



Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

Determination of ^{90}Sr and ^{89}Sr in water and urine samples by chemical separation and Cherenkov counting with LSC system

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Radiostrontium features

Strontium-90 and -89

- Origin: fission product.
- Intake: ingestion (for example by water) and inhalation
- Control analyses:
 - before internal contamination: on food (water)
 - after internal contamination: on excreta (urine)
- Differences between two types of radiostrontium:
 - ^{90}Sr : long-lived radioisotope ($t_{1/2} = 28.80$ years)
 - ^{89}Sr : short-lived radioisotope ($t_{1/2} = 50.57$ days)

Aim in developing a radioanalytical method

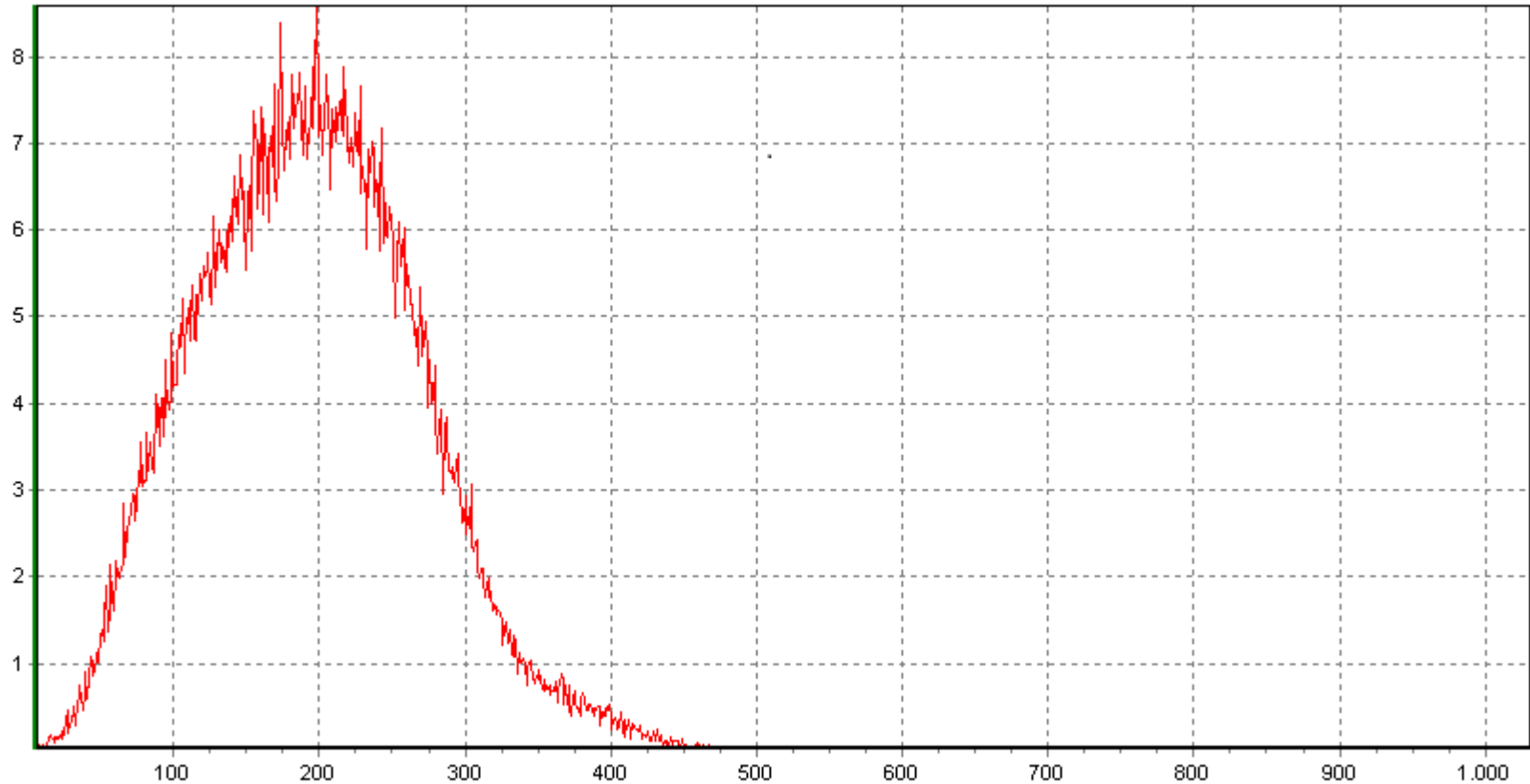
- Precise and accurate
- Suitable for routine analyses
- Chemical separation needing few modifications for different matrices
- Valid for using an external standard for chemical yield (no need of other supplementary techniques): a sample aliquot is marked by a high activity of a certified solution of ^{90}Sr

Chemical treatment

- Mineralization with conc. HNO_3
- Precipitation of phosphates at $\text{pH}=8.5-9.0$
- Isolation of precipitate by centrifugation
- Mineralization of precipitate with conc. HNO_3 and H_2O_2
- Dissolution in 8M HNO_3 for elution

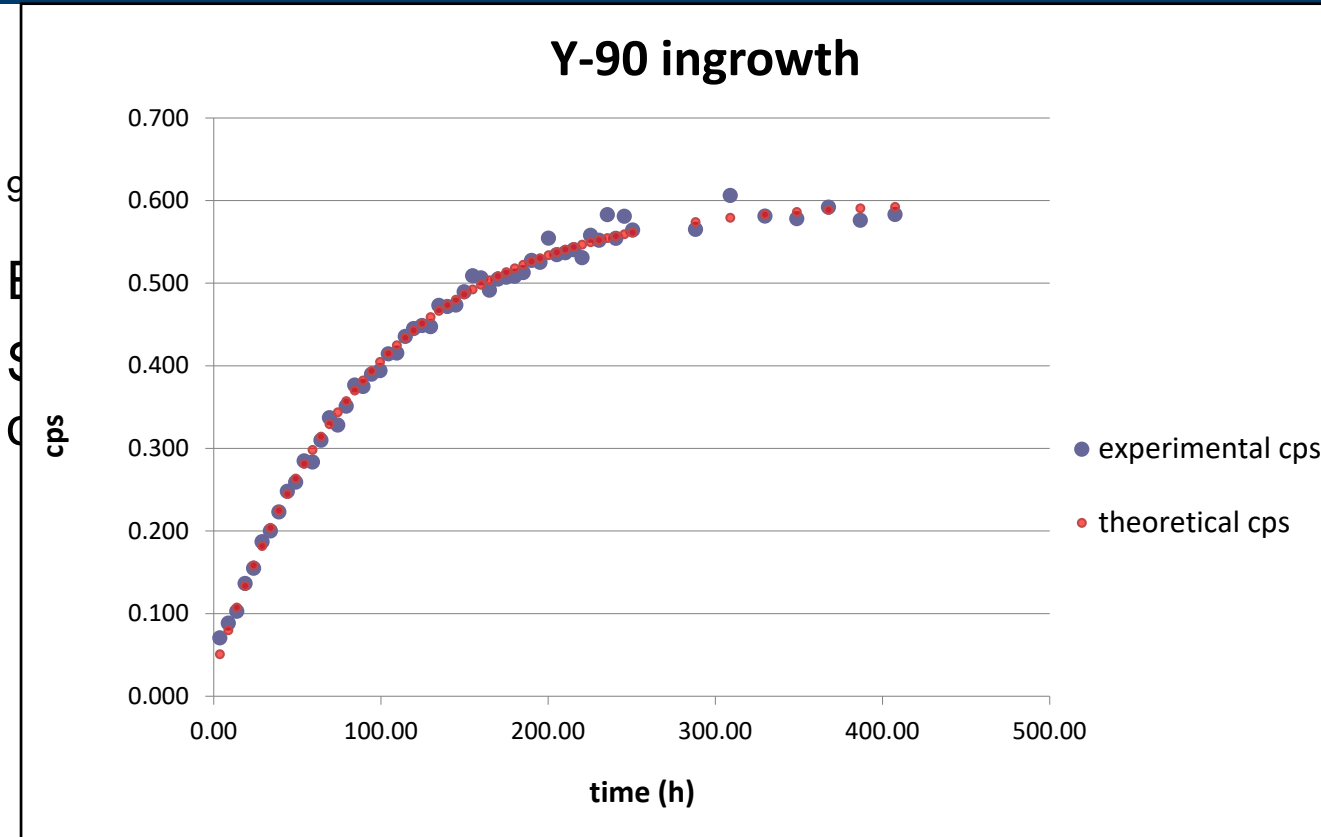
Chromatographic elution

Y-90 LSC spectrum



^{90}Y ingrowth

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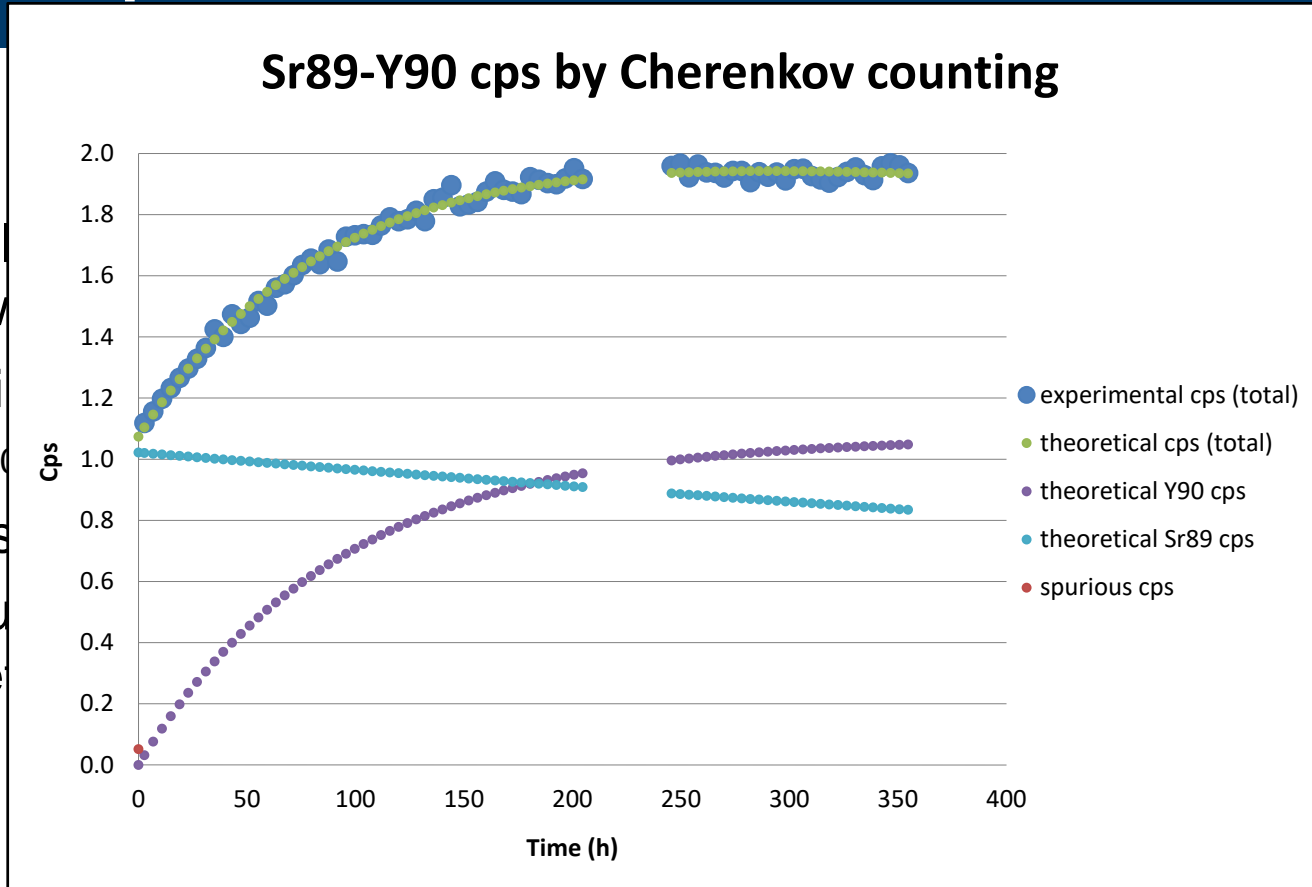


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$\text{Sr}/^{90}\text{Y}$ (A),

In case of presence of ^{89}Sr

- Difficult ingrowth
- Experimental
- After 90 Sr Res
- Measurement theoretical



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Conclusions

ALMERA Sample	⁹⁰ Sr			⁸⁹ Sr		
	Target	Rep. value	Rel. bias	Target	Rep. value	Rel. bias
2016	[Bq·L ⁻¹]	[Bq·L ⁻¹]	%	[Bq·L ⁻¹]	[Bq·L ⁻¹]	%
1	14.07±0.5	14.51±0.65	-1.29	-	-	-
2	20.5±0.5	19.02±0.83	-7.22	373±15	394±20	+5.63

ALMERA (101 water samples)

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PROCORAD Sample	⁹⁰ Sr		
	Ass. value	Rep. value	Rel. bias
2013	[Bq·L ⁻¹]	[Bq·L ⁻¹]	%
A	5.08±0.16	4.97±0.36	-2.2
C	1.09±0.05	1.12±0.11	+2.7
2015	[Bq·L ⁻¹]	[Bq·L ⁻¹]	%
A	2.38±0.12	2.04±0.36	-14
C	5.38±0.27	5.05±0.79	-6
2016	[Bq·L ⁻¹]	[Bq·L ⁻¹]	%
A	2.70±0.14	2.71±0.30	0
C	5.14±0.70	5.24±0.54	+2

*Thank
you*



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