

**Сравнительный анализ двух методов
определения стронция-90 в природных и
техногенно загрязненных водах**

**Two methods of determination of Sr-90 in
natural waters and liquid wastes**

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Aim of the work

- Development of fast and robust method of determination of Sr-90 in small volumes (about 1 L) water samples.
- Limit of detection should be less than 1 Bq/mL

Technique based on sedimentation

- Evaporation of sample to 20 mL
- Addition of 20 mg Y tracer
- Precipitation of Y, REE, An, Co-60 etc. by ammonia
- Decantation, acidification, addition of 20 mg Y tracer
- Ingrowth of Y-90
- Precipitation of Y and Y-90
- Dissolution in 20 mL of 1 M nitric acid
- Cherenkov counting

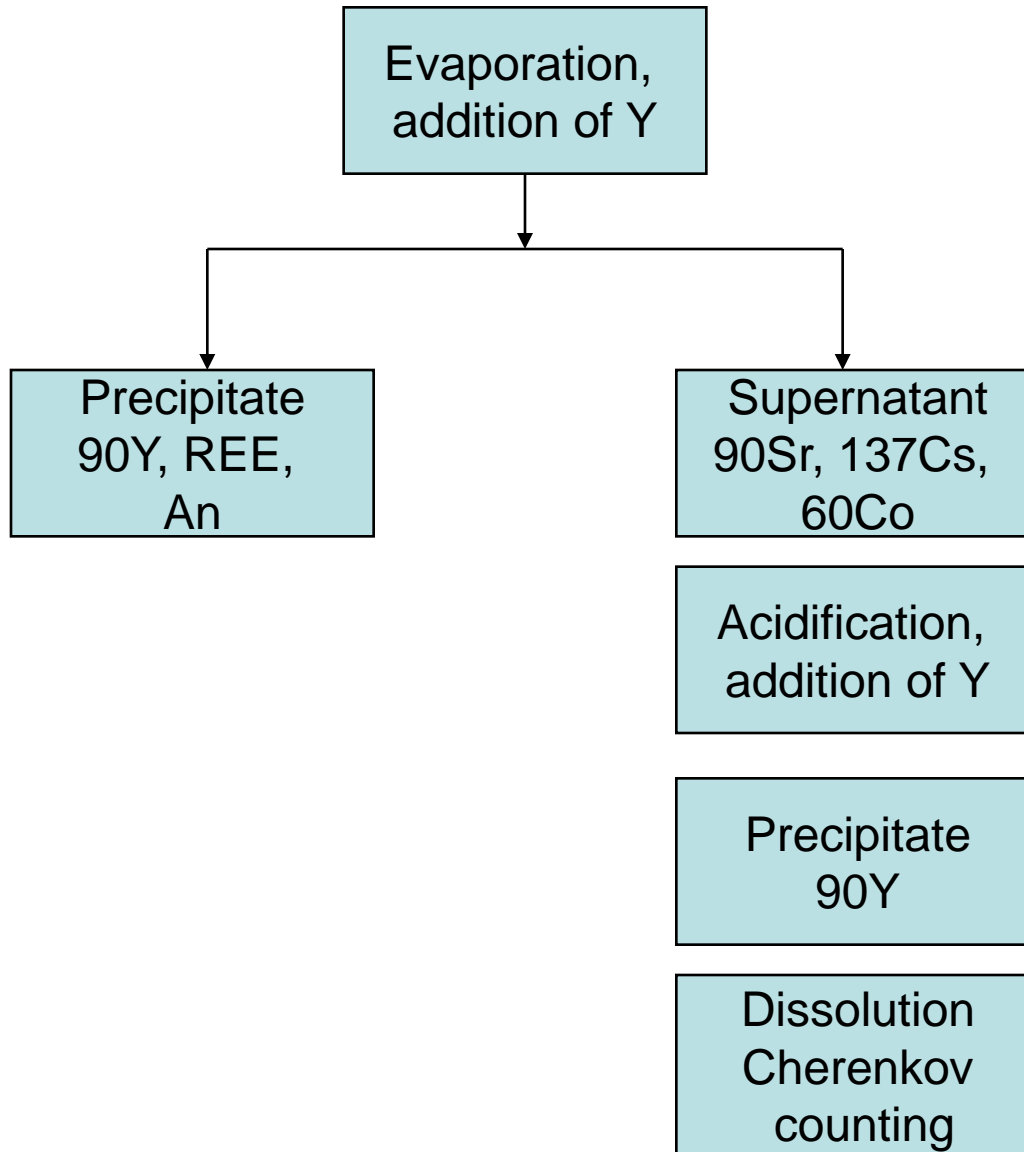
Advantages of method

- Simple
- Low cost

Disadvantages

- Poor separation from other beta emitting nuclides (Cs-137, Co-60)
- Time-consuming
- Tracers of chemical yield can not be used

Flow-chart



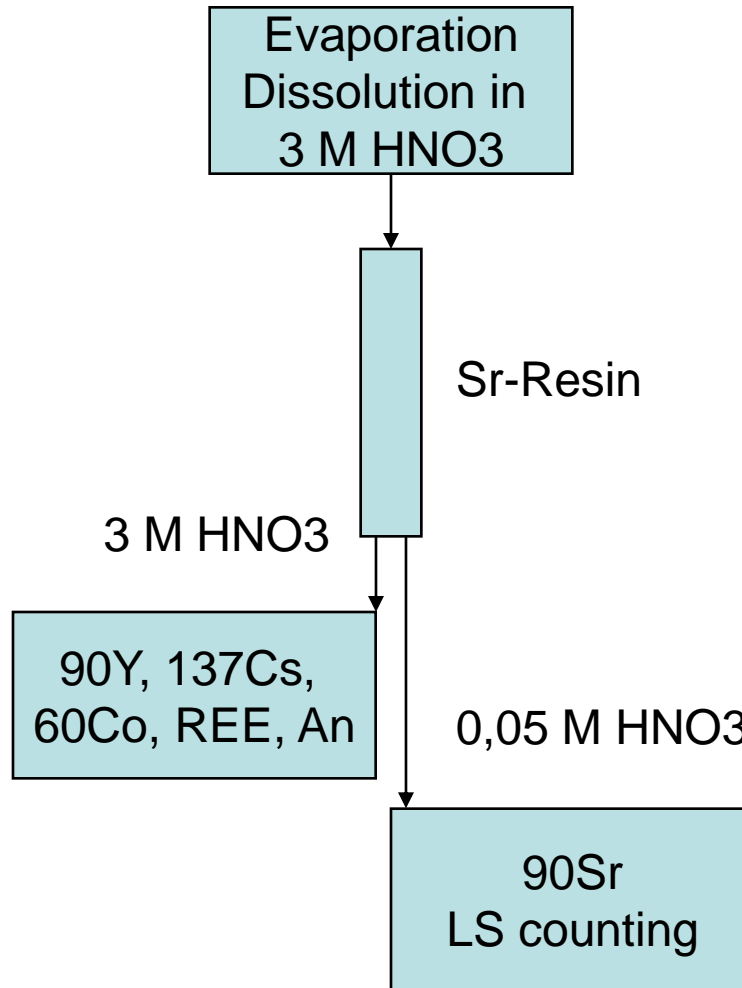
About 1 week!

Ingrowth of ^{90}Y

Technique based on extraction chromatography

- Evaporation of sample near dryness
- Dissolution in few mL of 3 M nitric acid
- Passing through Sr-Resin column ($V=1,5 - 2$ mL)
- Washing the column by 10 volumes of 3 M nitric acid
- Stripping of ^{90}Sr by 0,05 M nitric acid
- Addition of scintillation cocktail

Flow-chart



Two hours!

Advantages of method

- Fast
- Robust
- Excellent chemical separation
- Possible to apply chemical yield tracer

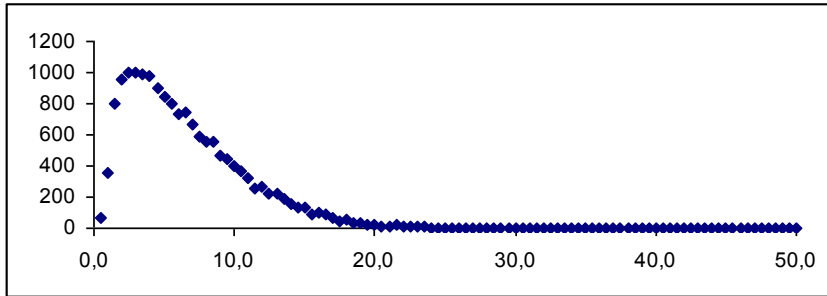
Disadvantages

- Expensive

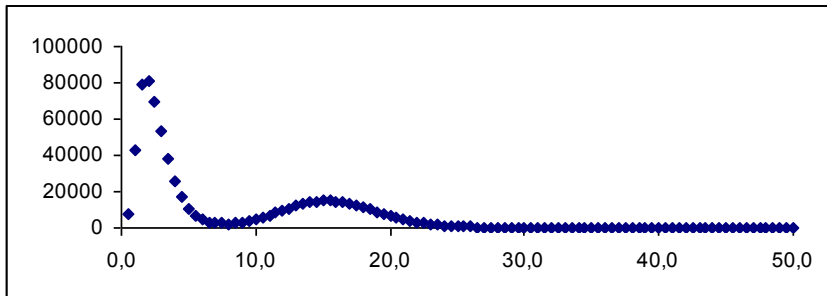
Chemical yield

- Both methods are validated using ^{85}Sr gamma emitter
- ^{85}Sr was produced in MSU cyclotron by the reaction $\text{natRb}(d,xn)^{85}\text{Sr}$ and separated by Sr Resin
- ^{85}Sr may be used as a tracer in routine analysis but it will increase detection limit

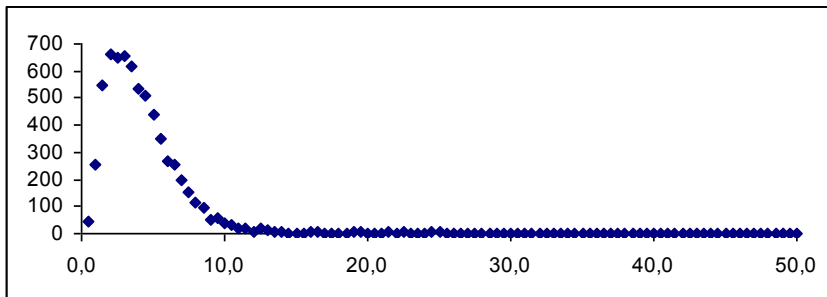
Cherenkov spectra



Sr – Y
Efficiency 54%



Cs-137
Efficiency 11%

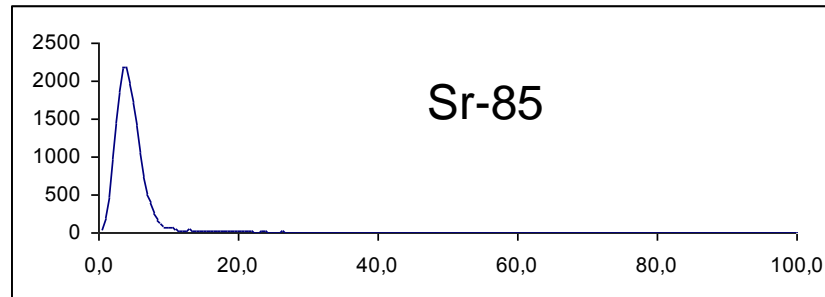
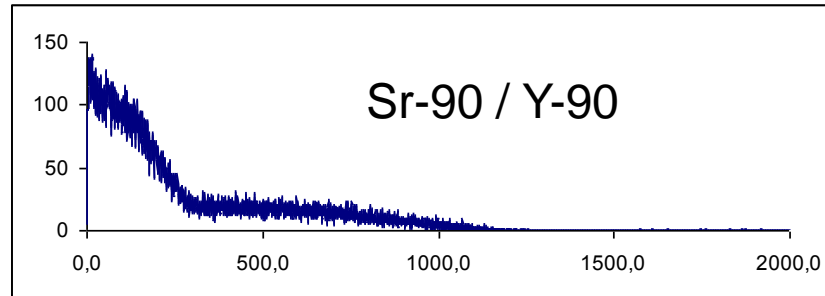


Co-60
Efficiency 2,5%

Should be studied

- Influence of stable Sr in the sample, because water may content up to tens of mg of Sr per liter

LS spectra



Summary

- The method of determination of Sr-90 using Sr-Resin is more selective and