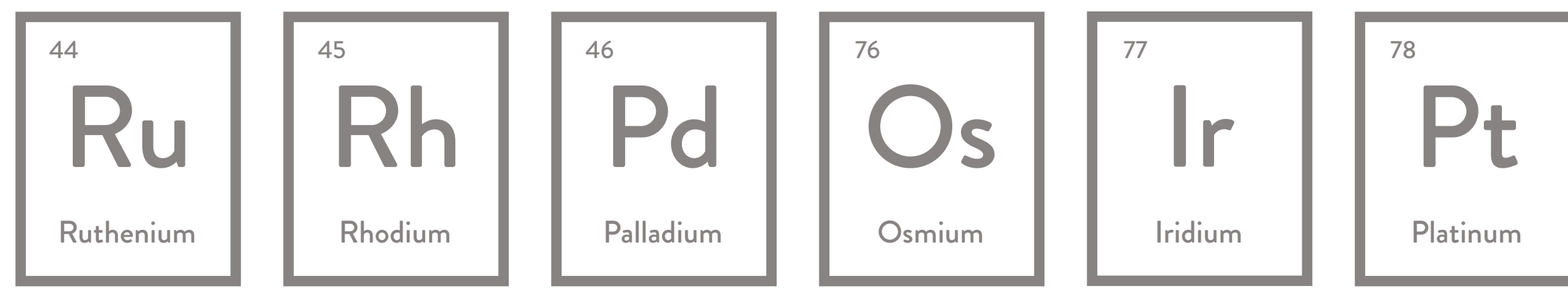


Environmental fate and toxicology of Platinum Group Metals (PGMs): areas for improvement

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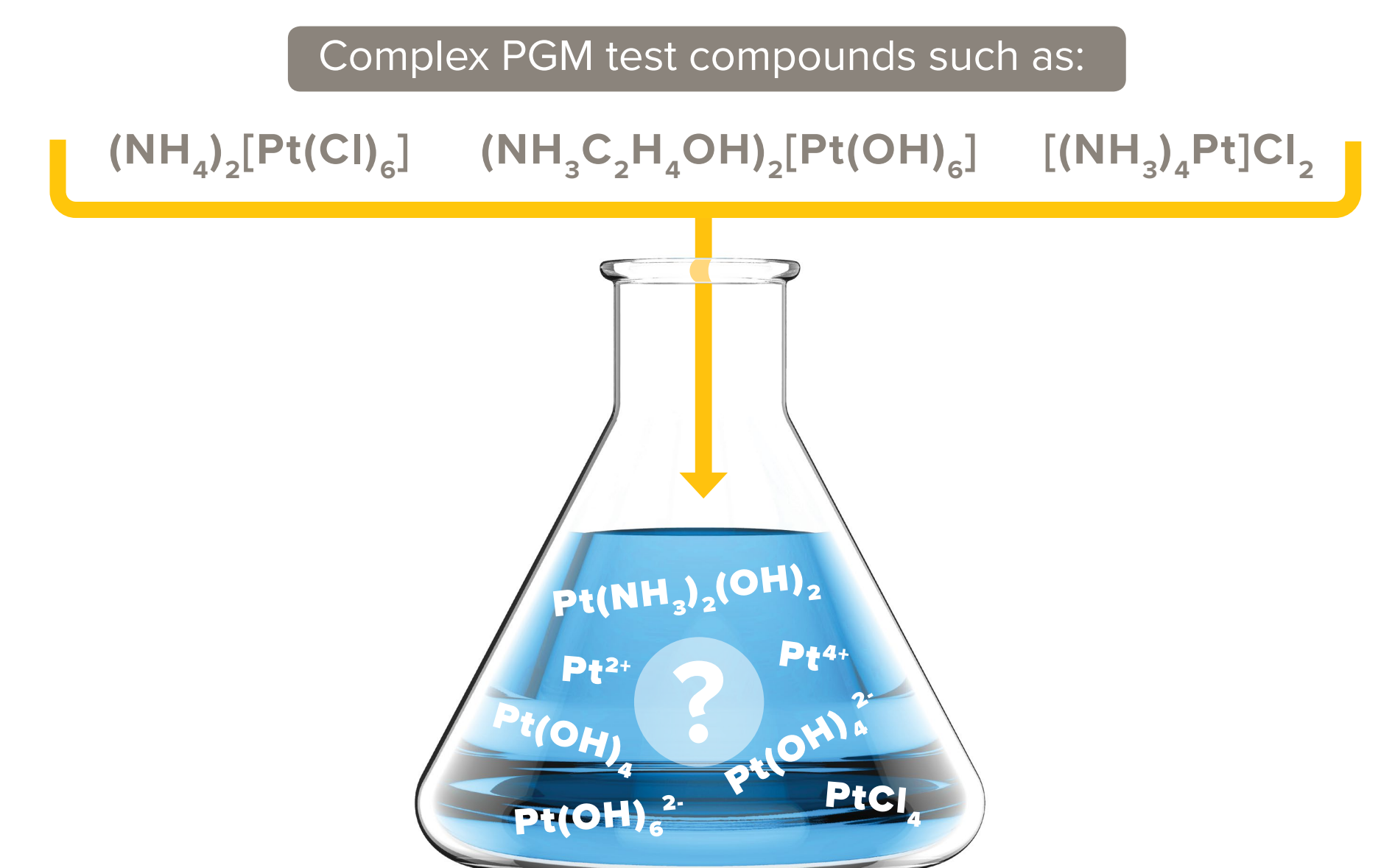
Platinum-Group Metals (PGMs)

Under the EU REACH Regulation, there is the obligation for industry to perform an assessment for each chemical put on the EU market. Therefore, the precious metals industry reviewed the available scientific data and performed additional testing where needed in order to create a REACH compliant dossier and ensure safe manufacturing and use of its chemicals/products.

However, during the preparation of the dossiers, it has been noticed that there are several areas where **reliable data for PGMs is currently limited or even completely lacking**.

PGM ENVIRONMENTAL SPECIATION

It is known that PGMs have strong coordination properties with (in)organic ligands. Some industrial complexes only exist in a narrow window of physicochemical conditions such as pH or excess ligand concentrations. In general, it can be expected that a **(rapid) re-speciation** occurs when PGM coordination complexes end up in a testing or natural environment (experimental test media, natural water, soil...), with the formation of new PGM species such as polyhydroxo-complexes. The (re-)speciation is a relevant determinant for predicting or interpreting the effects caused by PGM complexes, and for judging on the comparability of effects caused by different complexes of a metal. However, the **experimental determination of environmental speciation** of PGMs remains an **understudied field**, and **speciation modelling capacity is limited** because of the many thermodynamic constants with main ligands (HO^- , HCO_3^- , Cl^-) that are lacking.



PGM ECOTOXICITY

There are ecotoxicity data available in the peer-reviewed public literature. Most of these studies focus on acute toxicity endpoints in freshwater with algae or invertebrates as test organisms. These data are in many studies reliable (i.e. in compliance with internationally accepted protocols, well described test materials and test setup, measured soluble metal concentration and clear reporting of observations).

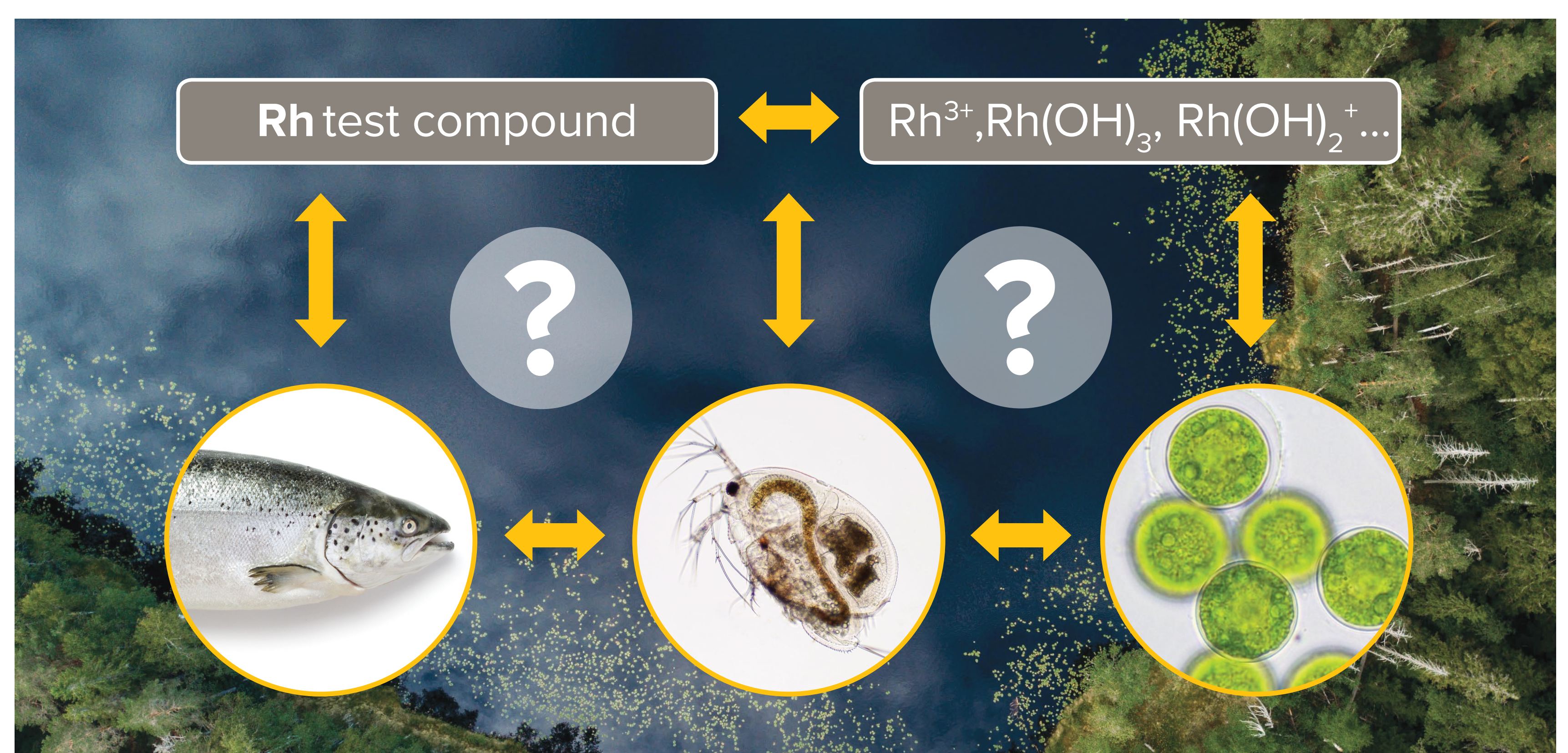
To optimize the assessment of metals, toxicity data to **other test species** (microorganisms, plants or fish), for **chronic rather than acute effects** and in **other environmental matrices** (soil or sediment) or **micro/mesocosms** are also required. Unfortunately there is **much less (or none) of this data available, or of limited use** for environmental assessments, **despite being the the most relevant**.

	L I T E R A T U R E D A T A					I N D U S T R Y D A T A				
	Micro-organisms	Algae	Invertebrate	Fish	Plants	Micro-organisms	Algae	Invertebrate	Fish	Plants
Aquatic	2	2 / 0	3 / 0	1 / 0	0	4	5 / 5	5 / 3	3 / 0	0
Sediment	0	NR	1	NR	0	0	NR	1	NR	0
Soil	0	NR	2	NR	0	0	NR	0	NR	0

Number of relevant and reliable studies for Pd ecotoxicity assessment identified in peer-reviewed literature and industry test reports. Numbers are provided for different groups of test species and for different environmental matrices. For the aquatic compartment, acute and chronic endpoints are shown separately for algae, invertebrate and fish studies. NR = not relevant

PGM BIOACCUMULATION

Bioaccumulation data for metals in higher organisms often shows an inverse relationship with exposure concentration, and trophic dilution processes might occur. Experimental data for PGMs are available in the peer-reviewed public literature. Unfortunately, this data is often reported in **monitoring studies** where no link between exposure and accumulation concentrations can be made, or in experimental studies with exposure to an **unidentified PGM test compound** (like a mixture containing PGMs), at **ecologically irrelevant concentrations** and/or insufficient exposure time to reach **steady-state conditions**. The importance of **PGM speciation** for bioaccumulation assessment should be well considered.



The precious metals industry is continuously following scientific research publications and investing in the development of experimental data and scientific concepts with regulatory importance (like Biotic Ligand Models or QICARs ('Quantitative Ion Character-Activity Relationships')) to allow proper and reliable assessments of its products.

In this respect, the precious metals industry encourages the **alignment between scientific research and industry / regulatory needs**. This will help the global recognition and implementation of scientific research.

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