

INFLUENCE OF THE INITIAL SPECIATION OF PLATINUM AND PALLADIUM ON THEIR BIOAVAILABILITY TO A GREEN ALGA

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KEY FINDINGS

- Disconnect between bioaccumulation and effects of Pt(II) complexes and those of Pt(IV)
- Toxicity driven by the formation of a radical chlorine during the reduction process of $\text{Pt}(\text{IV})(\text{Cl})_6^{2-}$
- Rapid dissociation and similar bioaccumulation for both tested palladium complexes
- Slightly higher toxicity of $\text{Pd}(\text{NH}_3)_4^{2+}$ explained by the presence of $\text{Pd}(\text{NH}_3)_{4-x}^{2+}$ ($x = 1-3$) complexes in addition to $\text{Pd}(\text{OH})_2$

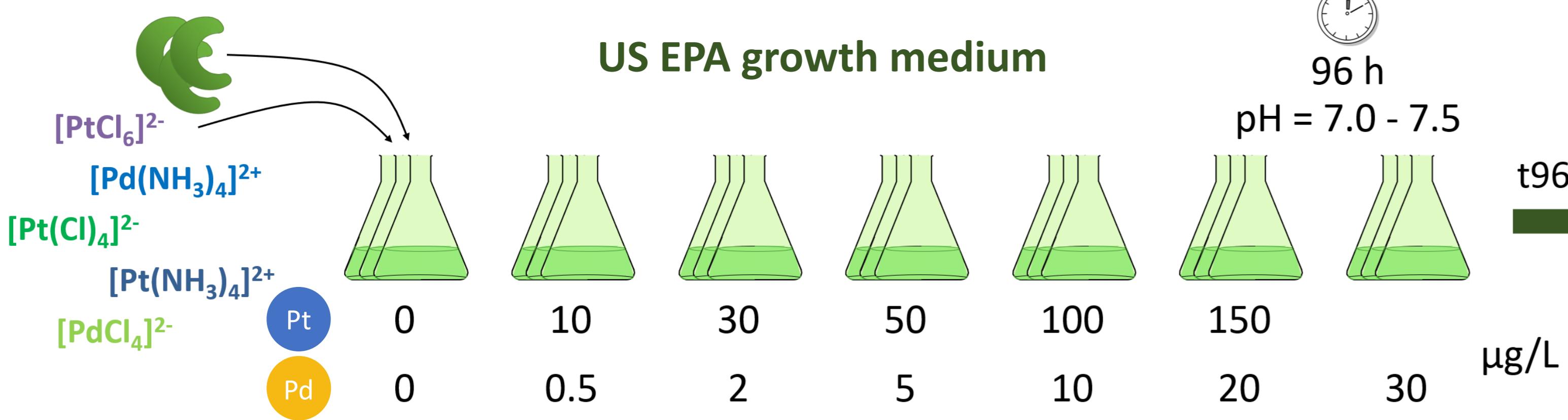
INTRODUCTION

Due to the increasing use of platinum (Pt) and palladium (Pd) in many industrial sectors, their potential toxicity have become a subject of interest.

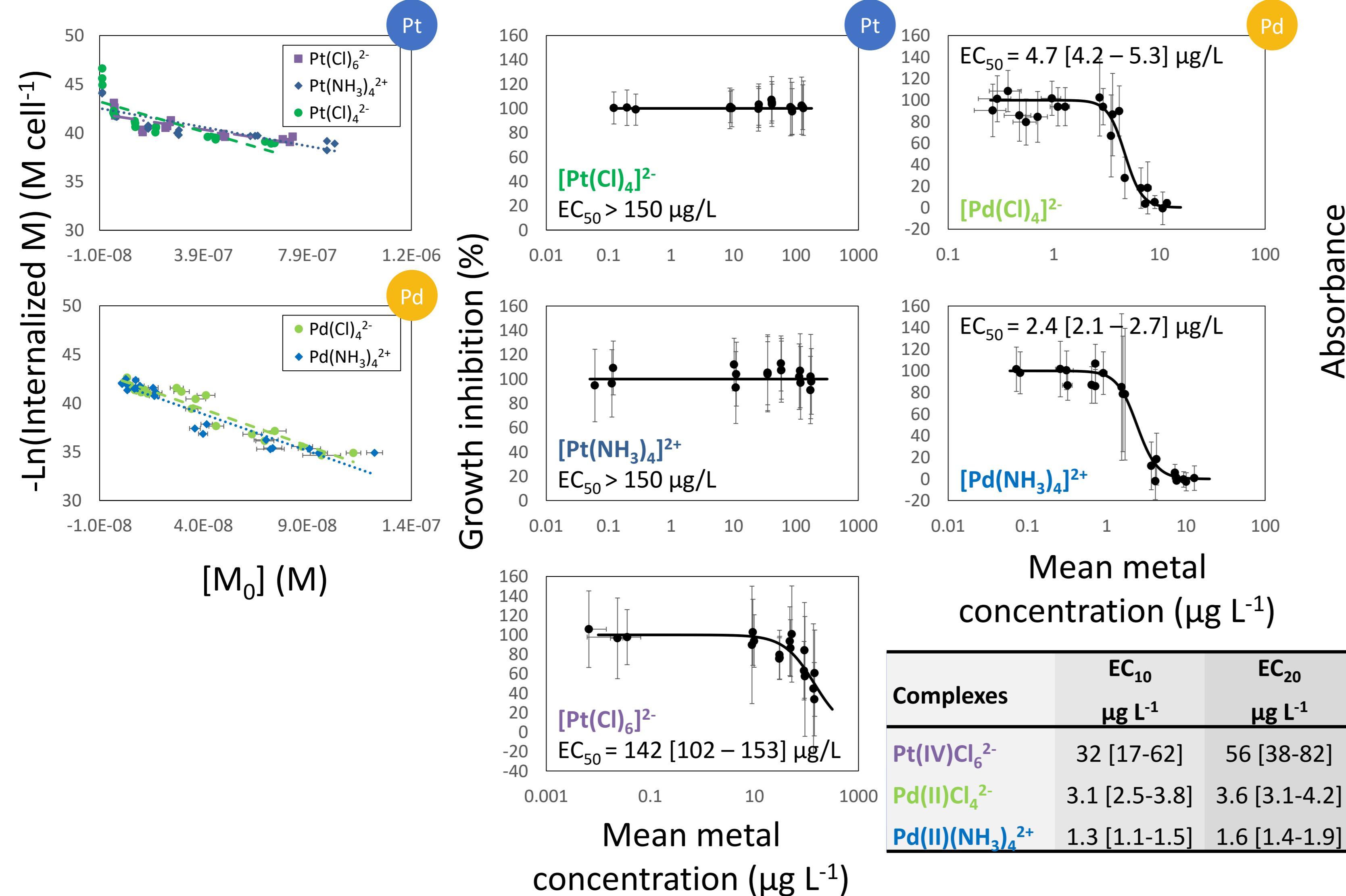
One factor to consider when investigating the toxicity of these metals is their slow exchange kinetics. Thus, while thermodynamics predict the formation of $\text{Pt}/\text{Pd}-(\text{OH})_2$ in freshwater, it is possible that their toxicity will be influenced by the persistence of their initial form (i.e. the form they had when first entering water).

In this project, we studied the toxicity of various Pt/Pd complexes with a green alga. We then used spectrophotometry and kinetic modelling to gain a better understanding of the behavior of some inorganic Pd/Pt complexes in freshwater, and to establish a link between toxicity and speciation.

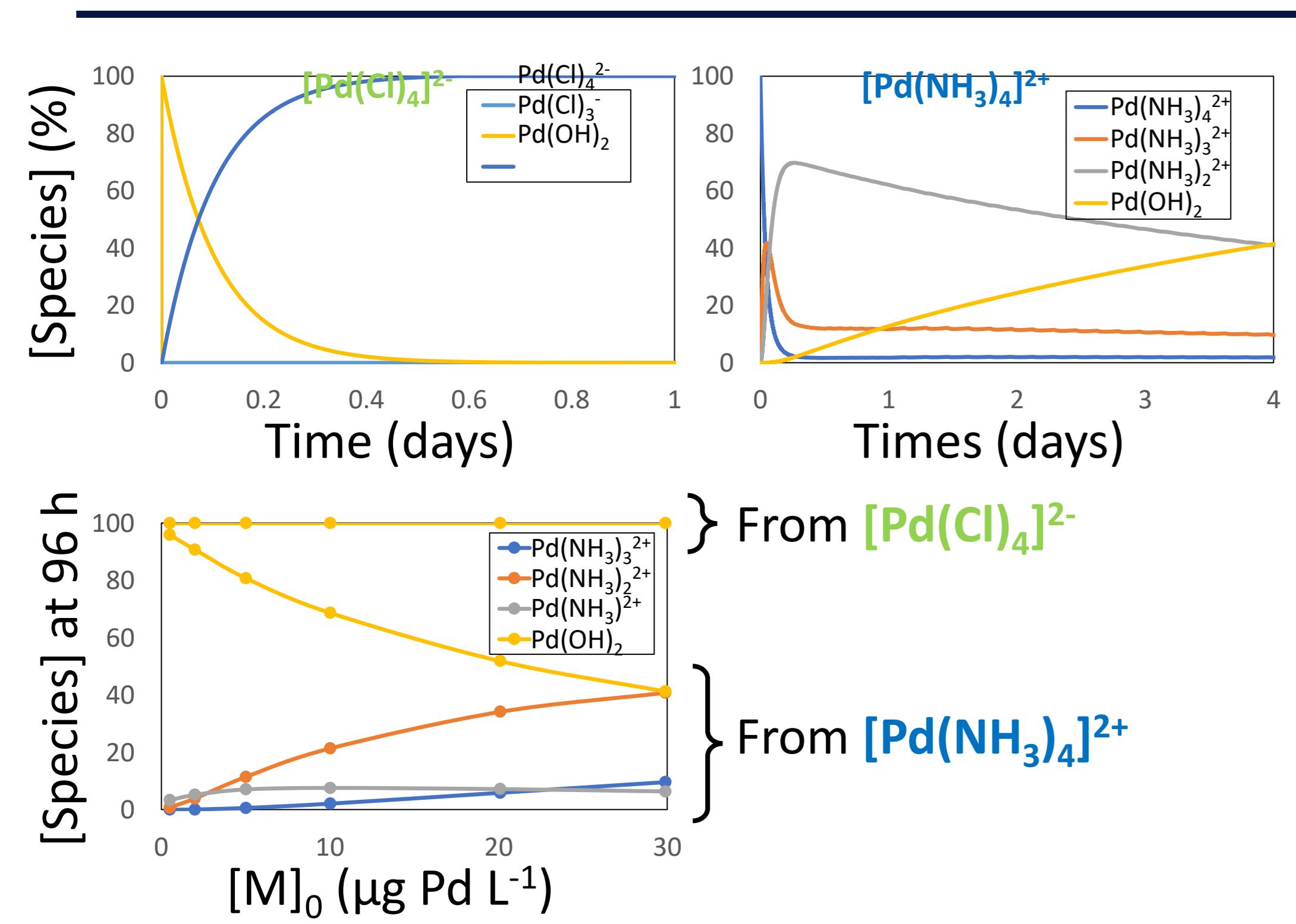
EXPOSURE



BIOACCUMULATION AND TOXICITY



KINETIC MODELLING

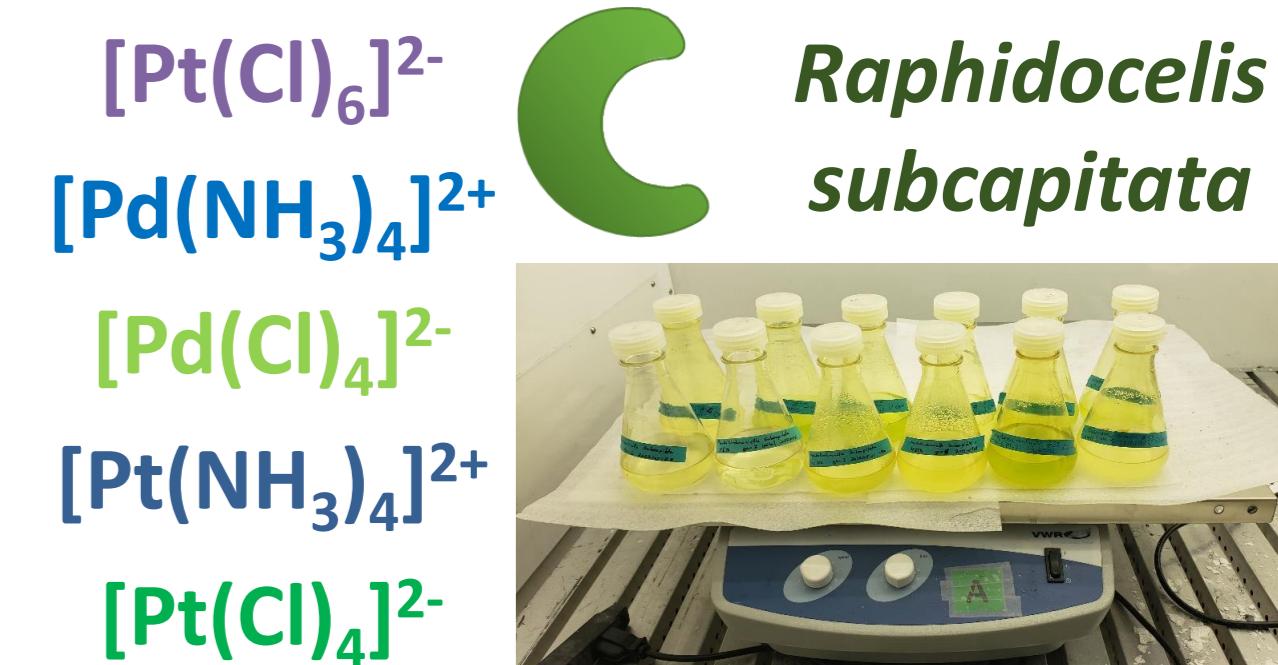


DISCUSSION

[1] SGM was used for spectrophotometry tests due to interferences caused by the US EPA medium

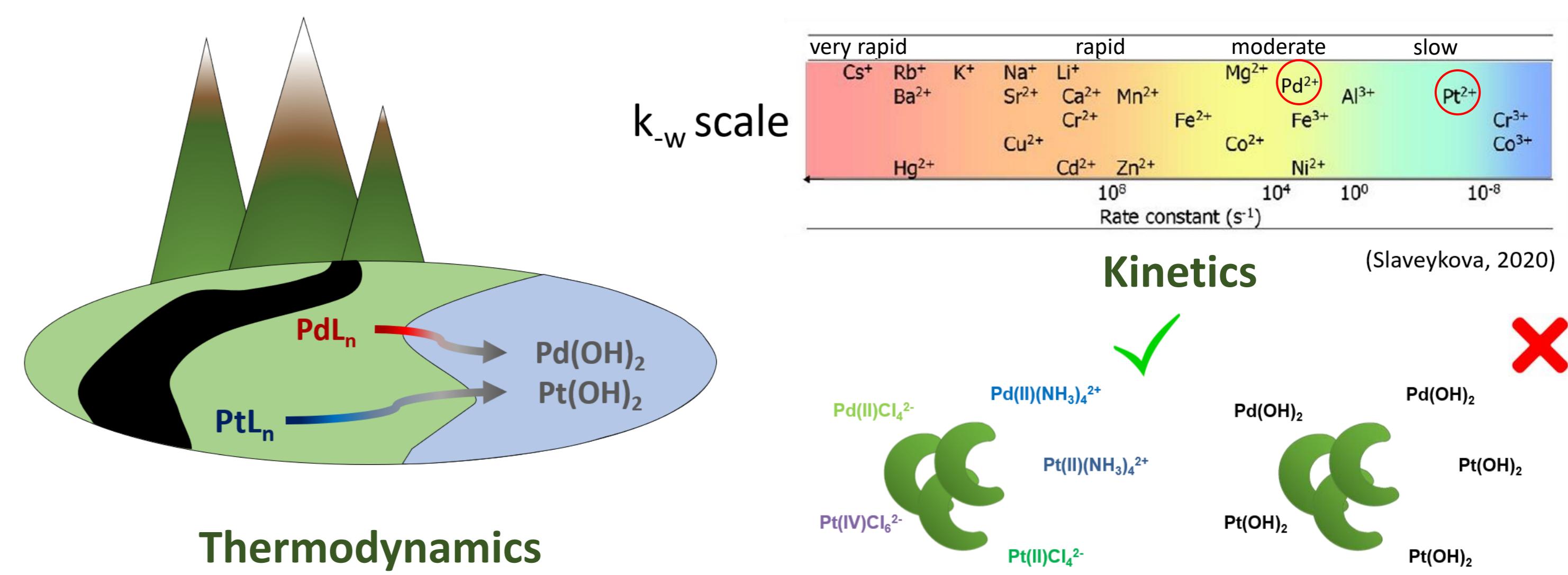
[2] It was assumed that no metal precipitation occurred during the spectrophotometry tests

[3] Kinetic calculations were performed using ReactLab KINSIM 2.0 software



HYPOTHESIS

Due to their slow exchange kinetics, aquatic organisms will be exposed to the initial chemical speciation of Pd/Pt for a long enough time to influence toxicity.



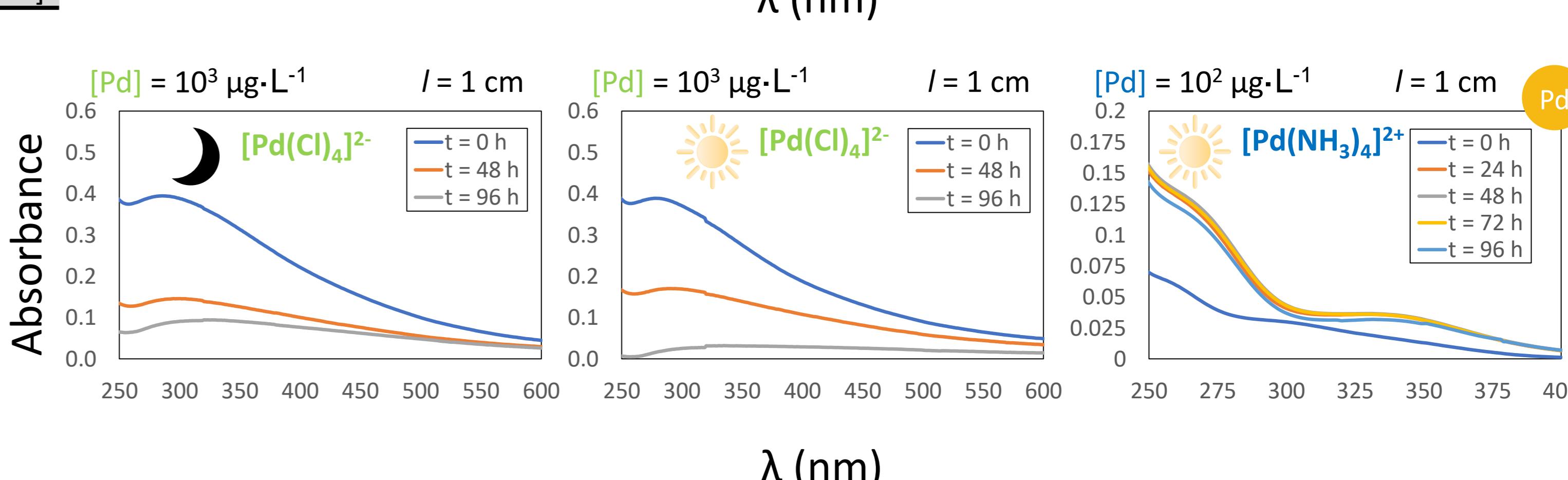
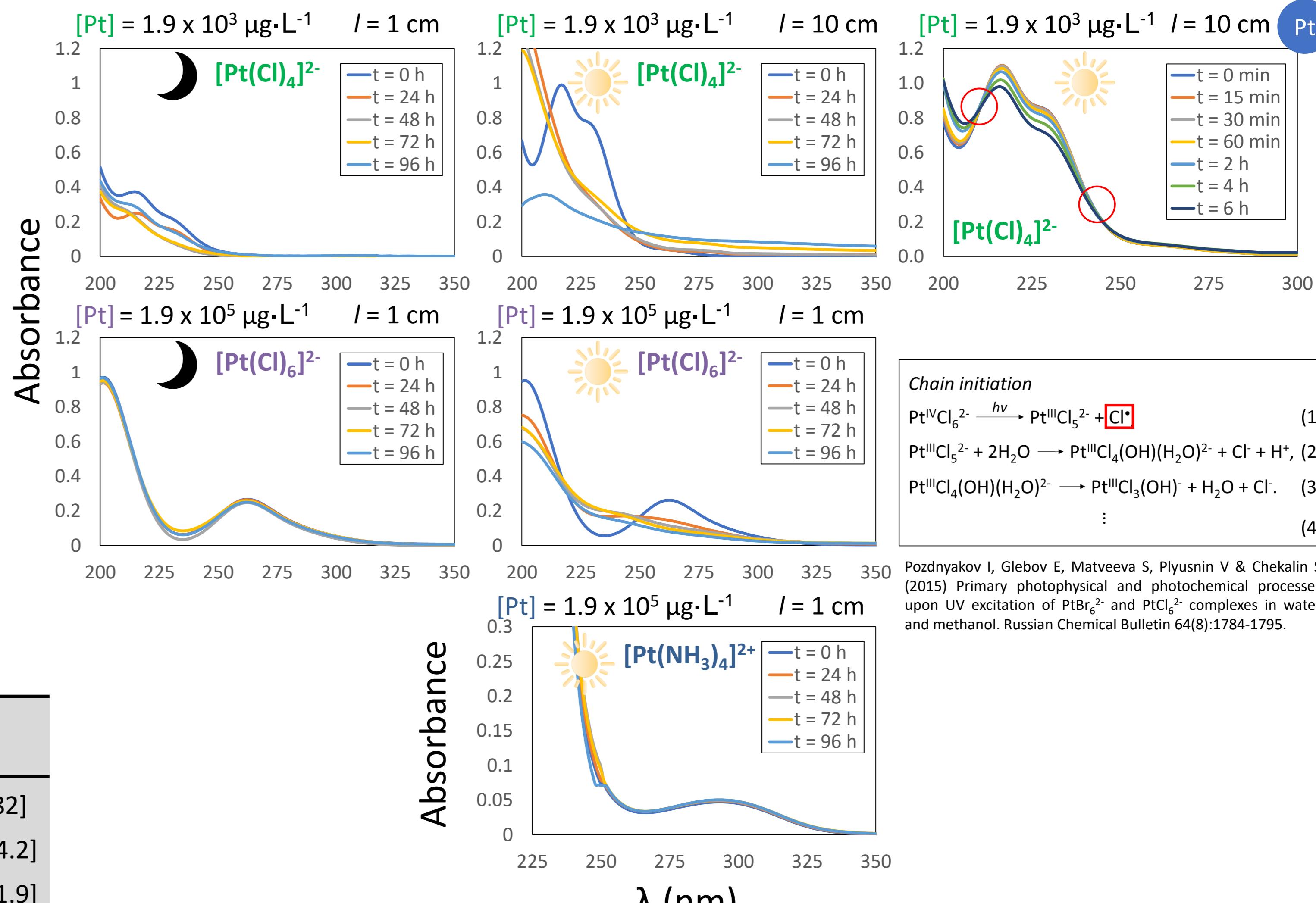
KINETICS



Spectrophotometry in Simplified Growth Medium (SGM)

Ratios for $\frac{M}{\text{EDTA}^{4-}}$ and $\frac{M}{\text{Cl}^-}$ were based on $[\text{M}]_{\text{max expo}}$
pH controlled by NaHCO_3

COMPLEXES STABILITY



SUMMARY

