

Introduction

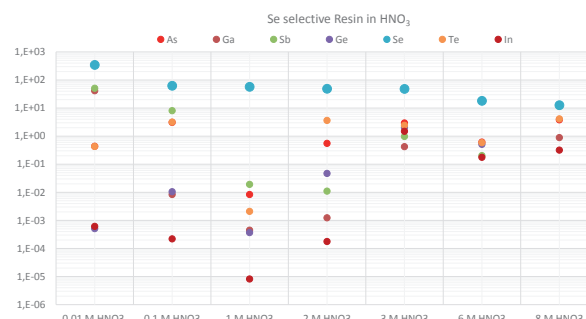
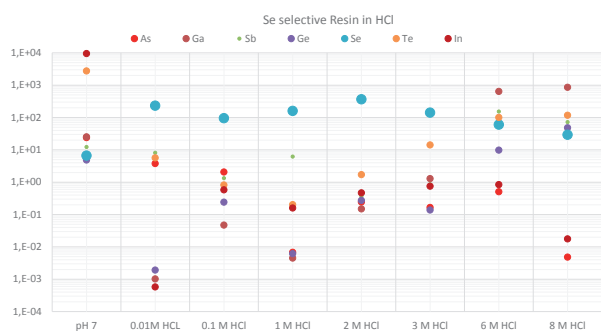
Measurement of Selenium is of importance regarding public health as the ratio between beneficial daily intake and toxicity is rather low [1], [2]. Also from the radiological perspective, Se-79 as a long-lived fission nuclide ($T_{1/2}=2.8 \times 10^5$ y) with high mobility in environment, is of concern regarding waste management and decommissioning [3], [4].

Selenium has a complex chemistry due to the existence of different oxidation states which makes separation schemes not straightforward. The aim of this research work is to develop a fast and easy separation method selective for Selenium. Extraction chromatographic resins have been tested and characterized for Se in presence of other metals. Elution studies were performed to optimize Se separation conditions.

Batch experiment

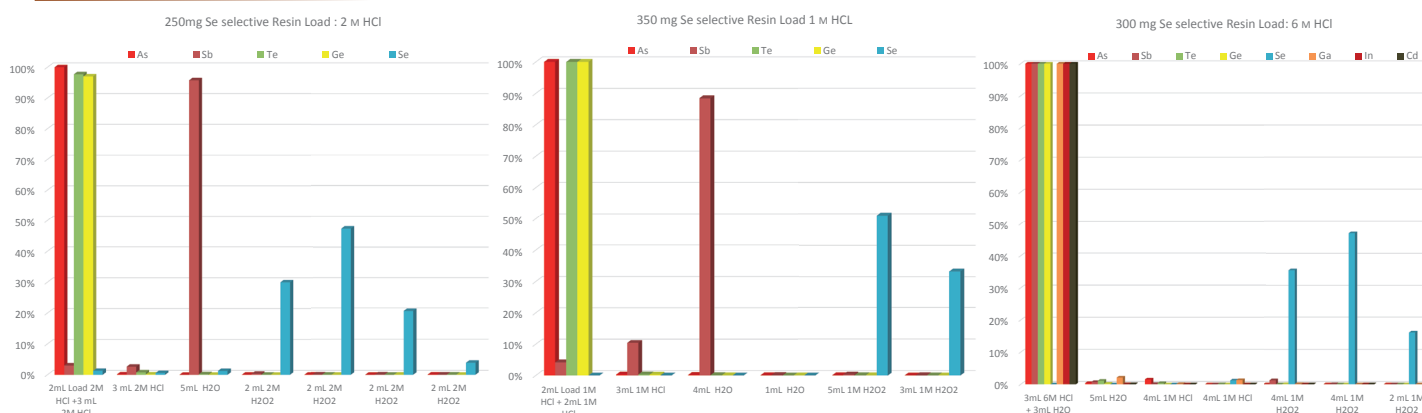
Several Prototypes were tested ; an amino compound in ionic liquid showed most promising results for the selective separation of Selenium

Se selective Resin: 50mg of prototype of Se selective resin in contact with 1 mL multielement solution (ME sol) for 1h – Measurement by ICP-MS



- High Se uptake between HCl 0.01 M and 8 M HCl
- In 2 M HCl D_w Se ≥ 360 , no selectivity for other elements ($D_w < 10$)

- Good Se uptake at 0.01 M HNO_3 (D_w Se ≥ 340).
- At same conditions, only Ga and Sb show a slight uptake ($D_w < 50$)



Good uptake for Se in 2 M HCl, 1 M HCl and 6 M HCl

- Load from 2 M HCl : 1-2% Se breakthrough during load and rinse when only 250 mg resin were used, Se recovery near 100% in 8 ml 2 M H_2O_2
- Load from 1 M HCl: no Se breakthrough during load and rinse when 350 mg resin were used; recovery of Se < 80% in 8 ml 1 M H_2O_2
- Load from 6 M HCl: no Se breakthrough during load and rinse when 300 mg resin were used; recovery of Se < 90% in 10 mL 1 M H_2O_2

- Loading under different conditions possible
- Se can be recovered in 8-12 mL 1 or 2 M H_2O_2

Conclusions

9 prototypes tested for D_w values of Se and various other elements. Presented resin best suited for Se extraction. D_w show predominant extraction of Se over other elements tested.

Elution studies performed.

Good separation and appropriate elution volumes. On-going work is being performed to optimize Se elution.

Bibliography

- [1] Cary L. et al. Applied Geochemistry 48 (2014) 70–82
- [2] Chen C. et al. Biological Trace Element Research Vols. 71-72 (1999) 131-138
- [3] http://www.irsn.fr/FR/Larecherche/publications-documentation/fiches-radionucleides/Documents/environnement/Selenium_Se79_v2.pdf last access 03/03/2016
- [4] Uchida et al. WM2009 Conference, March 1-5, 2009, Phoenix, AZ