1 Apparatus

1.1 Analytical balance- 0.0001 g sensitivity

1.2 Beaker (10 mL, 50 mL)

1.3 Watch glass

1.4 Vortex mixer

1.5 20 mL PE vials

1.6 Pipettes

1.7 Fume hood

1.8 Hotplate

1.9 Empty 2 mL columns incl. appropriate frits

1.10 Vacuum box or vacuum bottle with column adaptor

1.11 Vacuum box accessories: white and yellow tips, blue caps

1.12 Vacuum pump

Alternatively a positive pressure set-up (e.g. peristaltic pump based) might be used

2 Reagents

2.1 All references to water should be understood to mean deionized water (18 MΩ).

2.2 Hydrochloric acid (HCl), 37%, p.a.

2.3 0.01M HCl (pH >2) - Add ca. 900 mL of water in to a 1000 mL volumetric flask. Add 0.8 mL conc. hydrochloric acid. Complete with water. Adjust pH to 2.2 (+/- 0.1) with deionized water and or dilute HCl. This solution can be used for 1 year after its preparation.

2.4 8M HCl - Add ca. 300 mL of water in to a 1000 mL volumetric flask. Add 666 mL concentrated hydrochloric acid. Complete with water. This solution can be used for 1 year after its preparation.

2.5 Bulk CU resin

3 Procedure

3.1 Column preparation:

3.1.1 Weigh 0.35g of the resin into a 20 mL PE vial

3.1.2 Add 5 mL of 0.01M HCl (pH >2) solution and allow resin to soak for at least 30 min, preferably while shaking

3.1.3 Allow 2 mL standard column and frits to soak in water for at least 30 min

3.1.4 Place appropriately sized containers in vacuum box, place lid on top of box. Into each of the holes of the box tightly fit yellow tips, into these tightly fit white tips.

3.1.5 Empty soaked columns. Fix appropriate number of empty 2 mL standard column onto white tips, close remaining white tips with blue caps.

3.1.6 Transfer soaked resin into empty column and turn vacuum on. Allow liquid to pass the column, then turn vacuum off.

3.1.7 Add 4 mL of 0.01M HCl (pH >2) solution onto the column and turn vacuum on. Allow liquid to pass the column, turn vacuum off. Repeat until column is tightly packed and free of bubbles and channels (max. 5 times). Place frit on top of resin.

Note 1: The columns can run dry, but shouldn't stand dry for prolonged time (> 10 min). In case a column is not used immediately add another 4 mL of 0.01M HCl (pH >2) on top of the column, turn on vacuum and allow approx 2 mL of the solution to pass. Turn off vacuum and close lower and upper end of column (e.g. with ParaFilm). The so prepared column might be stored for several days (preferably at room temperature and in the dark).

3.1.8 Preconditioning of the column.

A freshly prepared column can be considered as preconditioned. In case a column has been stored for prolonged time it is preferable to precondition the column anew. To do so place column on prepared vacuum box, turn on vacuum and allow solution contained in the column to pass the column. Add 4 mL of fresh 0.01M HCl (pH >2) and allow to pass.

Note 2: The column rinsing can be done at a flow rate of up to 3 mL/min

3.2 Loading solution preparation:

3.2.1 Dissolve irradiated target.

Note 3: For Ni targets you might use the following method: Place irradiated Ni foil into an appropriate container and place container on hotplate. Add 1 mL 6M HCl per 100 mg of Ni foil and cover container with watch glass. Heat solution while stirring. Add H_2O_2 drop wise until target is dissolved (approx. 0.7 mL H_2O_2 (30%) per 100 mg Ni foil, depending on thickness of the foil).

3.2.2 Evaporate obtained solution to dryness. Rinse beaker and watch glass with water and re-evaporate. Dissolve residue in 1 mL of 0.01M HCl (pH >2) solution.

3.3 CU separation:

3.3.1 Place appropriately sized and labeled container below the columns.

3.3.2 Transfer solution onto prepared CU resin column.

3.3.3 Rinse container with 1 mL 0.01M HCl (pH >2) solution, transfer solution onto the same CU resin column.

3.3.4 Turn on vacuum, adjust flow rate to ≤ 1 mL/min and allow solution to pass column.

3.3.5 Add 5 mL of 0.01M HCl (pH >2) solution onto the column and adjust flow rate to ≤ 6 mL/min. Allow solution to pass.

Note 4: The container contains approx. 100% of the target material at this stage and might be removed for Ni recovery and replaced by a fresh container.

3.3.6 Add 3 mL of 0.01M HCl (pH >2) solution onto the column and allow solution to pass at a flow rate of ≤ 6 mL/min. Turn off vacuum.

3.3.7 Place fresh, labeled, appropriately sized container below column.

3.3.8 To elute the Cu-64 add 1 – 1.5 mL of 8M HCl onto the column. Turn on vacuum, adjust flow rate to 1mL/min. Allow solution to pass.

Note 5: In some cases the Cu eluate might be too acidic for direct use, in this case it might need to be converted to lower acid concentration or neutral media this can either be done via an evaporation/redissolution step or via an anion exchange step as described in 3.4.

3.4 Optional: Cu eluate conversion via anion exchange

3.4.1 Per Cu eluate to be converted weigh 400 mg anion exchange resin into a 20 mL PE vial.

3.4.2 Add 5 mL of 0.1M HCl and allow resin to soak min. 30 min.

3.4.3 For each Cu eluate to be converted place one empty 2 mL column in an appropriate rack. Allow column to soak in water for at least 30 min.

3.4.4 Transfer soaked resin into emptied soaked column and allow the resin to settle. Place container below column and break lower tip. Allow solution to pass column.

3.4.5 Subsequently rinse column with 2mL 2M HCl, then 2 mL 4M and at last 2 mL 8M HCl. The column is conditioned and ready for use. Place fresh container below the column.

3.4.6 Carefully transfer the Cu eluate on top of the AIX column without perturbing the resin bed. Allow solution to pass through the resin at gravitational flow.

Note 6: The separation might also be performed using vacuum or positive pressure set-ups, flow rates should be kept below 1 mL/min anyhow.

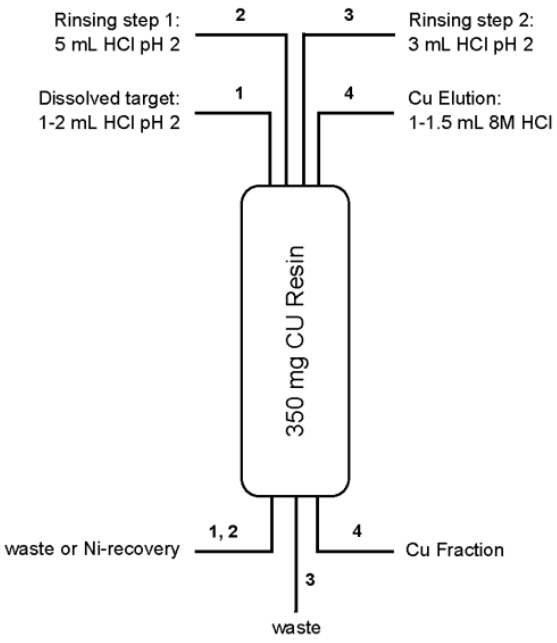
3.4.7 Rinse container that contained the Cu eluate with 0.6 mL 8M HCl, transfer rinsing solution onto column. Allow solution to pass through the resin at gravitational flow.

3.4.8 Rinse resin with max. 0.2 mL deionised water. Allow solution to pass through the resin at gravitational flow. Place fresh, labeled, appropriately sized container below column.

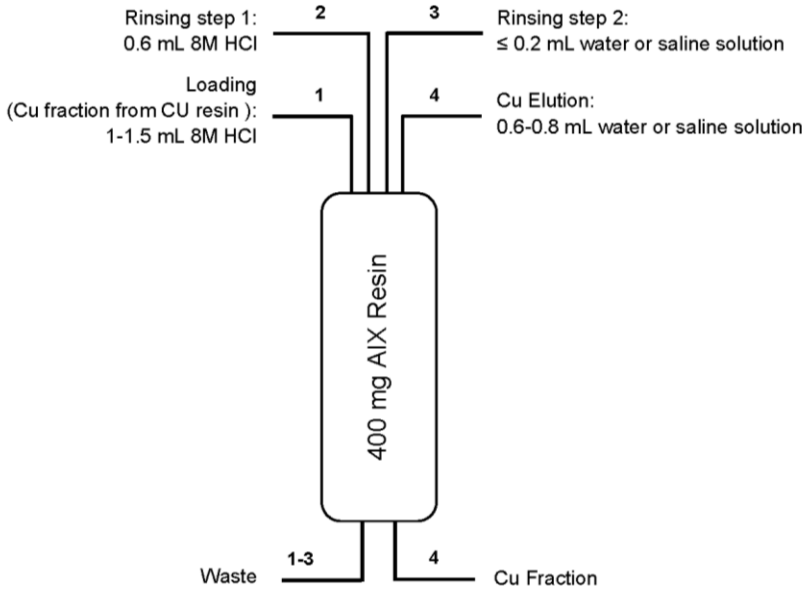
3.4.9 Elute Cu using 0.6 – 0.8 mL of deionised water or saline solution.

3.5 Synopsis of the separations

3.5.1 Cu separation on CU resin



3.5.2 Cu eluate conversion on AIX resin



4 References

(1) C. Dirks, B. Scholten, S. Happel, A. Zulauf, A. Bombard, H. Jungclas: Characterisation of a Cu selective resin and its application to the production of 64Cu. Accepted manuscript, J Radioanal. Nucl. Chem, DOI 10.1007/s10967-010-0744-9, (2010) Eichrom Referenz: T-DC110.

(2) C. Dirks, S. Happel: Characterization of a Cu selective resin and its application to the production of Cu-64. Presentation at the TrisKem International users group meeting, 14/09/2010, Chester (UK); available online: http://www.triskem-international.com/iso_album/ugm_chester_10_dirks_happel_cu_resin.pdf