Benefits of sample preparation via Electro Plating vs Micro-Precipitation For Alpha Spectroscopy

The preparation of alpha spectroscopy samples via Electro-Plating is a long standing technique with well established ability to produce samples which provide superior counting results . In spite of this, many facilities have replaced Electro-Plating methods in recent years with rare earth co- precipitation methods. A frequent but often unmentioned contributing factor to this change has been the unavailability of a commercial electro-plate apparatus. This forced users to confront the task of having to design and build their own apparatus. Another factor is the belief that the co-precipitation methods are faster and therefore less expensive for a commercial laboratory.

The frequent objection is that the 60-75minute plating time is "Too Slow". When determining the labor and time required for the entire sample preparation process the plating time should be considered relative to the steps that are avoided. These include: preparing the reagents, building the substrate on the filter prior to loading the actual sample, the individual sample labor to pull down the sample on the prepared substrate, and the drying time required to protect the detectors from being exposed to residual HF acid. When the electro plate apparatus is sized according to the lab's chemistry batch size the samples are plating in parallel with relatively minimal set up labor.

Phoenix is building and selling a traditional electro-plating apparatus in 4, 6, 8, and 12 wide models depending on the capacity needs of the specific customers. The plating cell is a typical 20ml LSC vial that is inverted with its bottom cut out and an open center screw on cap is used to hold the planchet in place, seal the cell, and provide electrical contact from the bottom. The other electrode is a platinum wire electrode coming from the top. The resulting 3/4 inch planchet with a ~5/8" sample spot is compatible with all the spectroscopy system manufactures, i.e. Ortec, CI, Tennelec, and Eurisys

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Electro Plate technique benefits include:

Resolution is detector limited to ~15 kev* vs 35-50kev for a well prepared precipitated sample on the same detector. Operator skill is critical with precipitated samples and results can often end up at 60-80kev.
*(~20kev for low specific activity analytes with significant analyte mass)

Improved resolution lets you set narrower ROIs for the analysis and thus improve the background counts per hour and improve your MDAs.

Improved resolution allows complex isotope peaks to be resolved i.e. U233/234 and U235/236 or multiple isotopes to be counted as a single sample i.e. U and Pu saving separation and count time.

There is no HF acid in the late stages of the process that can (and often does) destroy the detector if the sample is not dried perfectly prior to counting. Some samples can avoid HF entirely with Electro-Plating.

These samples are much more durable for long term storage and less inclined to contaminate the detector or the inside of the chamber during counting. Durability is important if samples require storage to allow for ingrowth of a daughter i.e Am-241 from parent Pu-241 for Pu-241 determination.

It is easy to re-dissolve the sample for further chemical separation or clean up.

More uniform distribution of the analyte over the planchet for better geometry control.

It is compatible with the popular extraction techniques now often used in early stages of sample preparation such as Eichrom columns.

Reduced use of expensive consumables i.e. filters, rare earth reagents, and glass frits.

Phoenix Apparatus Benefits include:

The samples prepared on the Phoenix apparatus are equally suited to CI, Ortec, Silena or Eurisys counters (3/4" planchet with ~5/8 sample spot)

Each cell's current is individually adjustable and easily monitored with independent large face analog current meters mounted in front of each cell.

This system uses standard low cost consumables (20ml LSC vials and caps, and long lived platinum electrodes that are simple formed wire)

The system is physically large enough to work with while wearing protective clothing making it suitable for production oriented users.

The parallel electrical configuration allows you to start and stop cells independently. A problem in an individual cell does not effect the results in the others

The unit is available with either 110 or 220-240V supplies that are 50 or 60Hz (or without any power supply)

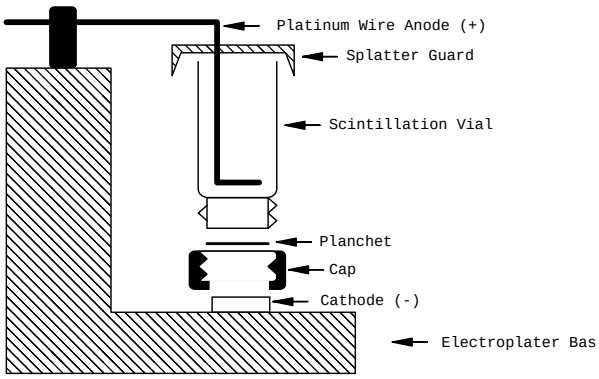

Figure 1. Disposable electro-deposition cell and support.

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