

Cadmium Pigments: Environmental Aquatic Hazard Assessment

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WHAT

Carefully engineered, crystalline inorganic solids used as **colouring agents** in ceramics, glass, enamels and high-quality artist colours considered practically insoluble and therefore specifically exempted from the CLP harmonized classification of cadmium and its compounds.

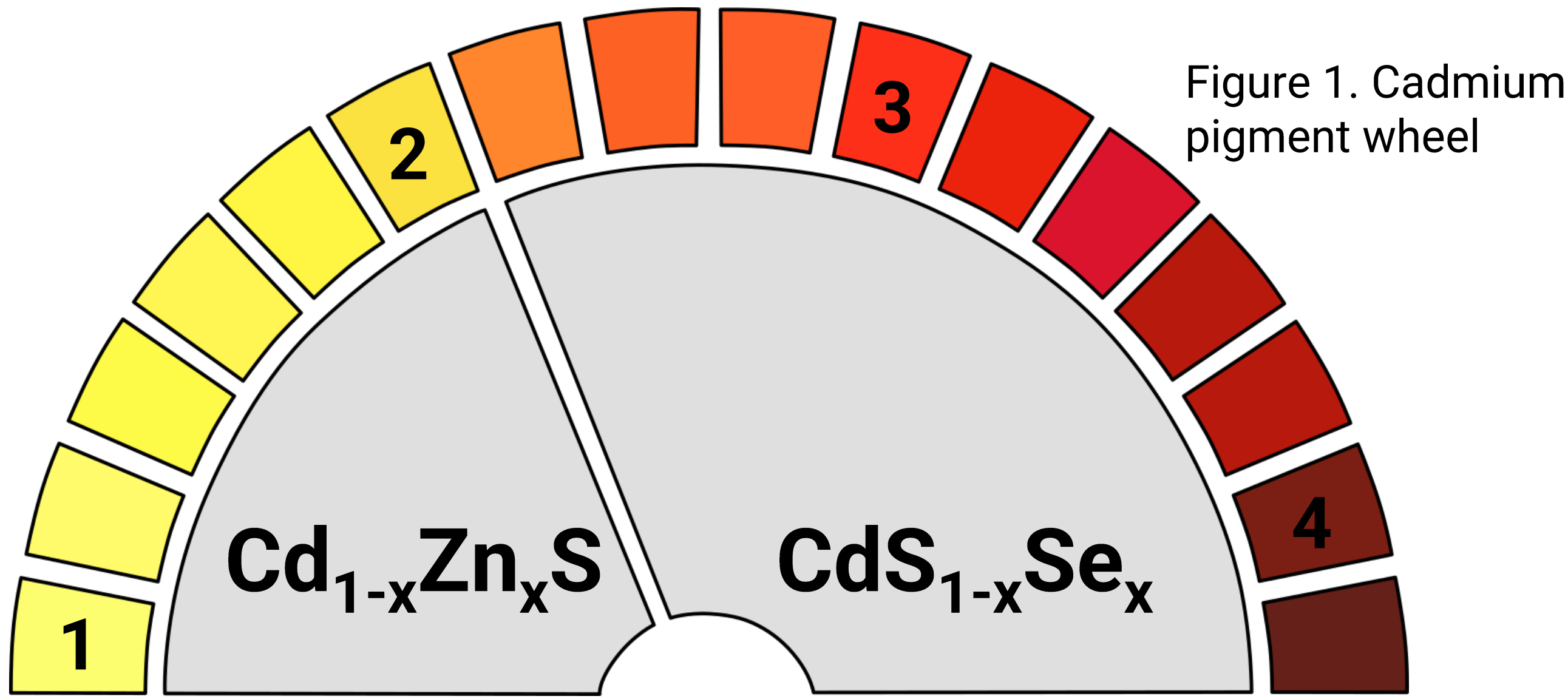
Cadmium zinc sulphide ($Cd_{1-x}Zn_xS$): from bright sunshine yellow to light lemon yellow (where $x = 0.1 - 25$ mol%).

Cadmium sulfoselenide ($CdS_{1-x}Se_x$): from light orange red to bright red through to maroon (where $x = 0.1 - 46$ mol%).

In this study, test items 1 & 2 and 3 & 4 were selected to represent CdZnS and CdSSe spectrum, respectively (Figure 1).

WHY

As Cd pigments are now considered UVCB^[1] under REACH, the acute and chronic aquatic hazard classification was re-determined on a more representative range, considering all relevant elements of the substance.



HOW

Conduct a **transformation/dissolution protocol over 7- and 28-days (T/Dp)** in line with OECD Guidance Document 29 to assess the bio-accessibility of these complex metal compounds (Figure 2). Both zinc and cadmium were measured by ICP-MS in all samples, in addition selenium was measured in the CdSSe samples to ensure a comprehensive hazard assessment.

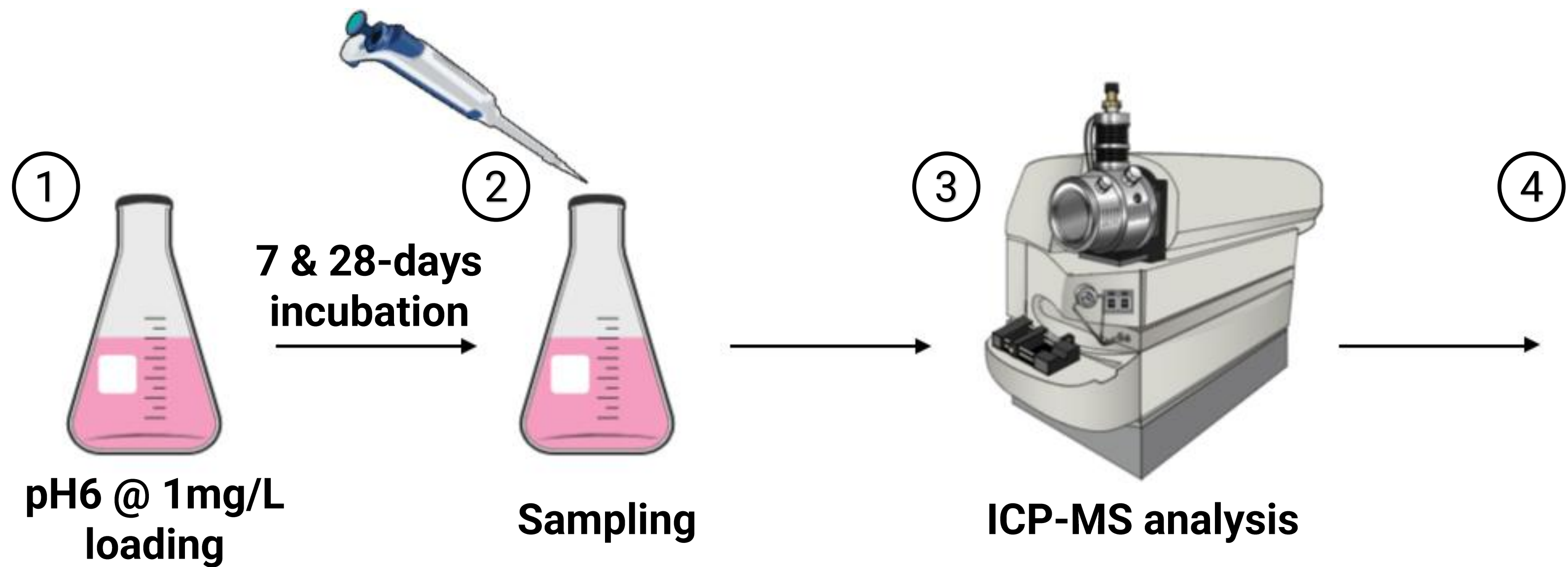


Figure 2. Transformation dissolution protocol and encoding in the Metals Classification tool (MeClas[®])

Element	Concentration	Classification Entry	Source	Distribution % (relative to element)	Formula	TDP 7 days	TDP 28 days	Relative bio-accessibility %
Cd	77.76000					0.00650	0.01100	Cd compounds 0.69500
		Cd compounds excluded from classification: cadmium sulphoselenide, mixture of cadmium sulphide with zinc sulphide, mixture of cadmium sulphide with mercury sulphide	not classified (annex VI)	100.00000	Cd			
S	24.16000					100.00000	100.00000	Metal 100.00000
		Metal sulfides/sulphates	class see metal specific entry	100.00000	MeS			
Zn	12.32000					7.90000	20.00000	Zn (other not classified) 64.50000
		Zn (other not classified compounds/species)	not classified	93.00000	Zn			
		ZnS	not classified	7.00000	ZnS			

Encode % of release in MeClas[®]

OUTPUT

In MeClas[®], the highest release for cadmium after 7-days ($0.049 \mu\text{g/L} = 0.0065\%$) and 28-days ($0.079 \mu\text{g/L} = 0.011\%$) are compared to the relevant **[ion/ECotoxicity Reference Values]**, set at $2.4 \mu\text{g/L}$ for the acute and $0.31 \mu\text{g/L}$ for the chronic aquatic toxicity, respectively. For zinc, selenium and sulfur, the release measurements were significantly below the respective ERVs and therefore do not contribute significantly to the assessment conclusion.

For all four representative tested pigments, cadmium release remained well below both acute and chronic ERVs, resulting in a Tier 2 non-classification confirmed by MeClas[®] (Figure 3). In summary, the data support and confirm the existing conclusion that cadmium zinc sulphide and cadmium sulfoselenide are highly insoluble and not hazardous to the aquatic environment.

Tier 2

Endpoint	EU-CLP	GHS
Acute toxicity-oral	Not classified	Not classified
Acute toxicity-dermal	Not classified	Not classified
Acute toxicity-inhalation	Not classified	Not classified
Skin corrosion/irritation	Not classified	Not classified
Serious eye damage/eye irritation	Not classified	Not classified
Skin sensitisation	Not classified	Not classified
Respiratory sensitisation	Not classified	Not classified
Germ cell mutagenicity	Not classified	Not classified
Carcinogenicity	Not classified	Not classified
Reproductive toxicity	Not classified	Not classified
Specific target organ toxicity - single exposure	Not classified	Not classified
Specific target organ toxicity - repeated exposure	Not classified	Not classified
Aspiration hazard	Not classified	Not classified
Endocrine Disruption - Human health	Not classified	
Hazardous to aquatic environment - ACUTE	Not classified	Not classified
Hazardous to aquatic environment - CHRONIC	Not classified	Not classified
Endocrine Disruption - Environment	Not classified	

Figure 3. MeClas[®] Tier 2 classification output

Extremely low Cd release of cadmium pigments in OECD GD29 T/D tests
→ Cd pigments not classified for aquatic hazards.

Definition/reference

- [1] UVCB: Unknown or Variable Composition, Complex Reaction Products, or Biological materials
[2] MeClas tool <https://www.meclas.eu>