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F L N R
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A NEW APPROACH TO INVESTIGATE THE CHEMICAL PROPERTIES OF DUBNIUM

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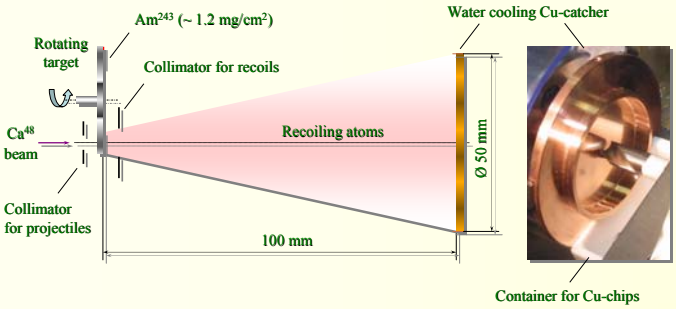
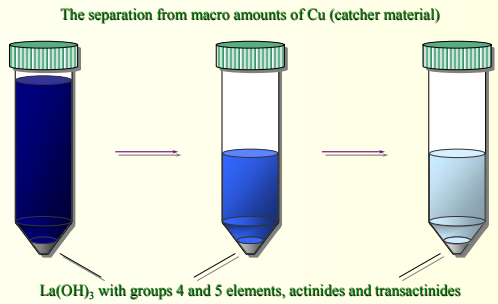
Objective

The aim of the present work is to propose a procedure for the off-line investigation of **dubnium** chemical properties using its **long-lived isotopes.**

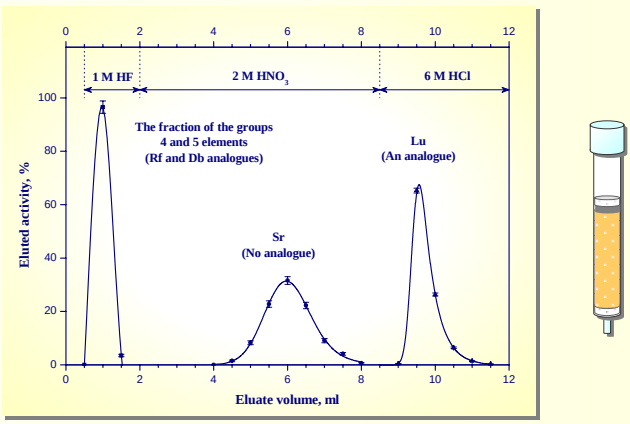
- The collection of recoil nuclei produced in the $^{243}Am(^{48}Ca, xn)^{291-xn}115 \xrightarrow{5\alpha}$ reactions will be performed by means of a copper catcher. It is necessary to cut a 7–10 μm layer (corresponding to 120 – 180 mg of Cu) from a catcher surface using a micro-lathe. Then the copper chips should be dissolved in concentrated HNO_3.



- The groups 4 and 5 elements are co-precipitated with **$La(OH)_3$** from the nitric acid by addition of concentrated aqueous ammonia solution. Under these conditions, copper and most part of the **group 6 – 14 elements remain in solution** as complexes. This procedure to be repeated two times to increase the separation efficiency.

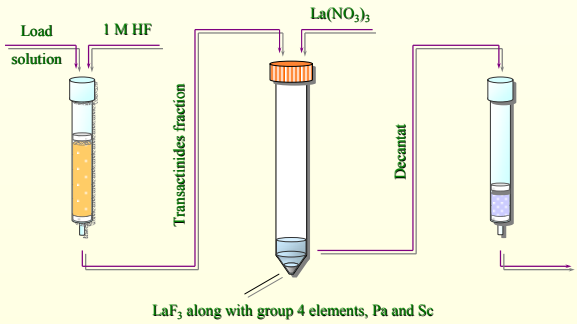


- The **cation exchange** column is used for separation of the transactinide fraction from actinides (spattering and transfer reactions products). The groups 4 and 5 fraction is eluted with 1 M HF in volume of about 1 ml. Lanthanum and heavy actinides are retained on the top of the column.

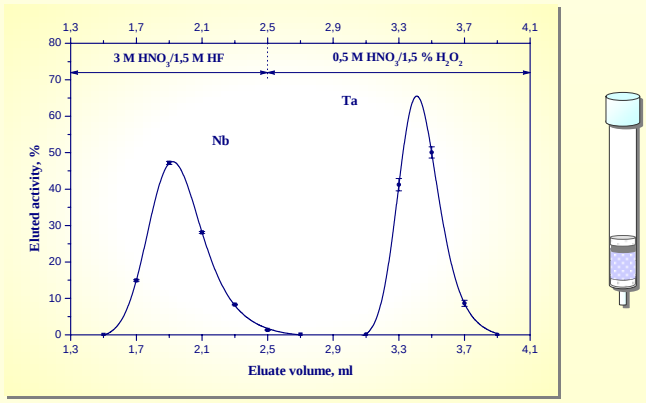


Separation of groups 4 and 5 elements from actinides analogues by cation exchange (Dowex 50 x 8, 100 - 200 mesh, 6 x 30 mm).

- The next step consists of **co-precipitation** of the group 4 elements along with Pa and Sc **with LaF_3**. Lanthanum carrier is added again into the effluent solution which contains HF. The **anion fluoride complexes of Nb and Ta** remain in solution. The separation coefficient was estimated at a level of 10^2.



- For separation of the group 5 elements on an **anion exchange** column the decantation solution from previous step is used as a load solution. Then Nb and Ta are eluted separately with mineral acids (HNO_3, HF) mixtures. Such procedure allows also to separate group 5 elements from cations of alkaline and alkali-earth metals and improves the quality of sources for α and spontaneous fission measurements.



Separation of Nb and Ta by anion exchange (Dowex 1 x 8, 200 - 400 mesh, 6 x 10 mm).

The final step includes the **preparation of a source** for activity measurements in 4π geometry. It may be produced by evaporation with a hot He-stream. To shorten the total procedure time we plan to use an ultrafiltration method or an ion selective membrane filtration.

Conclusion

A new approach to investigate the chemical properties of dubnium is proposed. All steps of a procedure are discussed. They include the collection of recoil nuclei on a copper catcher surface and the preparation of solution with transactinides and tracers. Then the separation of transactinides fraction from macro amounts of catcher material and actinides follows. After this the separation of Nb and Ta from group 4 elements along with Pa and Sc is needed. Finally the anion exchange separation of Nb and Ta from previous step and the preparation a source for α and SF measurements is applied.