Speciation of Cd(II) in Strong Chloride Media

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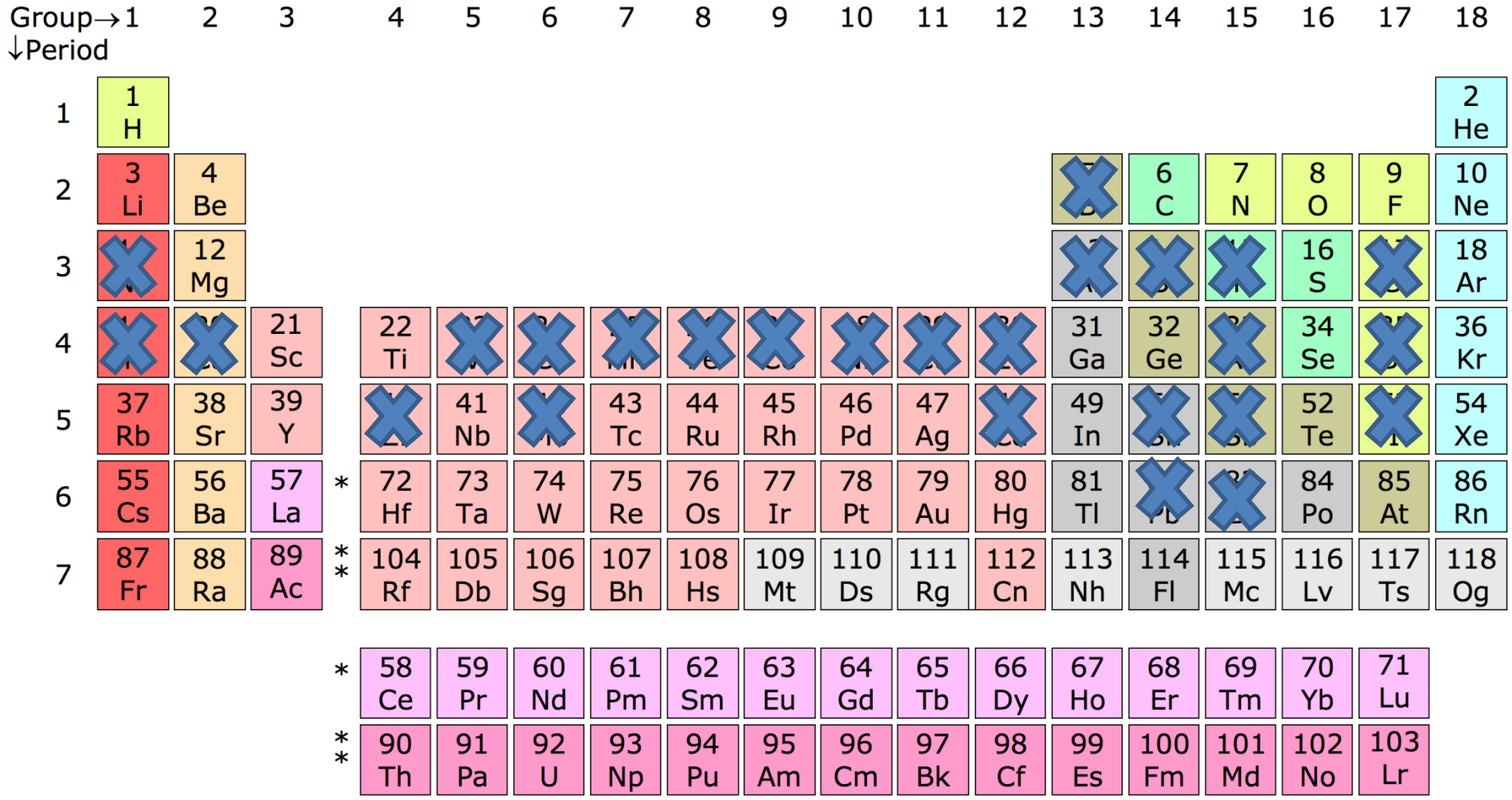
Industrial feeds are complicated

https://commons.wikimedia.org/wiki/File:Slovnaft_-_new_polypropylene_plant_PP3.JPG

What you look for is what you find



Modell solutions

http://paper4pc.com/model-train-train-toy-model-railroad-minature-trains-tracks-16.html#gal_post_87213_modeltrain-train-toy-model-railroad-minature-trains-tracks-wallpaper-9.jpg

Liquid-Liquid extraction

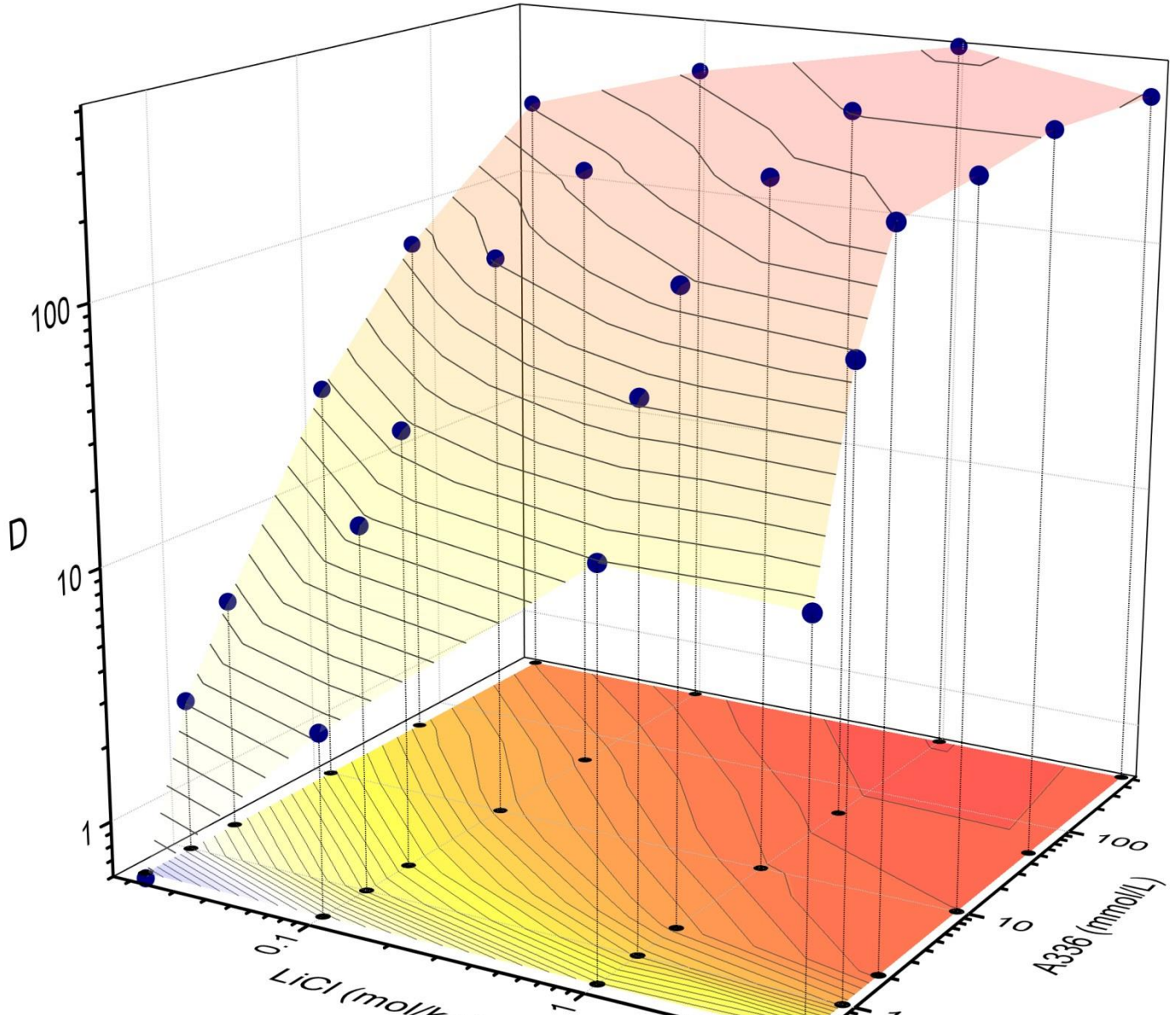
$$M + \overline{LX} \rightleftharpoons \overline{LM} + X$$

$$K = \frac{[\overline{LM}][X]}{[M][\overline{LX}]}$$

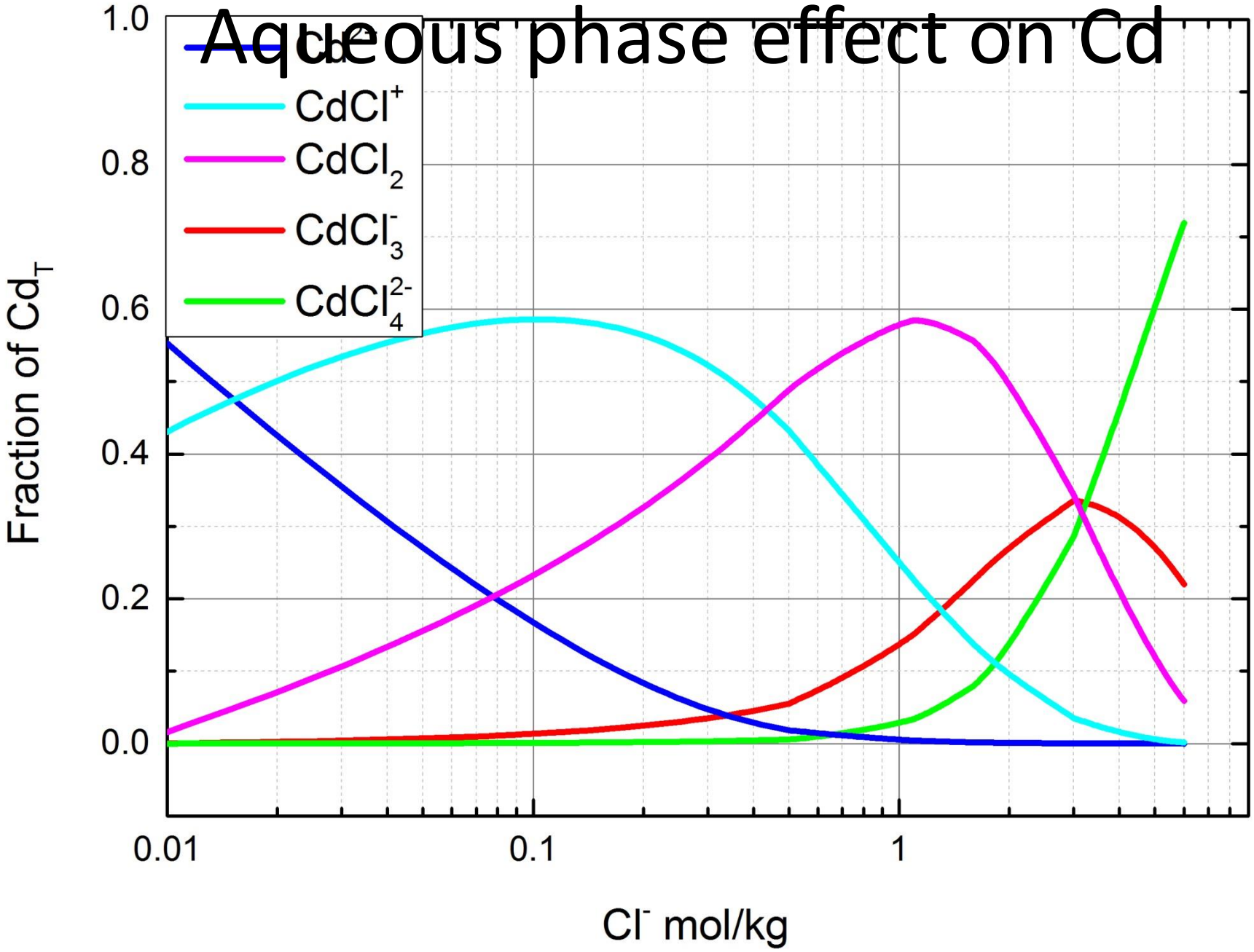
$$D = \frac{[A]_{org}}{[A]_{aq}}$$

$$K = D\frac{[X]}{[\overline{LX}]}$$

Making a map of the extraction



Aqueous phase effect on Cd



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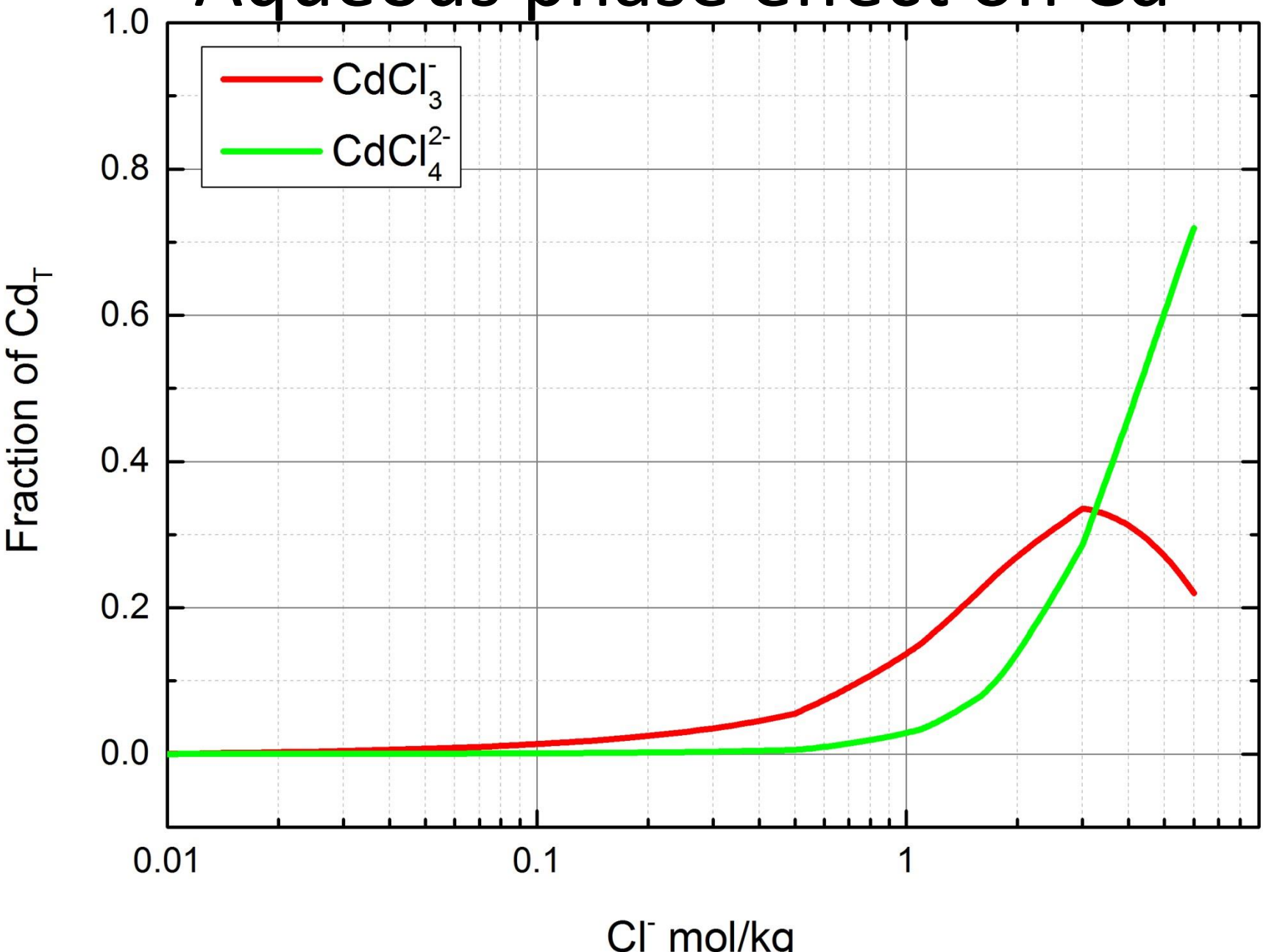

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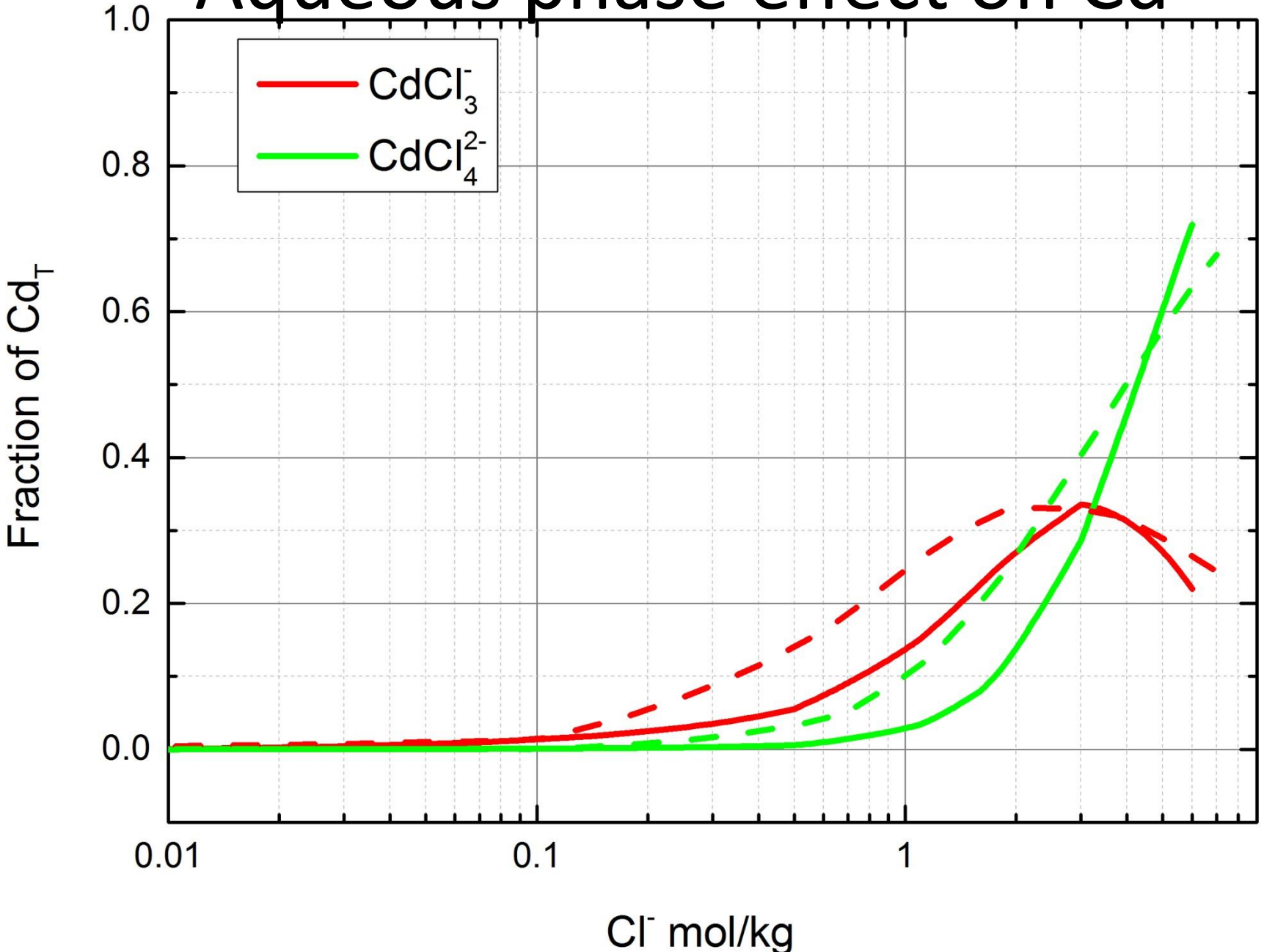

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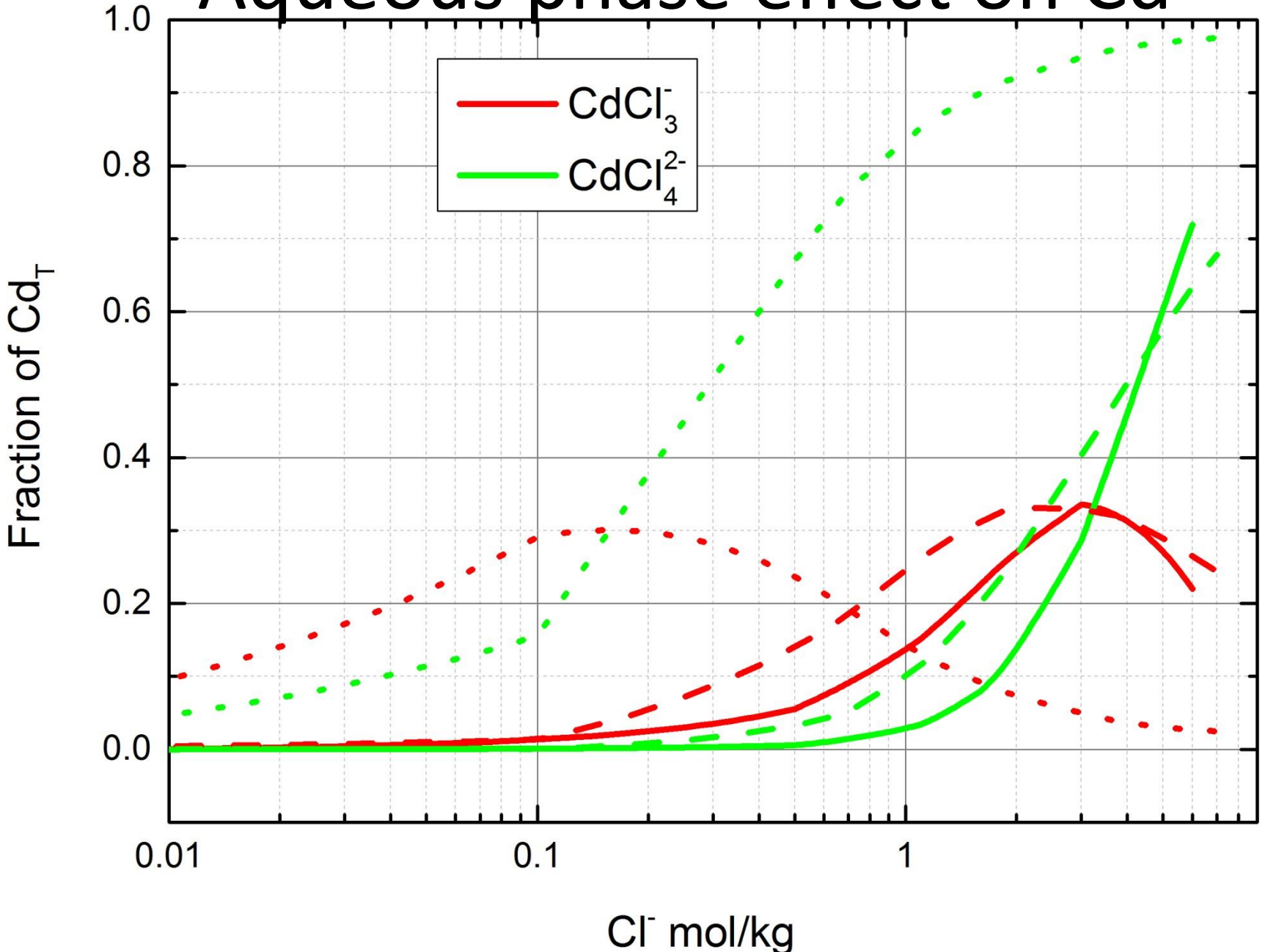
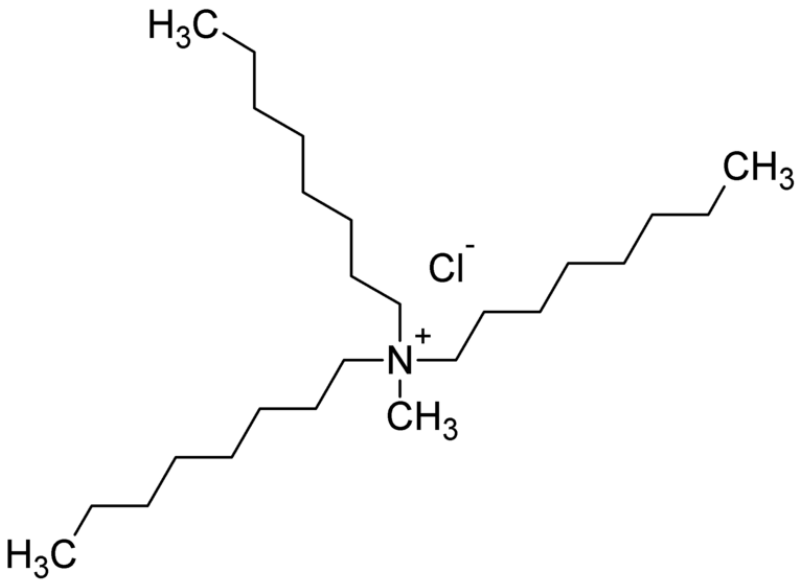
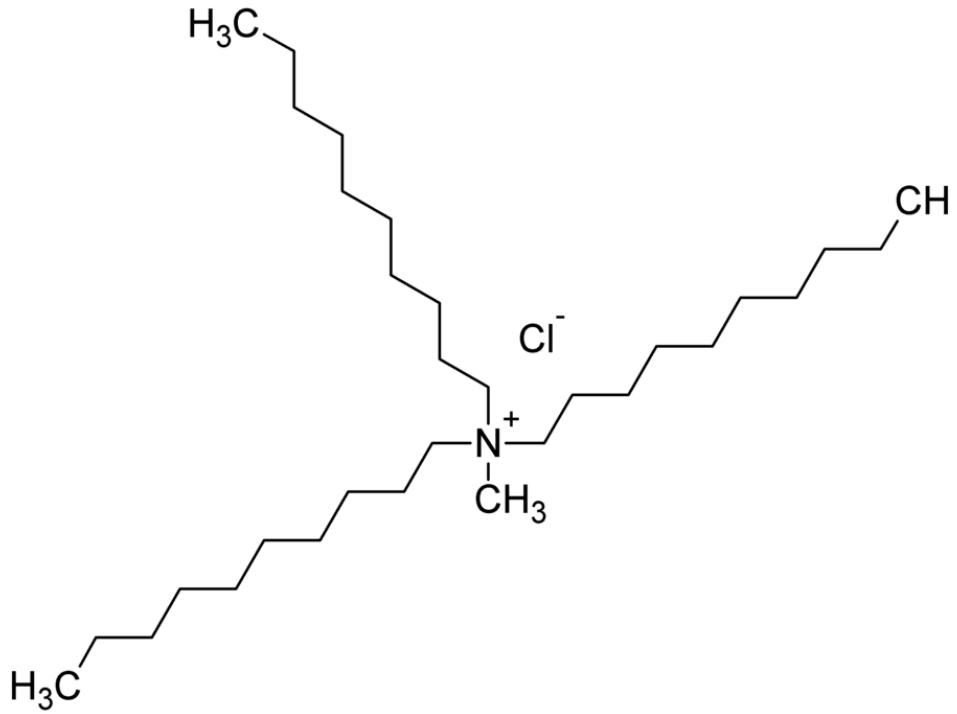


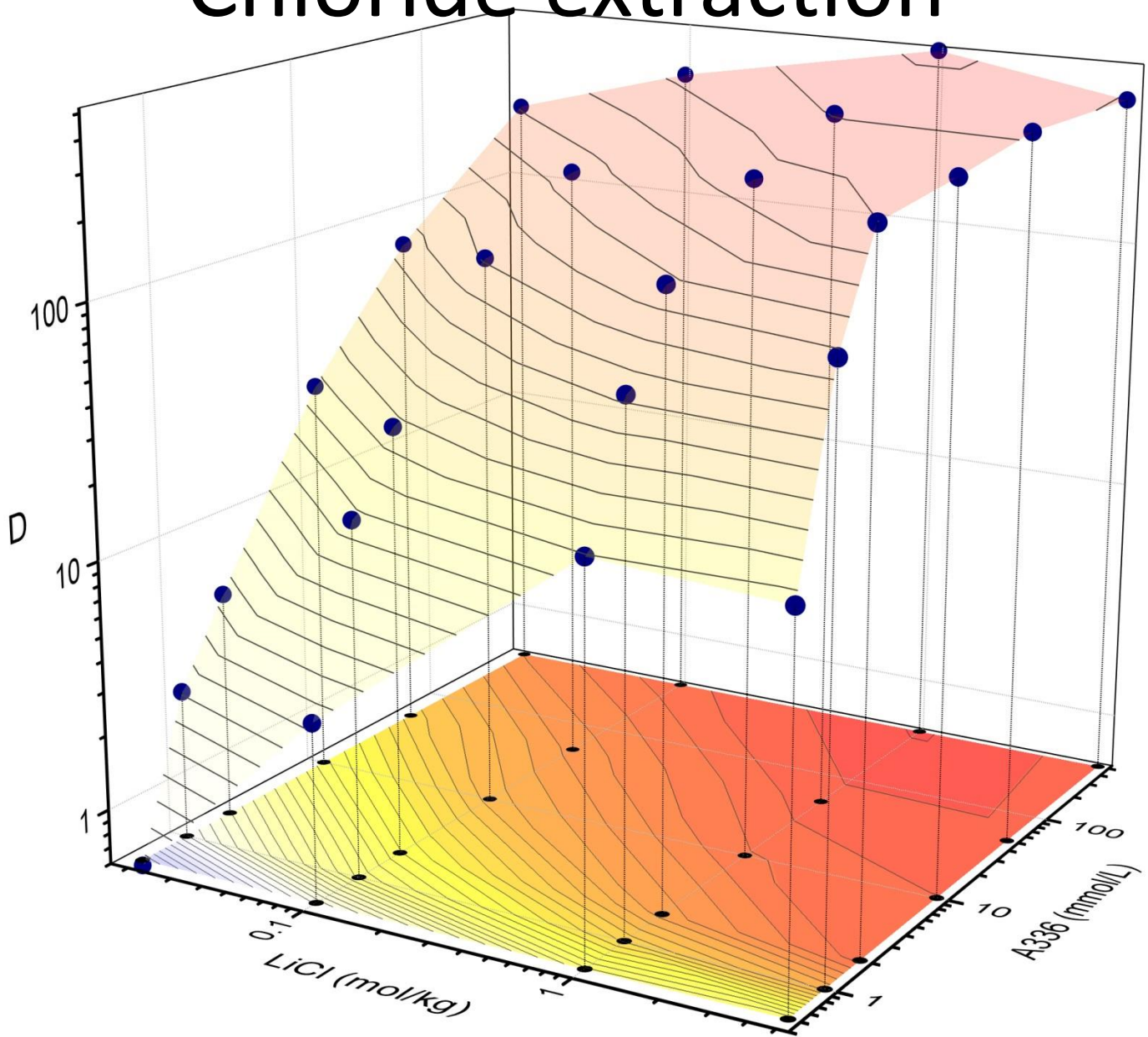
Aliquat 336



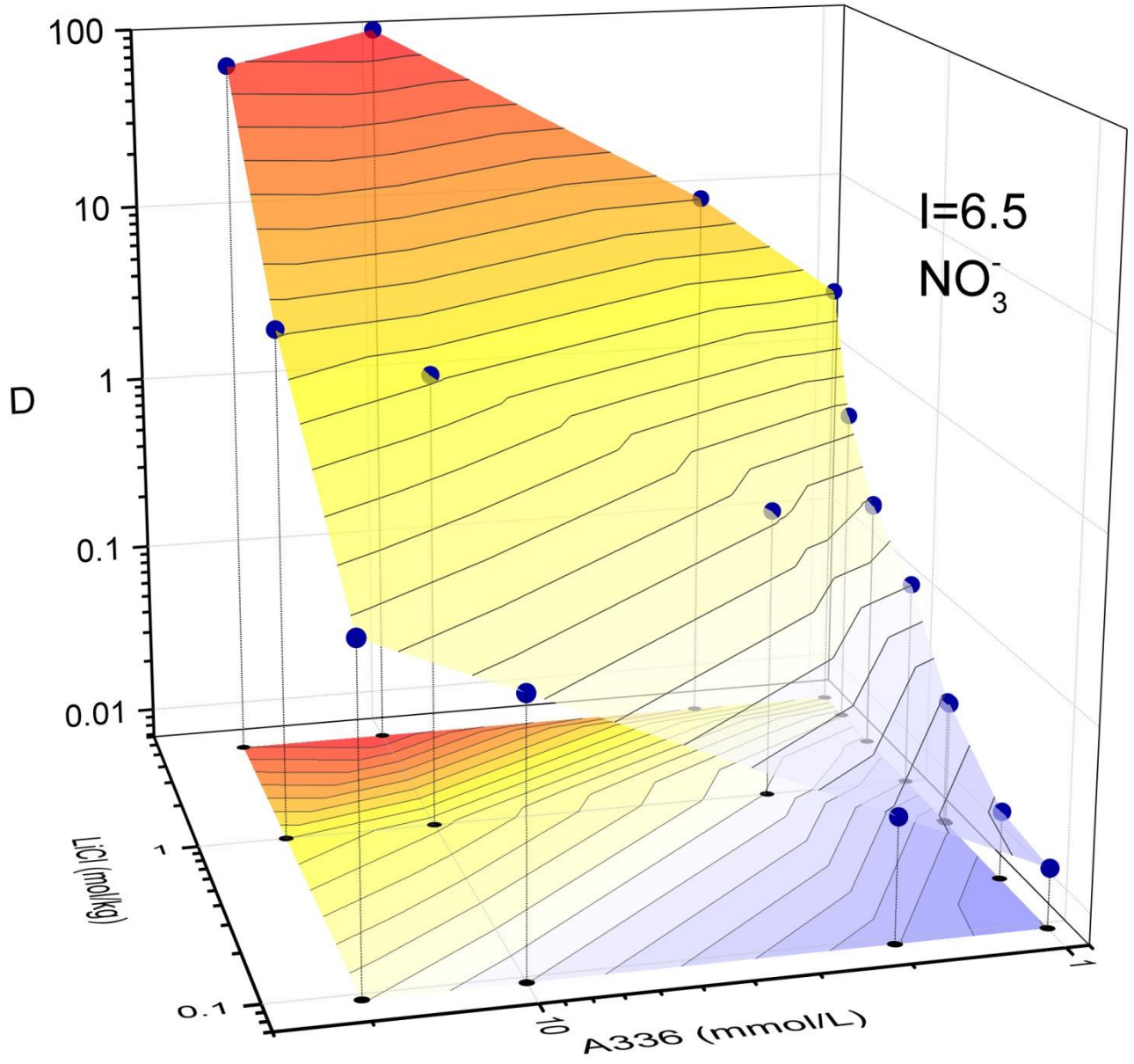


Rice, N.M., Smith, M.R.: Recovery of Zinc, Cadmium and Mercury(II) from Chloride and Sulphate Media by Solvent Extraction Journal of Applied Chemistry and Biotechnology **25**(379-402) (1975).
Wassink, B., Dreisinger, D., Howard, J.: Solvent Extraction Separation of Zinc and Cadmium from Nickel and Cobalt using Aliquat 336, a Strong Base Anion Exchanger, in the Chloride and Thiocyanate Forms. Hydrometallurgy **57**, 235-252 (2000).

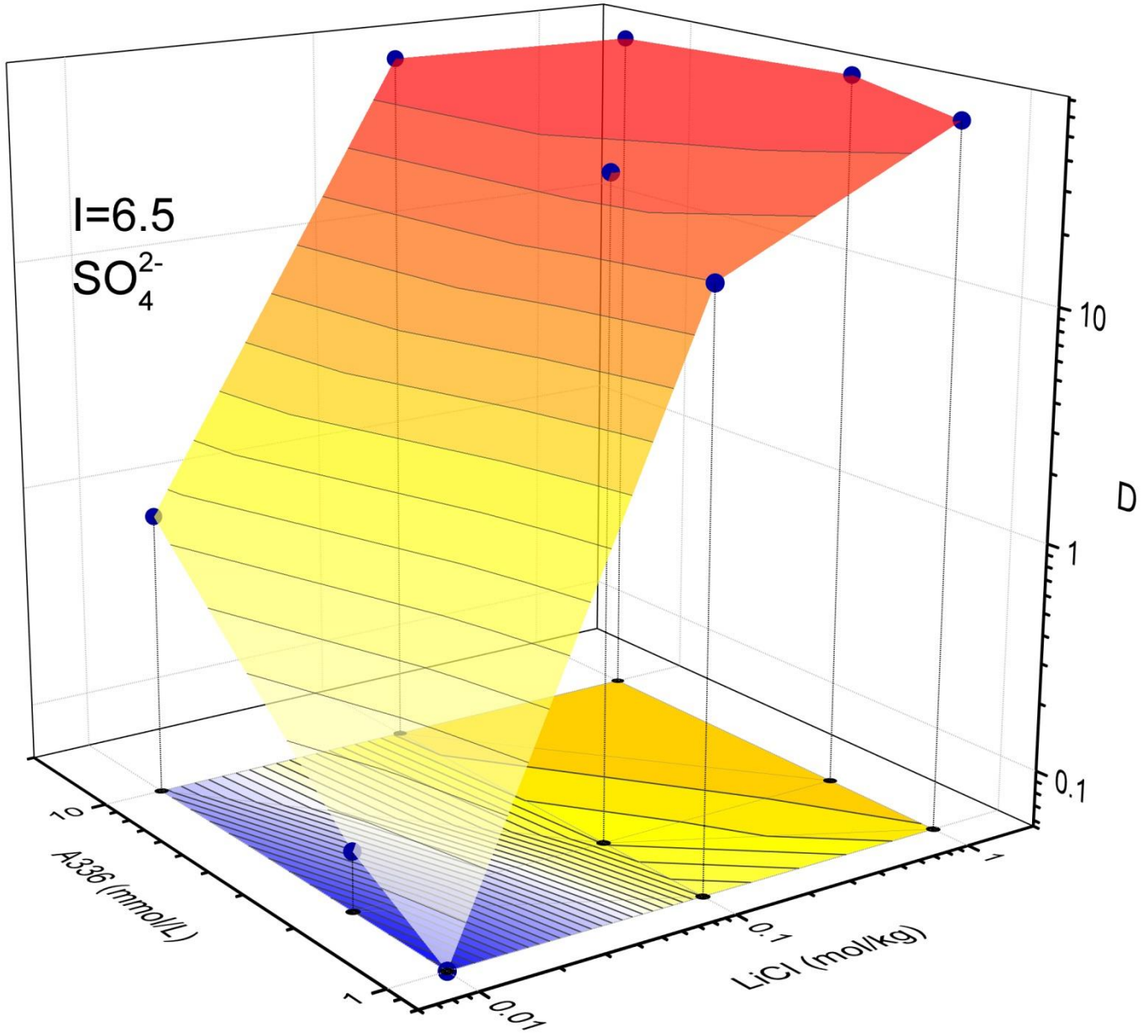
Chloride extraction



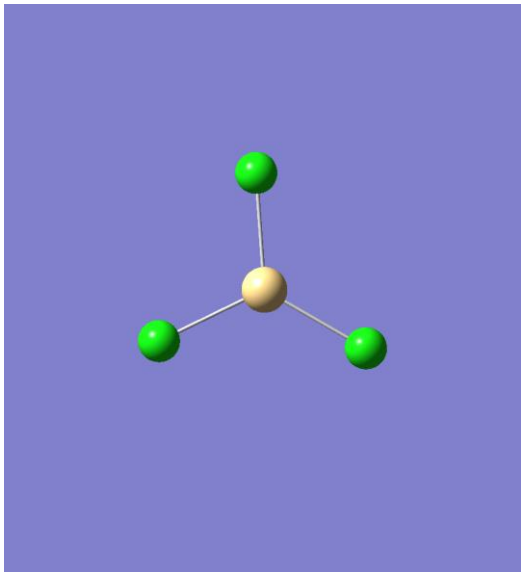
Extraction with Nitrate Present

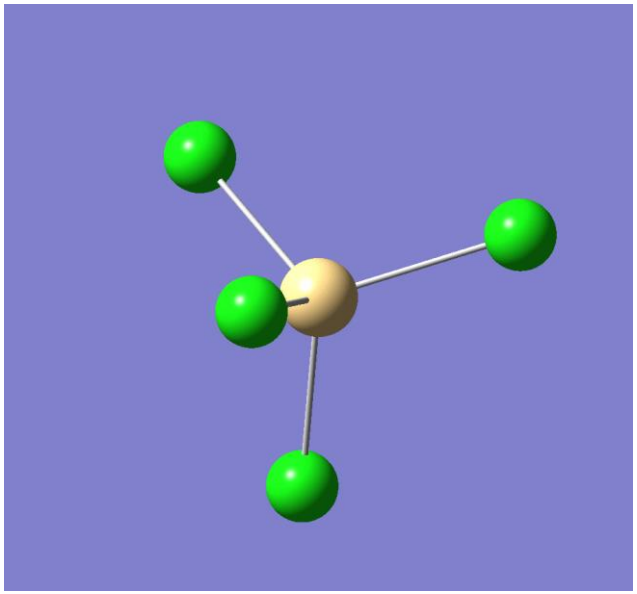


Extraction with sulfate present

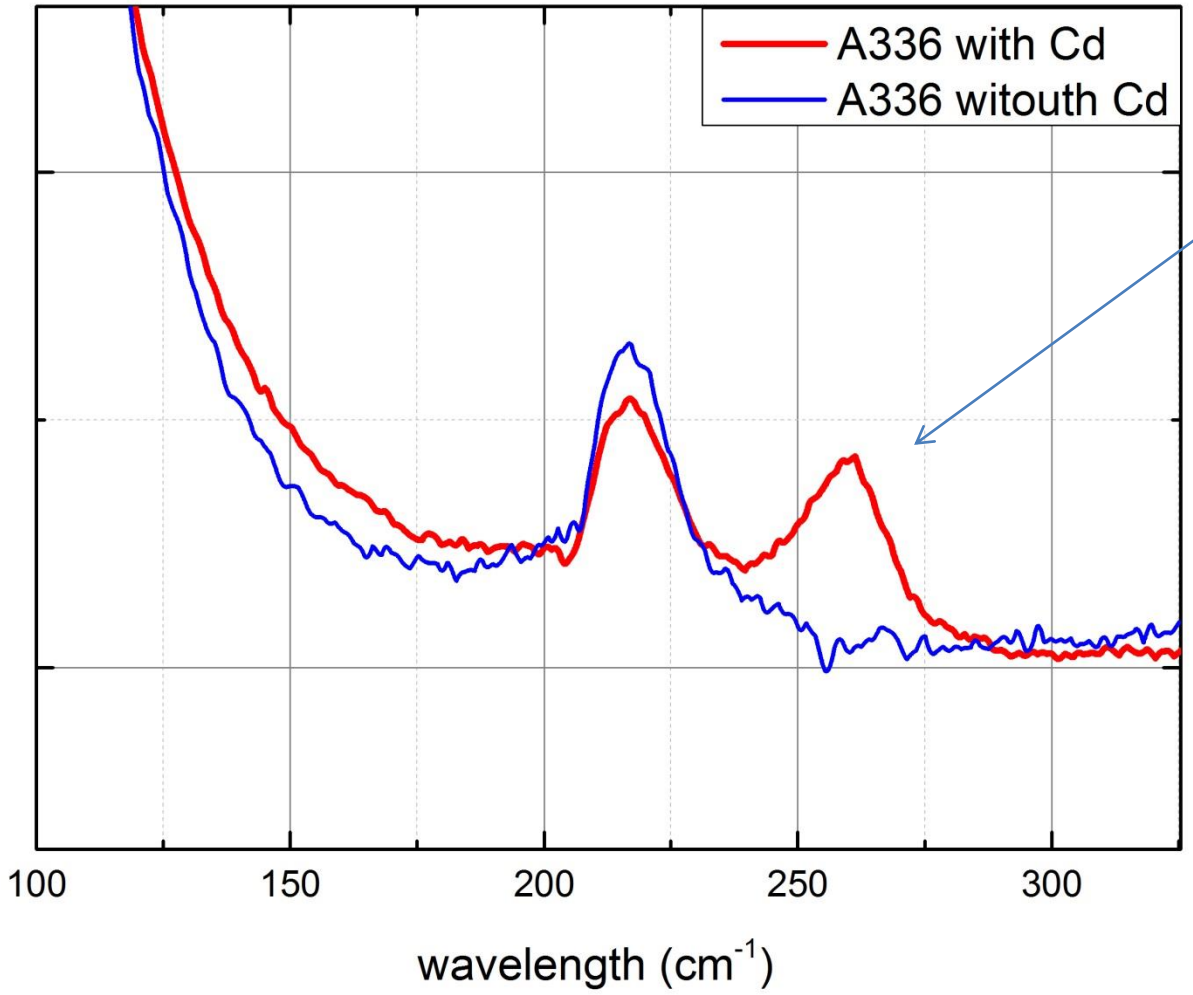


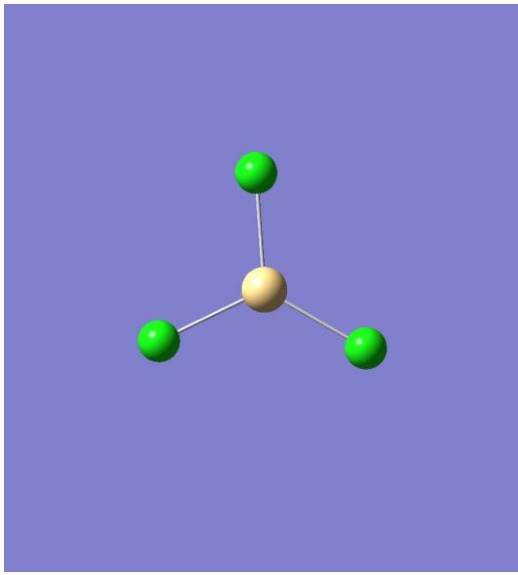
Raman spectroscopy



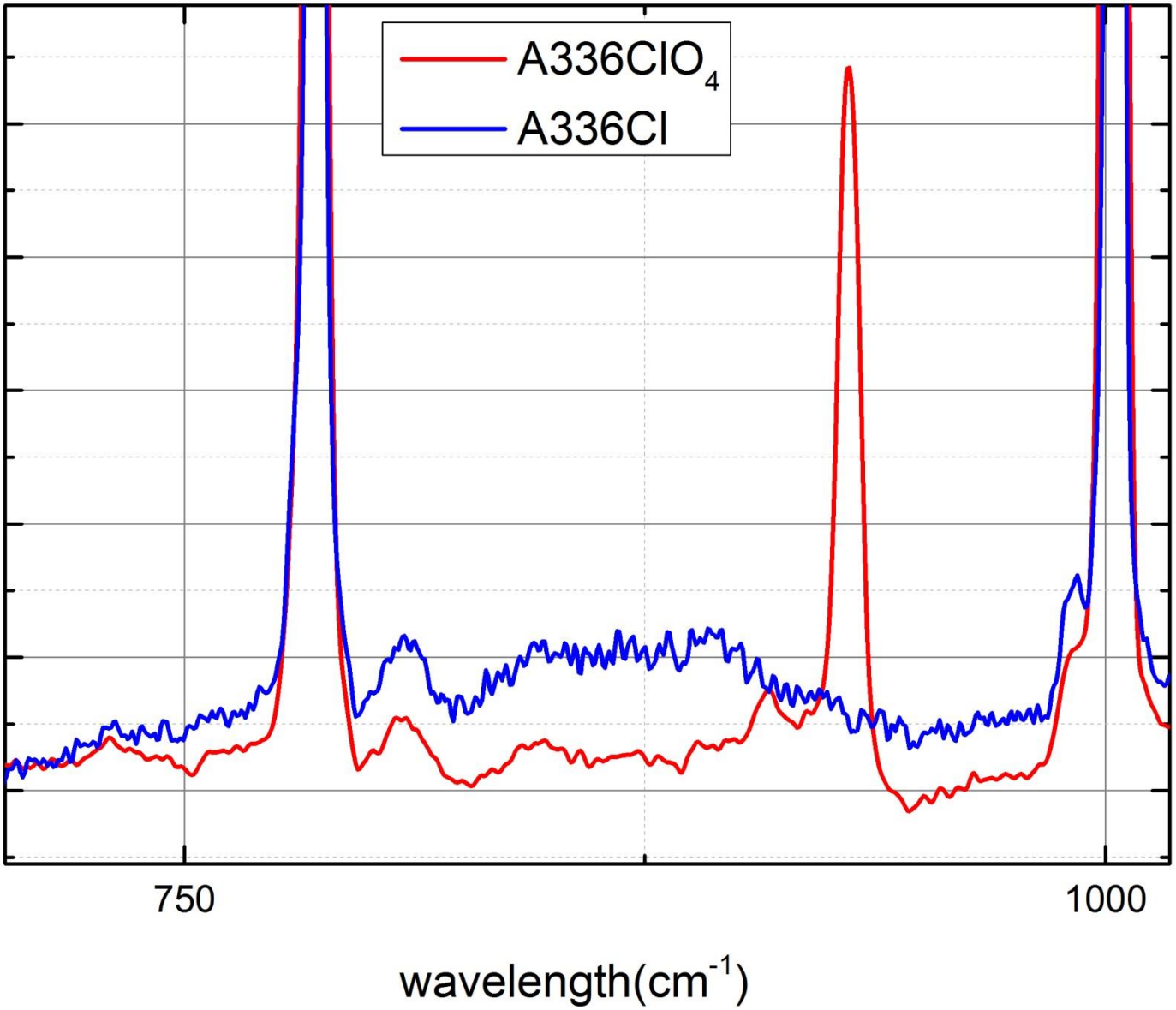


Distinct wavelengths can be recognised

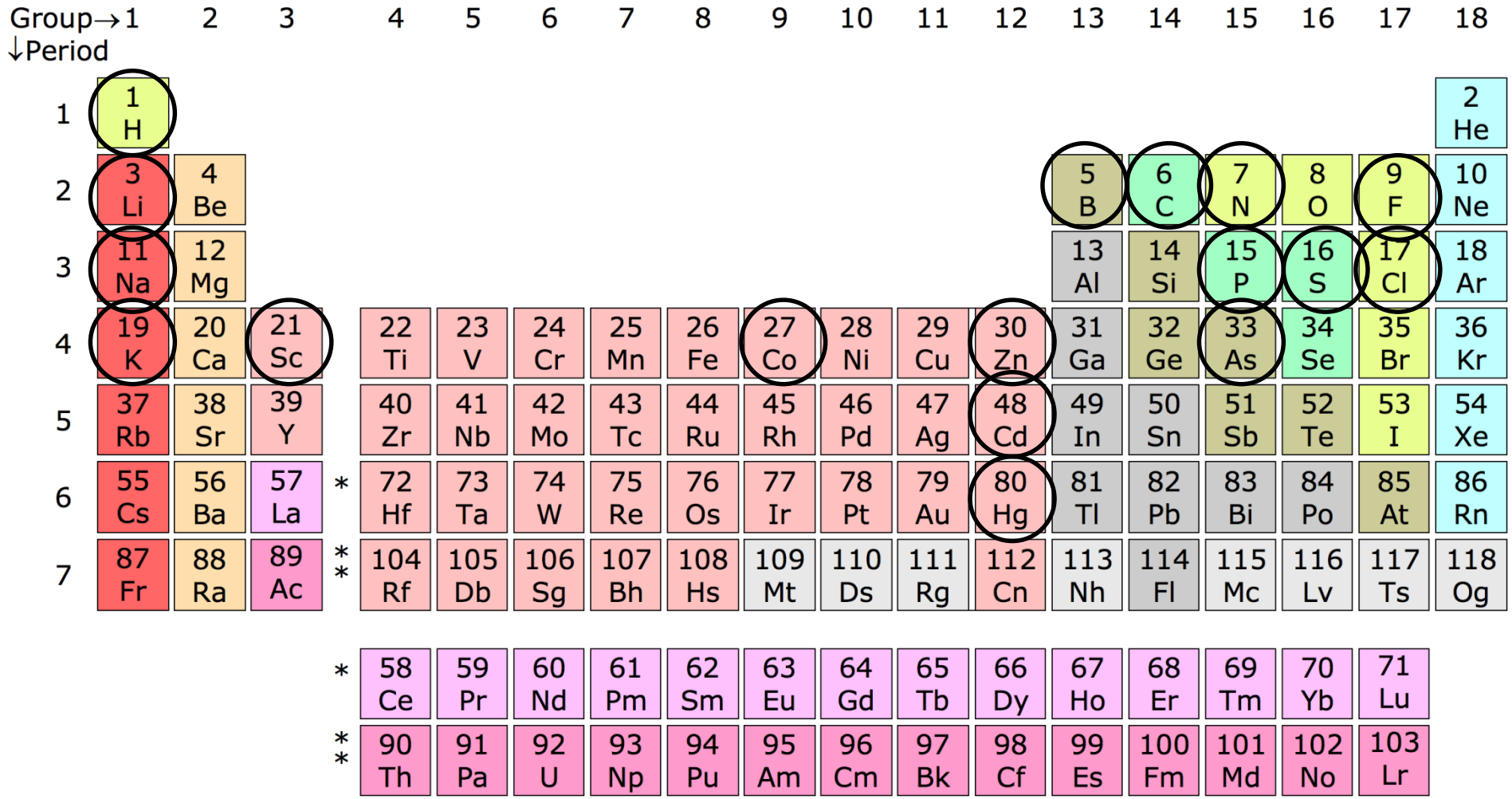




Extractant absorbs matrix ions

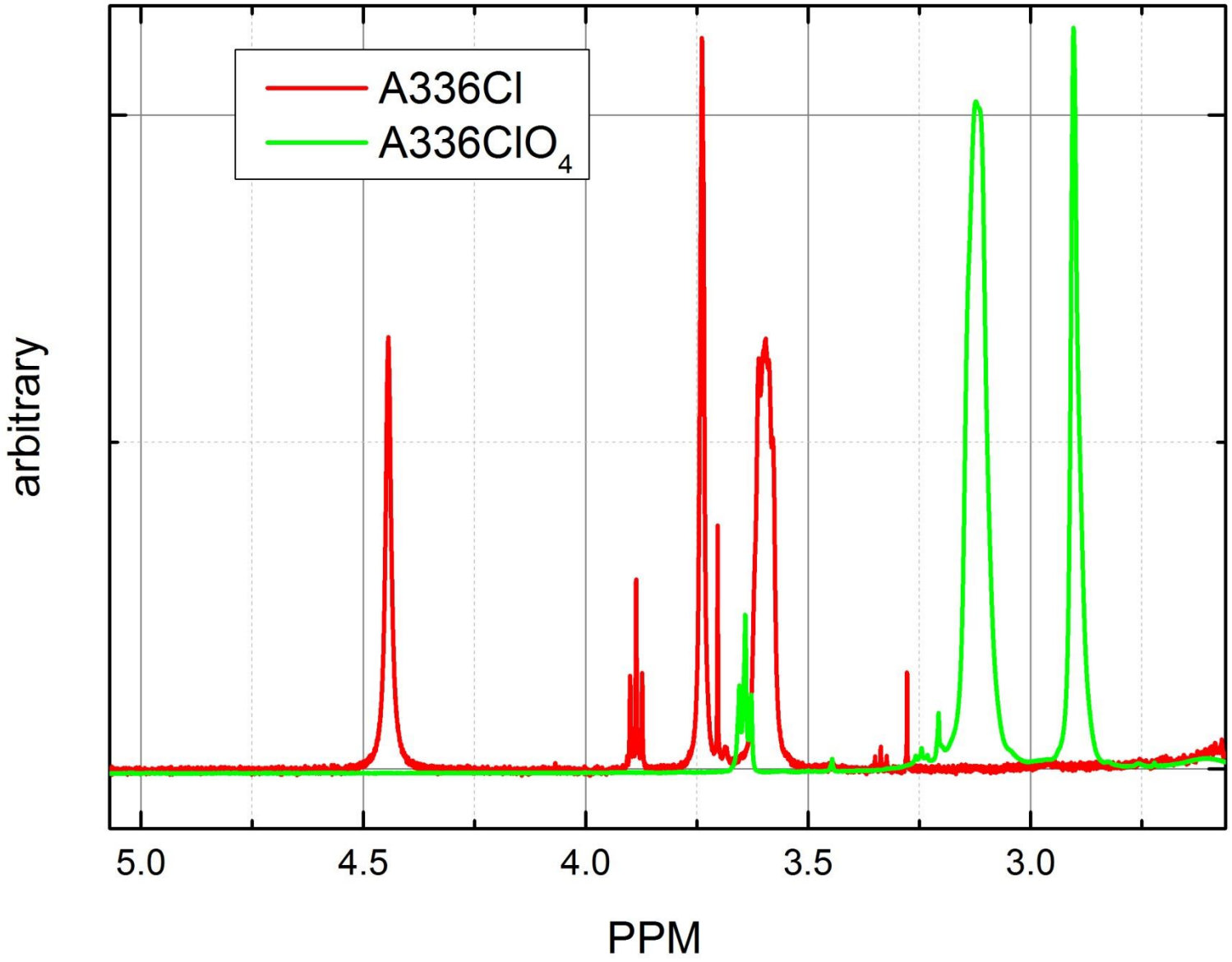


Some of the NMR active elements

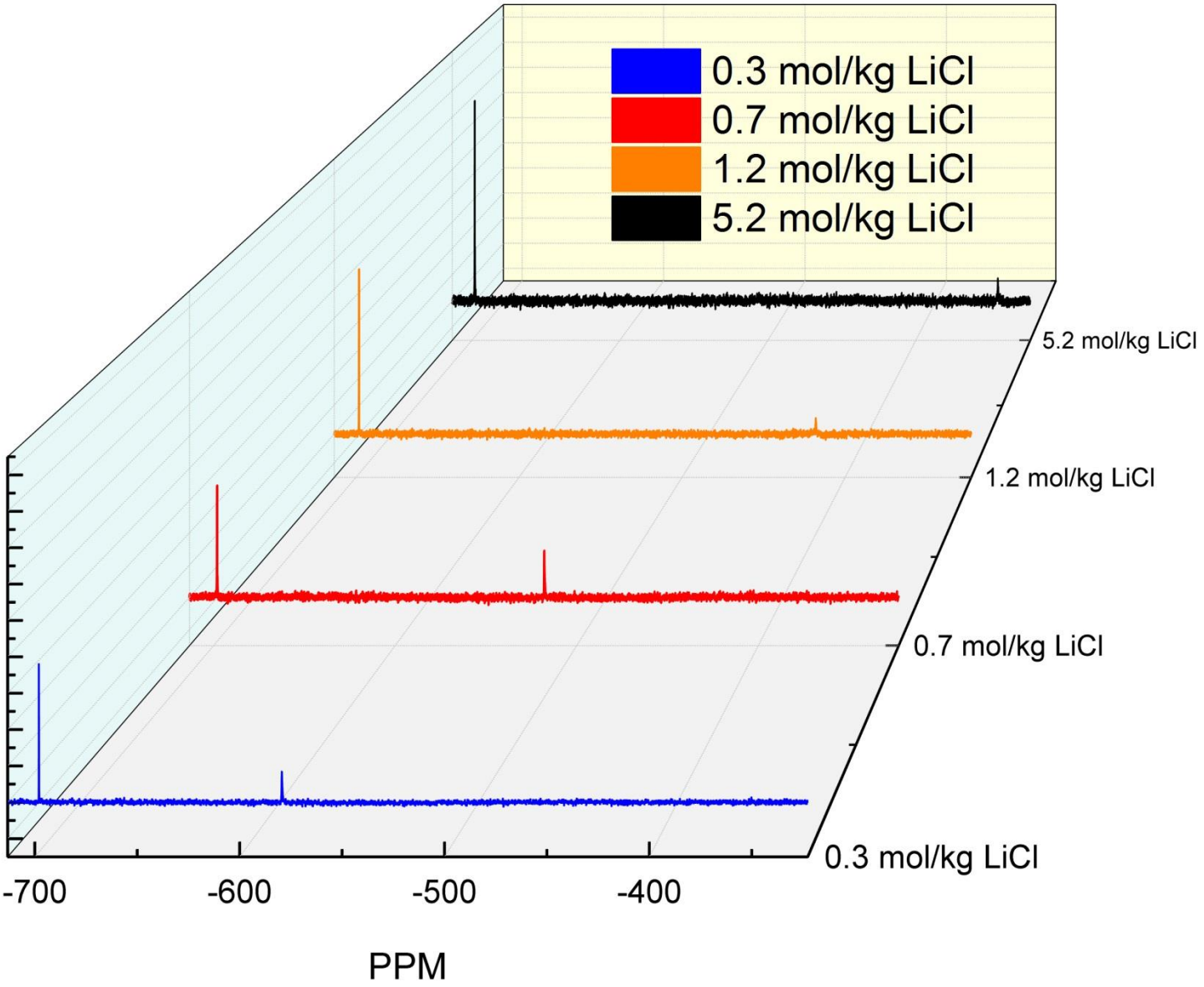


https://en.wikipedia.org/wiki/Periodic_table#/media/File:18-column_medium-long_periodic_table.png

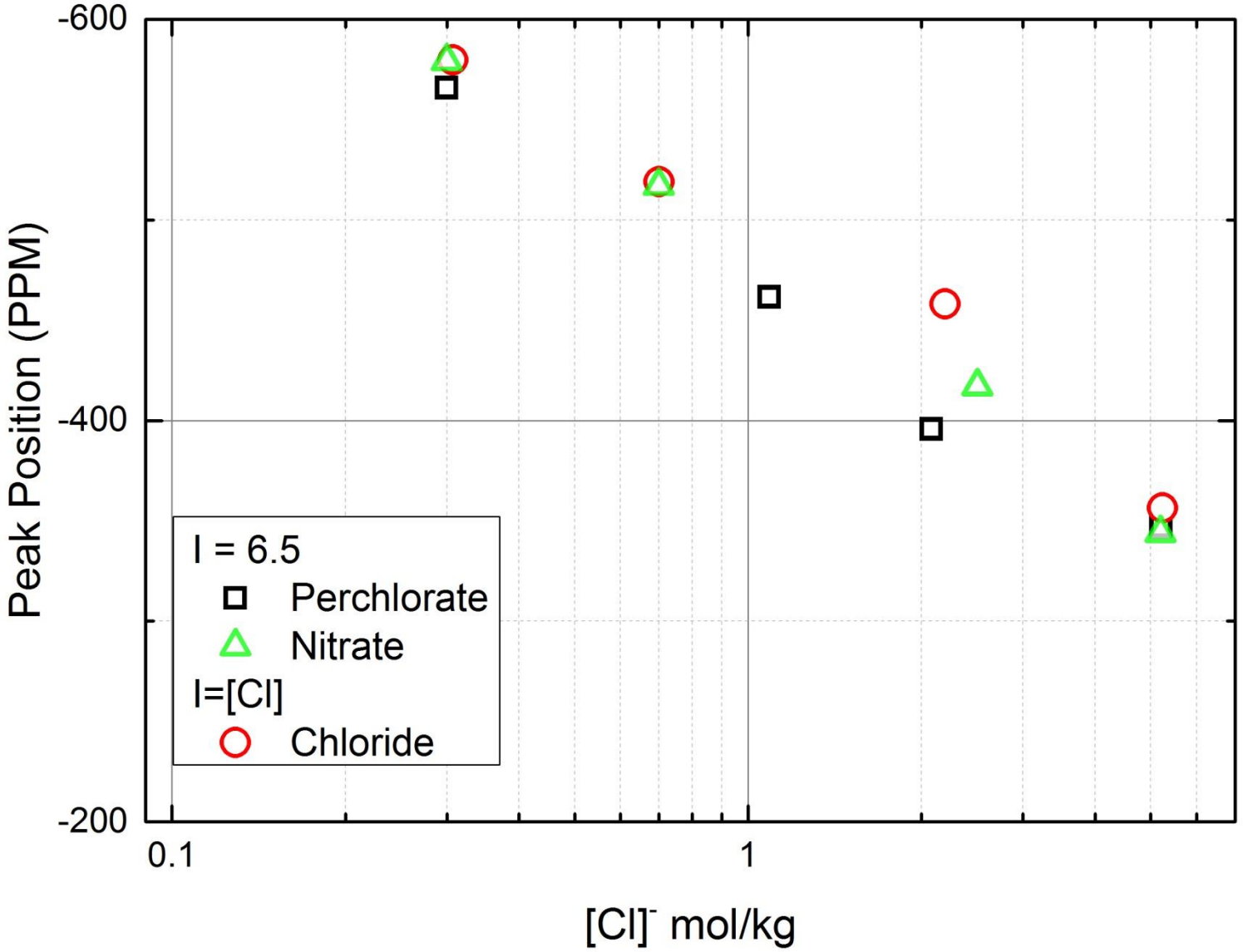
Combination of H-NMR with other nuclides gives much information



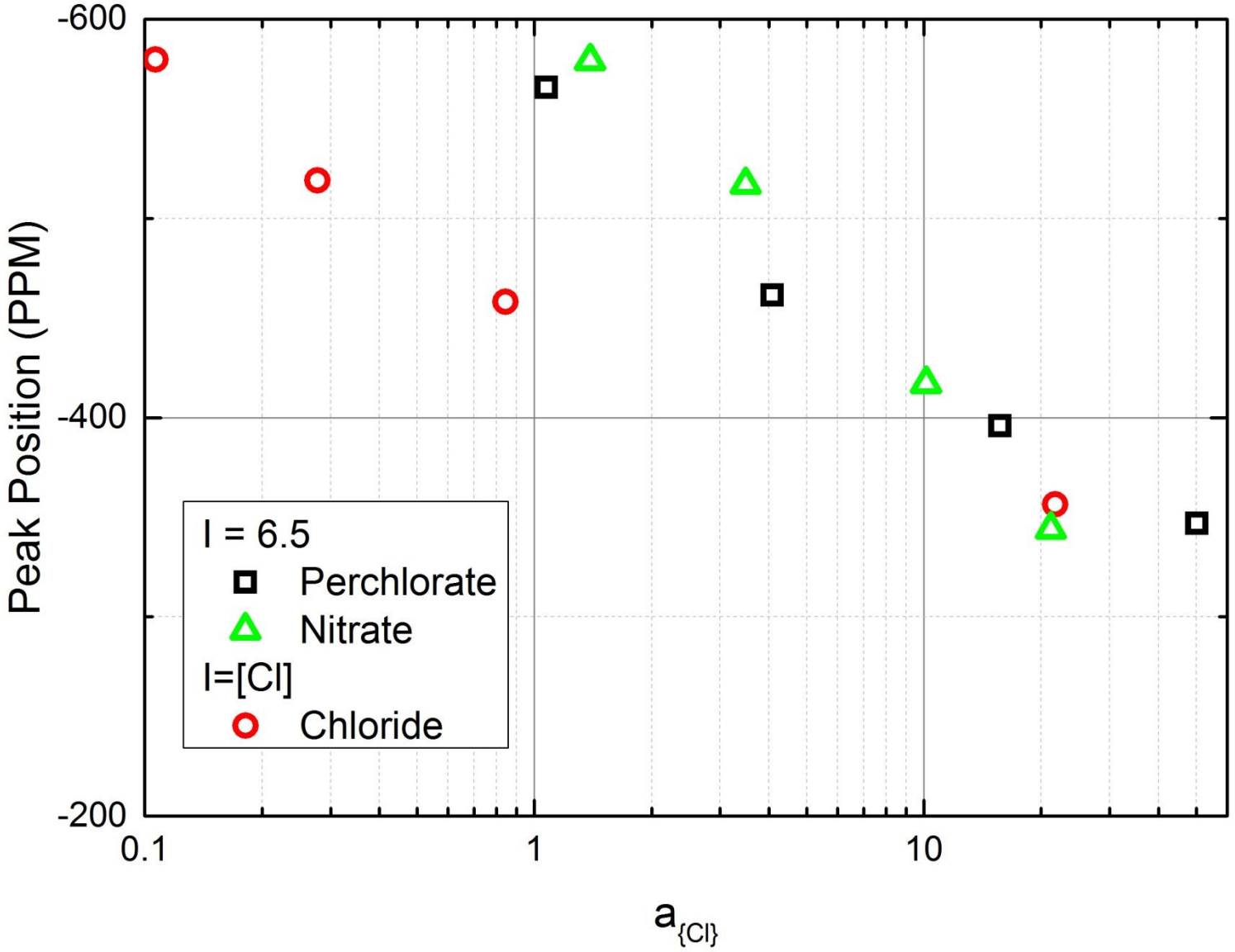
Chemical shift of Cd in aqueous media



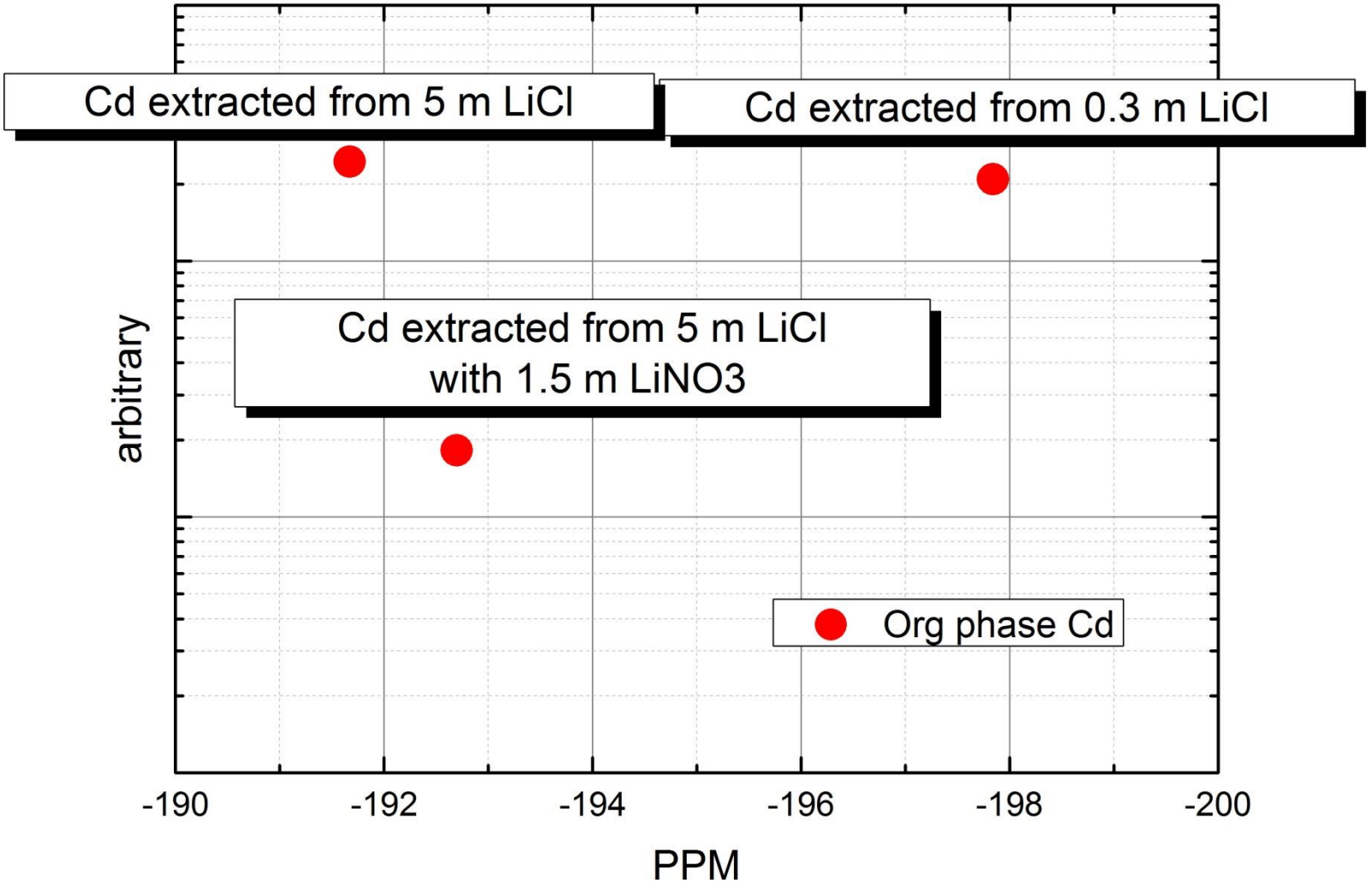
Chemical shift as a function of chloride concentration



Chemical shift as a function of chloride activity



Chemical shift of extracted specie depend on aqueous chloride concentration



Summary

- Speciation becomes difficult as several species are present at high concentrations
- Matrix ions can be traced by NMR and Raman spectroscopy

Thanks to

Jon Petter Omtvedt, Dag Øistein Eriksen, Eddy Walter Hansen, Grethe Wibetoe,Niels Højmark Andersen,Dirk Pettersen.

And the hydrometallurgy group