

PNNL R&D Activities Related to ^{212}Pb Generator Preparation

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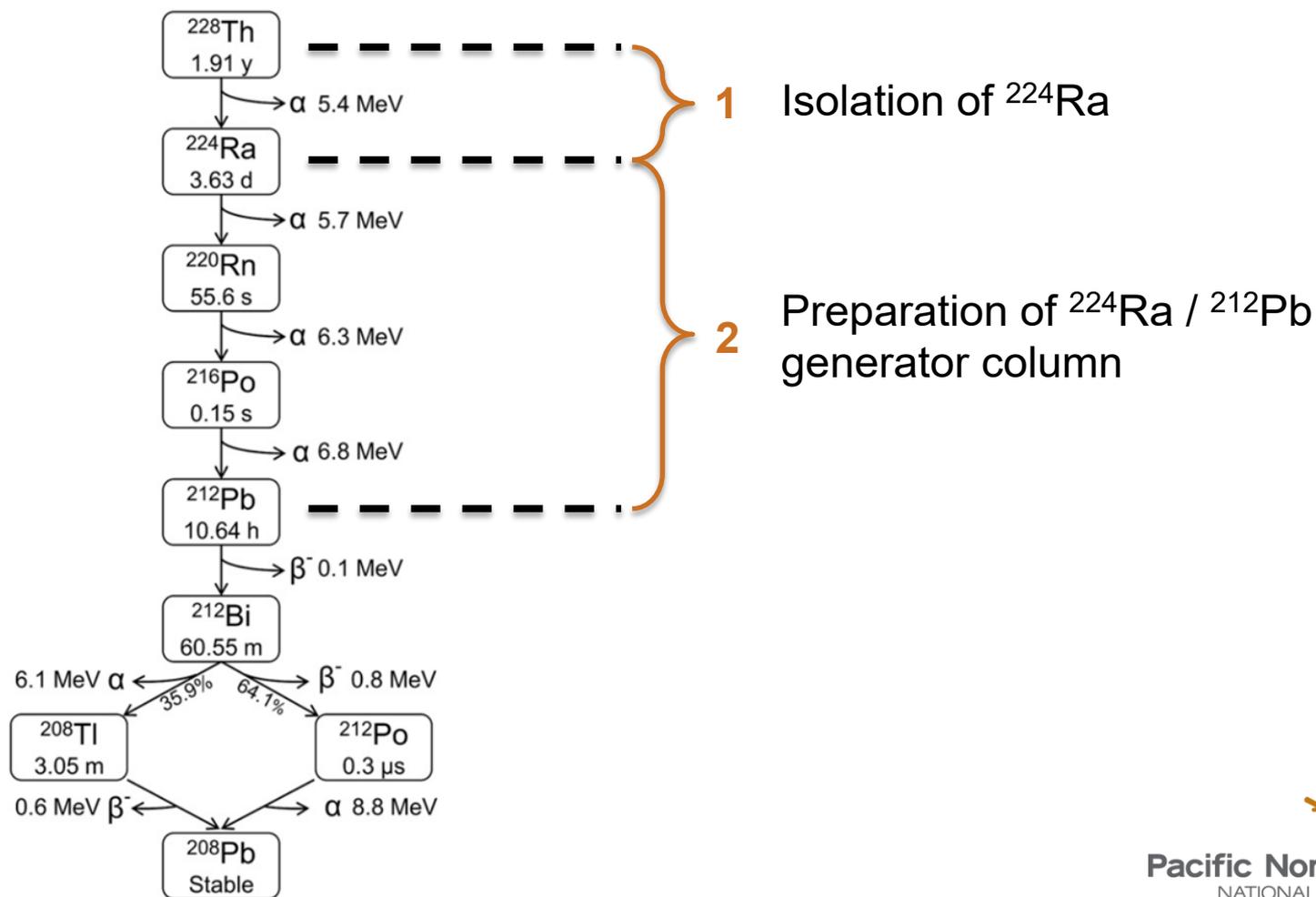
*^{212}Pb Users Meeting
2019 SNMMI Conference
Anaheim, CA
June 23, 2019*



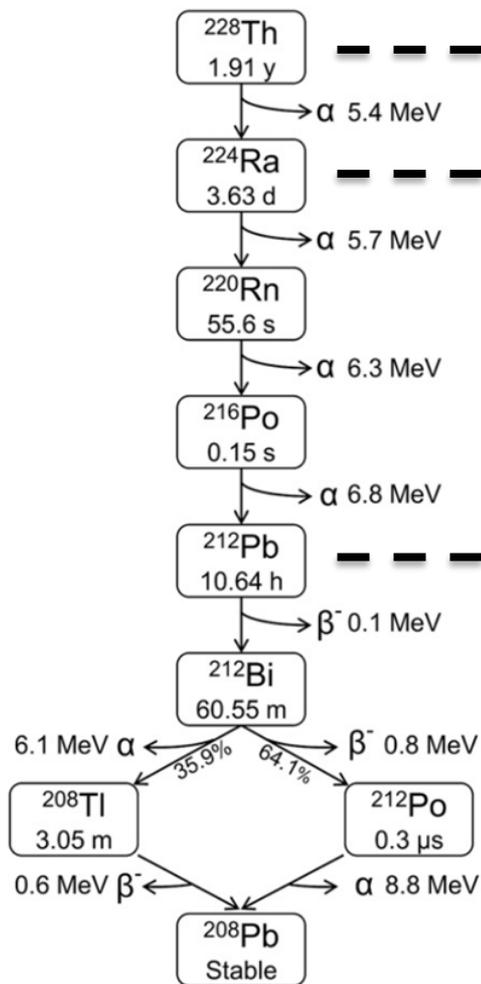
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Two Stages to Preparation of $^{224}\text{Ra}/^{212}\text{Pb}$ generator



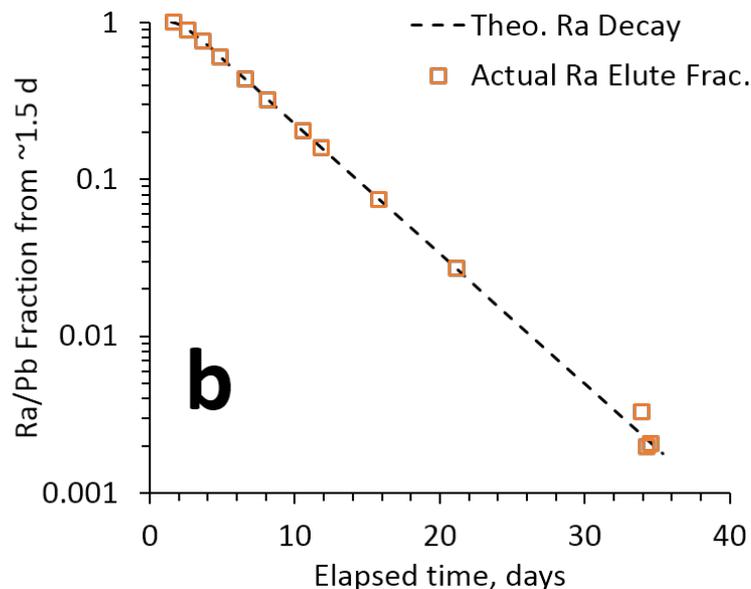
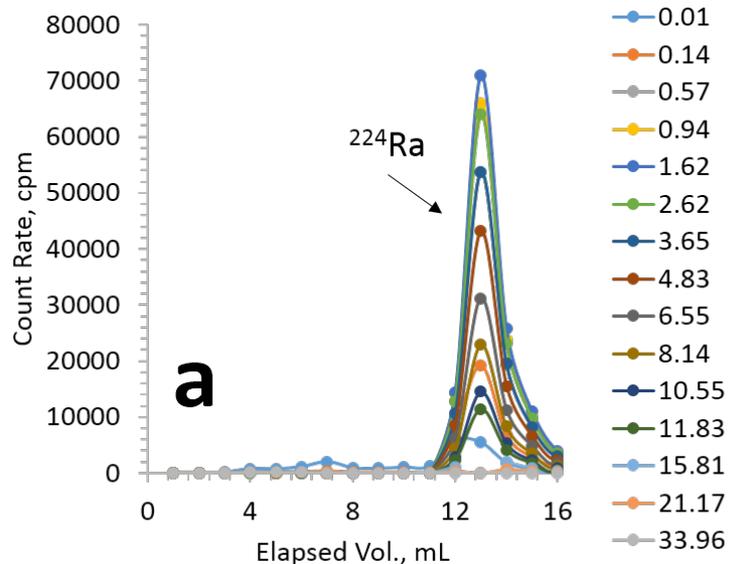
Two Stages to Preparation of $^{224}\text{Ra}/^{212}\text{Pb}$ generator



- Existing process is limited to ≤ 20 mCi generators due to high dose to production team.
- New methods are being developed to facilitate generator production in shielded facilities

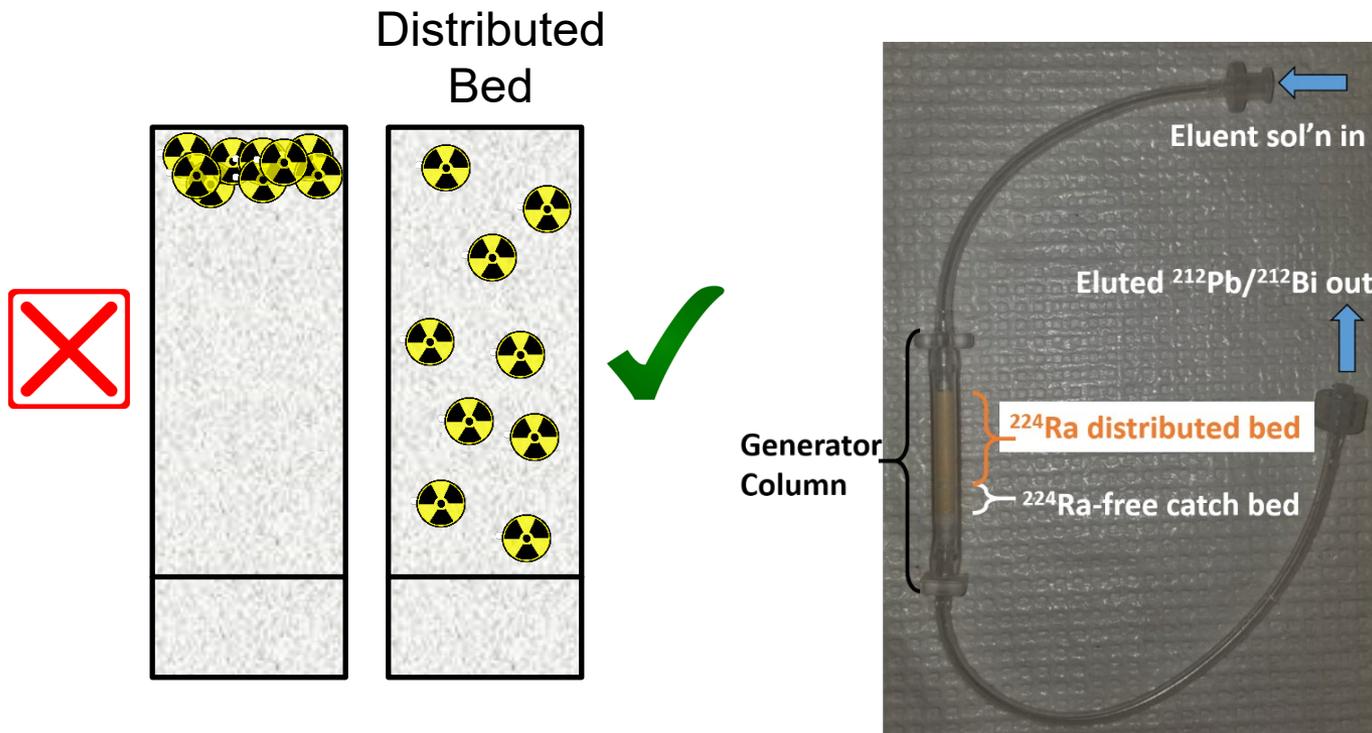
Two Stages to Preparation of $^{224}\text{Ra}/^{212}\text{Pb}$ generator (Stage 1)

- ▶ A new ^{224}Ra isolation method is integrated into a fluidic system that gates fluids through multiple pathways to:
 - Extract the ^{228}Th stock solution from a storage vessel
 - Isolate ^{224}Ra from ^{228}Th , ^{212}Pb , ^{212}Bi , and ^{208}Tl
 - Recover the ^{228}Th stock for later re-use



Two Stages to Preparation of $^{224}\text{Ra}/^{212}\text{Pb}$ generator (Stage 2)

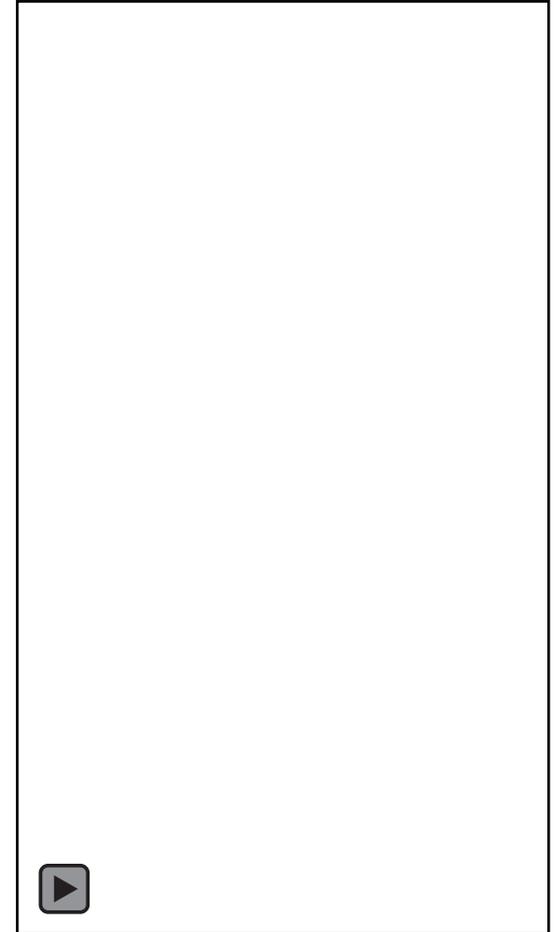
- ▶ Purified ^{224}Ra needs to be loaded onto cation exchange resin, which becomes the ^{212}Pb generator column
- ▶ A distributed ^{224}Ra -bearing column bed is required to reduce radiolytic degradation of the resin support



Two Stages to Preparation of $^{224}\text{Ra}/^{212}\text{Pb}$ generator (Stage 2)

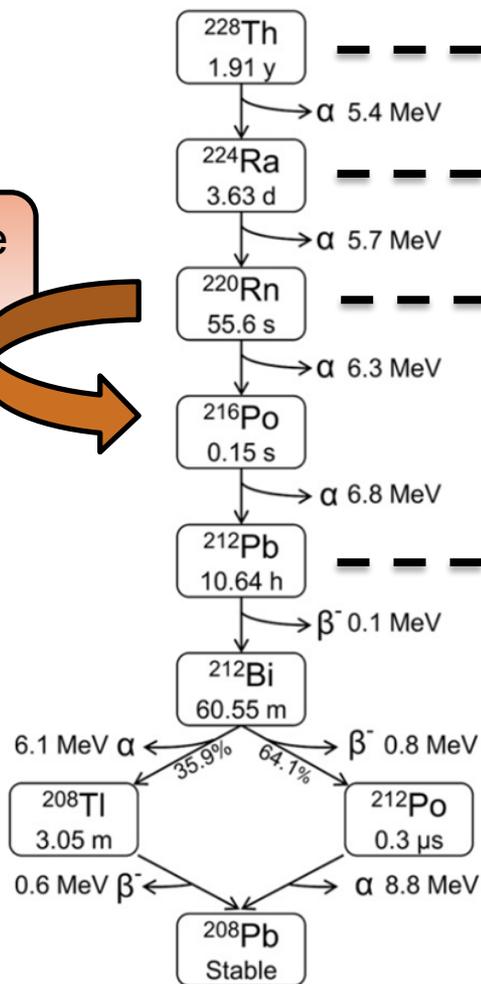
- ▶ A fluidic system is currently under development to prepare distributed-bed ^{224}Ra columns remotely

**Auto-packed
generator columns**



Alternate ^{212}Pb generator concept: ^{220}Rn emanation generator

Gas-phase separation



1 Isolation of ^{224}Ra

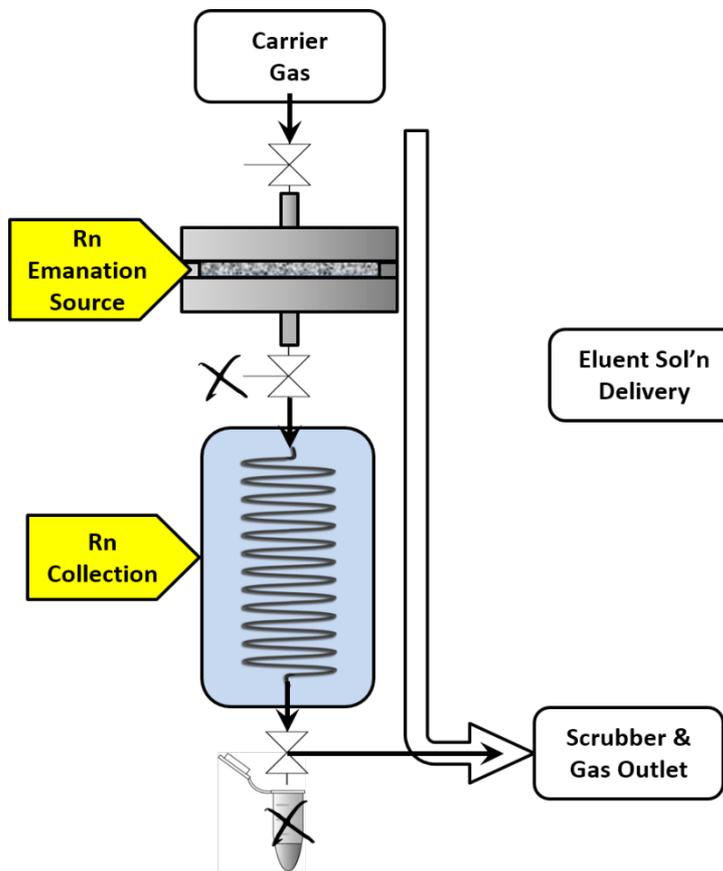
2 Preparation of ^{224}Ra / ^{220}Rn emanation source

3 Collection of ultra-high purity $^{220}\text{Rn} \rightarrow ^{216}\text{Po} \rightarrow ^{212}\text{Pb}$

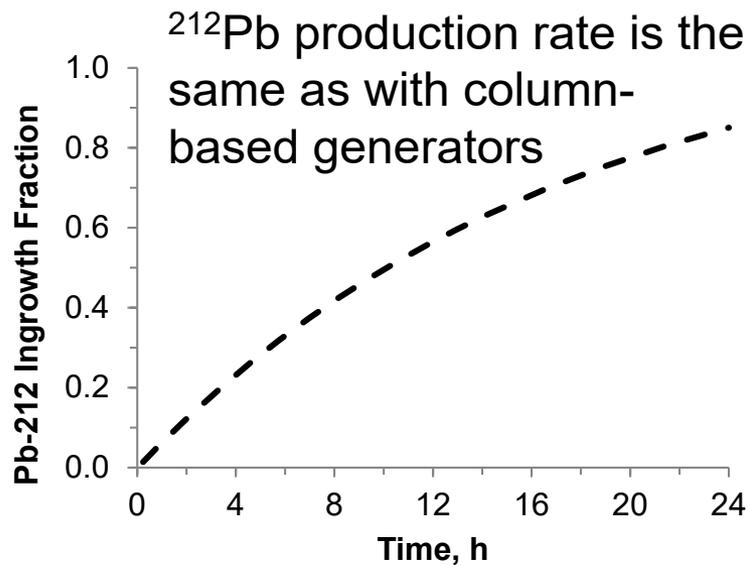
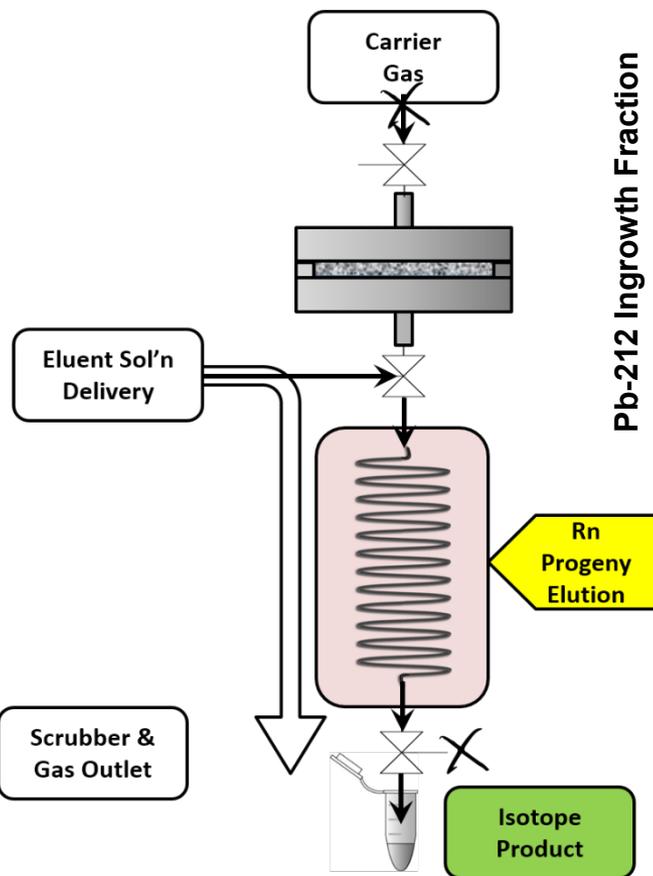
- This new approach has potential to:
 - Reduce possibility of ^{224}Ra breakthrough
 - Reduce presence of metal contaminants
 - Have ^{212}Pb collected in label-ready solution

Alternate ^{212}Pb generator concept: ^{220}Rn emanation generator

1. ^{220}Rn collection (^{212}Pb ingrowth) stage

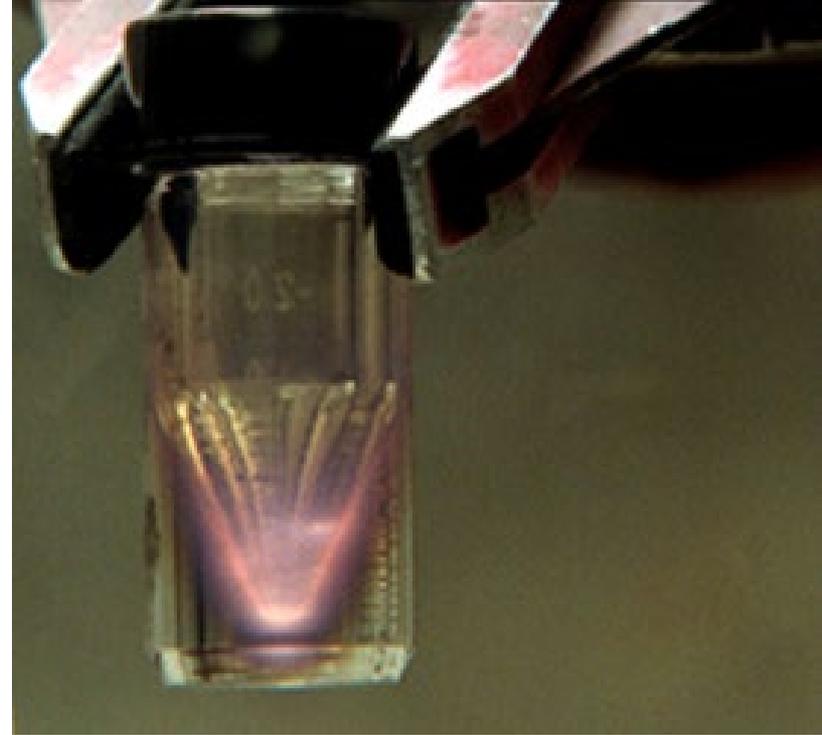


2. ^{212}Pb stripping stage



Thank You!

Questions???



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