TETRASODIUM GLUTAMATE DIACETATE

This dossier on tetrasodium glutamate diacetate presents the most critical studies pertinent to the risk assessment of tetrasodium glutamate diacetate in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch *et al.*, 1997).

Screening Assessment Conclusion – tetrasodium glutamate diacetate is classified as a **tier 1** chemical and requires a hazard assessment only.

1 BACKGROUND

Tetrasodium glutamate diacetate is a chelating agent most commonly used in soaps and detergents (CIR, 2021). The substance is readily biodegradable, not expected to bioaccumulate and has a low tendency to bind to soil or sediment. It is of low toxicity concern to aquatic and terrestrial organisms.

2 CHEMICAL NAME AND IDENTIFICATION

Chemical Name (IUPAC): Tetrasodium (2S)-2-[bis(carboxylatomethyl)amino]pentanedioate

CAS RN: 51981-21-6

Molecular formula: $C_9H_9NNa_4O_8$

Molecular weight: 351.129 g/mol

Synonyms: Tetrasodium glutamate diacetate; tetrasodium N,N-bis(carboxylatomethyl)-L-glutamate**;** tetrasodium (2S)-2-[bis(carboxylatomethyl)amino]pentanedioate

3 PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for the substance are shown in Table 1.

Table 1: Overview of the Physico-chemical Properties of Tetrasodium Glutamate Diacetate

Property	Value	Klimisch score	Reference
Physical state at 20°C and 101.3 kPa	Odourless white to off-white powder	1	ECHA
Melting Point	Does not melt under 250°C and starts to decompose at 280°C	2	ECHA
Boiling Point	Decomposes before boiling	-	ECHA
Density	1,630 kg/m^3@ 25 °C	2	USEPA CompTox
Vapor Pressure	80 Pa @ 20°C	2	ECHA

Property	Value	Klimisch score	Reference
Partition Coefficient (log K_{ow})	<0 @ 27°C	1	ECHA
Water Solubility	650 g/L @ 21°C	1	ECHA
Dissociation constant (pKa)	2.56, 3.49, 5.03, and 9.36 @ 25°C	2	ECHA
Viscosity	Not scientifically necessary (substance is a powder)	-	ECHA

4 DOMESTIC AND INTERNATIONAL REGULATORY INFORMATION

A review of international and national environmental regulatory information was undertaken (Table 2). This chemical is listed on the Australian Inventory of Chemical Substances – AICS (Inventory). No conditions for its use were identified. No specific environmental regulatory controls or concerns were identified within Australia and internationally for tetrasodium glutamate diacetate.

Table 2 Existing International Controls

Convention, Protocol or other international control	Listed Yes or No?
Montreal Protocol	No
Synthetic Greenhouse Gases (SGG)	No
Rotterdam Convention	No
Stockholm Convention	No
REACH (Substances of Very High Concern)	No
United States Endocrine Disrupter Screening Program	No
European Commission Endocrine Disruptors Strategy	No

5 ENVIRONMENTAL FATE SUMMARY

A. Summary

Tetrasodium glutamate diacetate is readily biodegradable and is not expected to bioaccumulate. It has a low tendency to bind to soil or sediment..

B. Biodegradation

Tetrasodium glutamate diacetate is readily biodegradable in water. In three studies using river water under aerobic conditions, degradation was approximately 83%, 91%, and 97% after 28 days as measured by oxygen consumption (ECHA) [KI. Score = 1].

In an activated sludge test under aerobic conditions, degradation was approximately 76% after 28 days as measured by oxygen consumption (ECHA) [KI. Score = 1

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

The adsorption coefficient of methyl acetate was determined by HPLC method. The capacity factors k' were calculated. The log k' values were plotted against the respective log soil organic carbon partition coefficient (K_{oc}) values of the reference substances. The log K_{oc} value of tetrasodium glutamate diacetate was calculated by means of the regression line equation resulting in <1.5 L/kg (K_{oc} value of 32 L/kg). (ECHA)[Kl. Score = 1].

Based on this value, tetrasodium glutamate diacetate has a low potential for adsorption to soil and is expected to have very high mobility. If released to water, based on this value and its water solubility, it is also not expected to adsorb to suspended solids and sediment.

D. Bioaccumulation

No bioaccumulation studies are available. Tetrasodium glutamate diacetate is not expected to bioaccumulate based on an estimated log K_{ow} of <0 (ECHA).

6 ENVIRONMENTAL EFFECTS SUMMARY

A. Summary

Tetrasodium glutamate diacetate has low toxicity to aquatic and terrestrial organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on tetrasodium glutamate diacetate.

Table 3: Acute Aquatic Toxicity Studies on Tetrasodium Glutamate Diacetate

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Oncorhynchus mykiss (rainbow trout)	96-hr LC_{50}	>95.26	1	ECHA
Daphnia magna	48-hr EC_{50}	>95.26	1	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	>95	1	ECHA

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on tetrasodium glutamate diacetate.

Table 4: Chronic Aquatic Toxicity Studies on Tetrasodium Glutamate Diacetate

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Danio rerio (zebrafish)	9-day NOEC	103	1	ECHA
Daphnia magna (water flea)	21-day NOEC	≥265.7 (249 corrected for water content)	1	ECHA
Desmodesmus subspicatus (green algae)	72-hr NOEC	>95	1	ECHA

C. Terrestrial Toxicity

In an acute 21-day study with three plant species (oats [*Avena sativa*], rapeseed [*Brassica napus*], and soybeans [*Glycine max*]), the NOEC was 754 mg/kg dry weight (358.2 mg a.i./kg DW) for all species (ECHA) [KI. Score = 1].

In a chronic 56-day study with earthworms (*Eisenia fetida*), the NOEC was 248 mg/kg dry weight (117.8 mg a.i./kg soil DW) (ECHA) [KI. Score = 1].

7 CATEGORISATION AND OTHER CHARACTERISTICS OF CONCERN

A. PBT Categorisation

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REAC Criteria methodology (IChEMS, 2022; ECHA, 2023).

Tetrasodium glutamate diacetate is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Based on an estimated log K_{ow} of <0, tetrasodium glutamate diacetate does not meet the screening criteria for bioaccumulation.

The lowest chronic NOEC for tetrasodium glutamate diacetate is >0.1 mg/L. The acute E(L)C_{50} values are >1 mg/L. Thus, tetrasodium glutamate diacetate does not meet the screening criteria for toxicity.

The overall conclusion is that tetrasodium glutamate diacetate is not a PBT substance.

B. Other Characteristics of Concern

No other characteristics of concern were identified for tetrasodium glutamate diacetate.

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8 SCREENING ASSESSMENT

Chemical Name	CAS No.	Overall PBT Assessment [1]	Chemical Databases of Concern Assessment Step		Persistence Assessment Step		Bioaccumulative Assessment Step	Toxicity Assessment Step			Risk Assessment Actions Required[3]
			Listed as a COC on relevant databases?	Identified as Polymer of Low Concern	P criteria fulfilled?	Other P Concerns	B criteria fulfilled?	T criteria fulfilled?	Acute Toxicity [2]	Chronic Toxicity[2]	
Tetrasodium glutamate diacetate	51981-21-6	Not a PBT	No	No	No	None	No	No	1	1	1

Footnotes:

1 - PBT Assessment based on PBT Framework.

2 - Acute and chronic aquatic toxicity evaluated consistent with assessment criteria (see Framework).

3 - Tier 1 – Hazard Assessment only.

Notes:

NA = not applicable

PBT = Persistent, Bioaccumulative and Toxic

B = bioaccumulative

P = persistent

T = toxic

9 REFERENCES, ABBREVIATIONS AND ACRONYMS

A. References

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B. Abbreviations and Acronyms

°C	degrees Celsius
AICS	Australian Inventory of Chemical Substances
COC	constituent of concern
EC	effective concentration
ECHA	European Chemicals Agency
EU	European Union

g/L	grams per litre
IChEMS	Industrial Chemicals Environmental Management Standard
IUPAC	International Union of Pure and Applied Chemistry
kg	kilograms
Kl	Klimisch scoring system
KOCWIN™	USEPA organic carbon partition coefficient estimation model
kPa	kilopascal
L	litre
L/kg	litres per kilogram
LC	lethal concentration
LD	lethal dose
m^3	cubic metre
MCI	molecular connectivity index
mg/kg	milligrams per kilogram
mg/L	milligrammes per litre
mg/m^3	milligrams per cubic metre
mL	millilitre
mPa s	millipascal second
NICNAS	The National Industrial Chemicals Notification and Assessment Scheme
Pa	pascal
PBT	Persistent, Bioaccumulative and Toxic
ppm	parts per million
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SGG	Synthetic Greenhouse Gases
USEPA	United States Environmental Protection Agency