimate is consistent with a total market size of 300 tpa.</p> <p>It is taken that the regional tonnage is 40 tpa.</p> <p>Assuming a worst case of 2% handling loss this is a local release of 200 kg per year. Such a wastage rate is less than for scenarios considered earlier and there is no need to calculate local exposures. The releases will be added as regional and continental losses to waste water:</p> <p>Regional = 200 x (40/10) / 365 = 2.2 kg/d</p> <p>Continental 2.2 x (260/40) = 14.3 kg/d</p>
	Use	<p>The coating process used by both professionals and consumers is typically by brush or roller application. For releases to waste water during consumer use, the OECD Emission Scenario Document for coatings assumes that an estimated 1% of the volatile fraction of the coating will be lost as brush residues and then end up in the sewer. The same fraction (1%) of the volatile fraction is assumed to be lost during professional use, but this is properly disposed and does not end up in the sewer [OECD, 2007].</p> <p>Therefore the amount of citric acid in the application passing to waste is estimated to be widely dispersed:</p> <p>Regional wastewater:</p> <p>0.1 x 300 tpa x 1000 kg/t x 0.01 /365 = 0.82 kg/d</p> <p>Continental wastewater:</p> <p>0.9 x 300 tpa x 1000 kg/t x 0.01 /365 = 7.40 kg/d</p>

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

		<p>Therefore, for simplicity, for this application area, the totals are: Regional wastewater: + 0.82 = 3.0 kg/d Continental wastewater: 14.3 + 7.4 = 21.7 kg/d For human health worker exposure at paint production sites will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.</p>
--	--	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119520510-57-0002	
Substance identity	CAS# 7775-14-6 ,EC#231-890-0	
1	Short title of the exposure scenario	12、 Use in photography
	Processes and activities covered by the exposure scenario	SU20,SU21,SU22 PROC5, PROC 13
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	Other relevant operational conditions of use	N/A
Formulation of exposure scenario:		
2.1	Exposure scenario	<p>Citric acid is one of a range of complexing agents used in photography to control the effects of calcium and magnesium hardness, and to keep iron soluble in solution as part of redox processes.</p> <p>Due to the rapid growth of digital photography, use of chemicals in film processing is now limited almost entirely to a small number of professional providers. The chemicals used are collected by photochemical companies in order to recover silver and disposal to drain does not take place.</p> <p>Citrate may also be used as a stop bath in professional or consumer settings as part of the process for the manual development of photographic film. Releases to the environment from this application are insignificant compared to those from considered in other exposure scenarios (cleaning products for example).</p> <p>Therefore this scenario need not be considered further in respect of the environment.</p>
	human health	<p>For human health, the processes applied during both professional and consumer uses are:</p> <p>PROC 9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>PROC 5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC 13 Treatment of articles by dipping and pouring</p>

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	13. Use in paints and coatings
	Processes and activities covered by the exposure scenario	SU3 PROC 1, PROC 2, PROC 4, PROC 8a
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	relevant operational conditions of use	<p>Following the REACH descriptor system [ECHA, 2009] the following sector of use is covered by this scenario: SU3 Industrial uses</p> <p>The relevant product category is PC21 Laboratory chemicals</p> <p>Citric acid may be used at low levels within laboratories. Exposures will take place but under highly controlled conditions. Therefore this scenario need not be considered further for human health or the environment.</p>

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	14. Use in water treatment
	Processes and activities covered by the exposure scenario	SU3, SU14, SU15, SU16, SU17, PROC 1, PROC 2, PROC 3, PROC 4, PROC 7, PROC 8a, PROC 8b, PROC 9, PROC 10, PROC 13, PROC 17, PROC 18, PROC 20, PROC 23, PROC xyz ¹
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	relevant operational conditions of use	This scenario covers use in smaller-scale circulating water treatment in industrial settings, which typically use high substance concentration at low discharges and would usually have a waste water treatment plant (WWTP) in place. The degradability of citric acid in power station cooling systems makes in not suitable for such purposes.
Formulation of exposure scenario:		
2.1	Industrial cooling systems	<p>Industrial cooling systems can be categorized by their design and by using water as coolants. The exchange of heat between process medium and coolant is enhanced by heat exchangers. From the heat exchangers the coolant transports the heat into the environment.</p> <p>Usage of water treatments containing citrates would be continuous for the correct functioning of the cooling water system. Re-loading may be needed more or less frequently, for open and closed cooling water systems respectively, to refresh the system.</p> <p>The worst-case for the local environment is to assume treatment of a large industrial plant, open cooling system, which requires the use of large volumes of a high concentration product on a continuous basis and involves the direct release of blow down effluent to the river or receiving water.</p>
	In open recirculating systems	<p>In open recirculating systems, alkaline conditions (pH of 8-9), in combination with organic complexing agents are effective against corrosion and scaling. Most currently used corrosion programmes are based on phosphates, and zinc is added if water conditions require this.</p> <p>Typical concentrations of scale control agents (polyphosphates, phosphonates, polyacrylates, copolymers and ter-polymers) range from 2 to 20 mg/l, as active compound. Hardness stabilisers prevent the formation of crystals and are used in recirculating systems, but rarely or never in once-through systems. Citrates may be used to enhance the performance of the other additives.</p> <p>In most downstream uses treatment chemicals are applied in water-based processes. The final concentration in the water used in scale inhibition is typically from less than 1 to 10 ppm. Depending on the exact nature of the process, the complexing agents may remain present in the aqueous effluent and the discharge streams. These streams will be treated on the user's site, discharged to sewer</p>

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

	<p>systems or discharged to waterways (wide dispersive use).</p> <p>Given the low volatility and the high water solubility of the substances, direct releases to air and soil can be considered negligible.</p>
Wastewater	<p>In the UK, the capacity of 50% of installed base cooling towers is in the range of 22.7 m³ and 227 m³ (OECD, 2004). The water circulation rate of a typical open cooling system (with capacity of 100 m³), for an industrial plant, is assumed to be 350 m³/h (3.5 times the capacity). The blowdown of open cooling systems is related to the rate of evaporation (1% of the circulation rate) and the concentration cycle, which is the ratio (typically 3) of the maximum concentration of dissolved solids in the recirculating water to the concentration in the make up water (OECD, 2004).</p> <p>For the purpose of this calculation, a scaling inhibitor product with an active content of citrate at 25% is assumed. Therefore, for a blowdown of 1.75 m³/h from an open cooling system; the estimated release of citrates to water is</p> $0.25 \times 20 \text{ mg/l} \times 1.75 \text{ m}^3/\text{h} \times 1000 \text{ l/m}^3 \times 24 \text{ h/d} \times 10^{-6} \text{ kg/mg}$ $= 0.44 \text{ kg/day.}$ <p>This is lower than ES considered above and there is therefore no need to develop the scenario further.</p> <p>In the nature of the use it must be assumed that all the citric acid used in water treatment could pass to waste water. Therefore:</p> <p>Regional wastewater:</p> $\times 1000 \text{ tpa} \times 1000 \text{ kg/t} / 365 = 274 \text{ kg/d}$ <p>Continental wastewater:</p> $0.9 \times 1000 \text{ tpa} \times 1000 \text{ kg/t} \times / 365 = 2470 \text{ kg/d}$
human health	<p>For human health worker exposure at industrial sites will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.</p>

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	15. Use in metal surface treatment
	Processes and activities covered by the exposure scenario	SU3, SU14, SU15, SU16, SU17, SU21, SU22 PROC 2, PROC 3, PROC 4, PROC 7, PROC 8a, PROC 8b, PROC 9, PROC 10, PROC 13, PROC 17, PROC 18, PROC 23
2	Operational conditions and risk management measures	
	Duration and frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	relevant operational conditions of use	Citric acid may be used as a complexing agent during metal surface treatment operations. This includes cleaning, brightening and passivation of fabricated stainless steel components, and other metal components, cleaning of circuit boards prior to soldering, and metal cleaning or chemical polishing for the surface treatment of aluminium, copper and other metals. The following applications should be taken as representative rather than the sole example of where and why citric acid or citrates may be used in the treatment of metal surfaces. Some industries using citric acid include fasteners, medical devices, semi-conductors, automotive and aerospace.
	Passivation	Citric acid may be used in stainless steel passivation to remove iron from the surface of the stainless steel and prevent later corrosion. After thorough cleaning, the stainless steel part is immersed in a passivating acid bath. Any one of three approaches can be used: nitric acid passivation, nitric acid with sodium dichromate passivation and citric acid passivation. Which approach to use depends on the grade of stainless steel and prescribed acceptance criteria. When citric acid passivation is used, typical solutions range from 4 to 10% citric acid by weight.
Electroless plating	Plating describes the coating of surfaces with metals, either through an electrolysis or electroless plating processes. Electroless plating is also known as 'autocatalytic' plating; deposition of the metal starts on metal nuclei such as palladium and continues autocatalytically. Electroless plating is favoured over electrolysis for most component production (EA 2009). There are usually three stages in the electroless plating process: de-smearing, activation and electroless copper plating. The plating solution has a copper content of 2 – 5 g/l, with sodium hydroxide (15 – 20 g/l), complexing agents (10 – 15 g/l) or tartrates (5 – 10 g/l) and reducing agents, such as formaldehyde (3 – 5 g/l). The process solution lifetime is limited by the build-up of reaction products and is proportional to the rate of throughput of components (EA 2009). Citrate may be used as a complexing agent. Electroless plating involves the large-scale use of water in both providing the medium for the process itself and for the subsequent rinsing and washing of components. There is a degree of recycling of rinse water through use to top-up the plating tanks, but there is ultimately loss through carry-over on components. Spent fluids can only be topped up a limited number of times before the media needs replacing. Water-soluble waste is discharged in waste water for basic on-site	

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

		treatment (settling and pH adjustment) before discharge to municipal treatment works, controlled by local discharge consent agreements (EA 2009).
	Exposure scenario:	
2.1	Environment exposure	The use of citrate in metal-surface treatment is estimated as approx. 1000 tpa. Therefore, environmental releases are not dissimilar to those discussed in the cleaning scenario (ES5) but on a much smaller scale. Therefore, it is not considered necessary to further assess environmental exposure.
	human health	For workers, exposures are not expected to be greater than those discussed in other industrial use scenarios. The basic risk management measures discussed for these scenarios are considered sufficient to ensure safe use. Human health exposure is not discussed further.

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	16、 Use in agriculture
	Processes and activities covered by the exposure scenario	SU1, SU3, SU21, SU22 PROC 3, PROC 5, PROC 8a, PROC 8b, PROC 10, PROC 11, PROC 14, PROC 15, PROC 19
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	relevant operational conditions of use	This scenario covers use in smaller-scale circulating water treatment in industrial settings, which typically use high substance concentration at low discharges and would usually have a waste water treatment plant (WWTP) in place. The degradability of citric acid in power station cooling systems makes in not suitable for such purposes.
Formulation of exposure scenario:		
Wastewater	The amount of citric acid believed to be used in this application is at most 1500 tpa. The use per site is unknown, but this should be considered as a widely dispersed use. In the worst case a release of the entire tonnage to the region could be included, i.e. 1500 tpa. Of this, part will be released to agricultural soil (90%) and part to waste water (10%). A regional release of $150 \times 1000/365 = 411$ kg/d to waste water will be added to the model, and 3699 kg/d to soil will be included.	
human health	For human health worker exposure will be to aqueous formulations for which no hazard has been identified. In addition, relevant exposures have been calculated for life cycle stages with higher exposures. Therefore no attempt at quantification will be made nor is needed.	

Safety Data Sheet
According to Regulation (EU) No. 1907/2006, Annex II,
Amended by REGULATION (EU) No 453/2010

Citric acid

Substance / User identity		
Registration number(s)	01-2119457026-42-0004	
Substance identity	CAS#77-92-9; EC#201-069-1	
1	Short title of the exposure scenario	17、 Use in medical devices
	Processes and activities covered by the exposure scenario	SU3, SU20, SU22 PROC 1
2	Operational conditions and risk management measures	
	Duration an frequency of use	
	Worker All applicable PROCs	>4h
	Physical form of substance: under conditions of use it is used as a liquid.	Solid.
	Concentration of substance in preparation or article	
	relevant operational conditions of use	Citrates may be used in medical devices, for example, citrate is added to human blood to prevent coagulation. The whole blood collection process is a closed process as sterility must be maintained. Procedures are carried out by trained personnel in a controlled environment. Therefore, exposures from this use are expected to be minimal and the scenario is not considered further for human health or the environment.

Safety Data Sheet

According to Regulation (EU) No. 1907/2006, Annex II,

Amended by REGULATION (EU) No 453/2010



Citric acid

Substance / User identity						
Registration number(s)		01-2119457026-42-0004				
Substance identity		CAS#77-92-9; EC#201-069-1				
1	Short title of the exposure scenario		18、 Regional exposure concentrations			
	Processes and activities covered by the exposure scenario		N/A			
2	Regional exposure concentrations					
		Predicted regional Exposure Concentrations		Measured regional exposure concentrations		Explanation / source of measured data
		value	unit	value	unit	
	Freshwater	1.52 x 10 ⁻²	mg/l	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1
	Marine water	1.41 ⁻³	mg/l	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1
	Freshwater sediments	3.32 x 10 ⁻¹	mg/kg d.w.	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1
	Marine sediments	2.60 x 10 ⁻²	mg/l	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1
	Agricultural soil	3.19 x 10 ⁻³	mg/kg wwt	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1
	Grassland	7.47 x 10 ⁻¹²	mg/kg wwt	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1
Air	1.24 x 10 ⁻¹⁹	(mg/m ³)	No data		The value represents the sum of the regional PECs calculated by EUSES 2.1.1	