

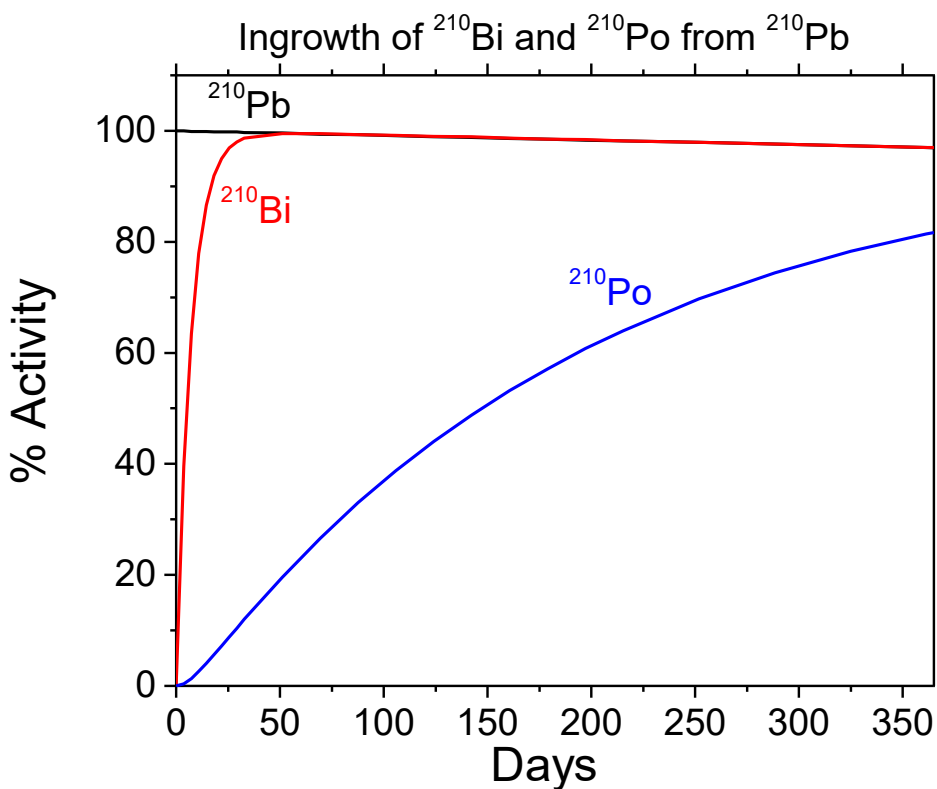
**Summary of Method** A method for the preparation of  $^{210}\text{Po}$  ( $t_{1/2} = 138.4$  days) and  $^{210}\text{Bi}$  ( $t_{1/2} = 5.013$  days) from  $^{210}\text{Pb}$  ( $t_{1/2} = 22.26$  years) source material is presented. The method employs 2mL cartridges of DGA and Sr resins to obtain high purity  $^{210}\text{Po}$  and  $^{210}\text{Bi}$  in small volumes of eluate while preserving valuable  $^{210}\text{Pb}$  source material. The source material, containing  $^{210}\text{Pb}/^{210}\text{Bi}/^{210}\text{Po}$  in 2.67M HCl, is loaded onto stacked 2mL cartridges of DGA and Sr resins.  $^{210}\text{Po}$  is retained on DGA Resin, while  $^{210}\text{Pb}$  is retained on Sr Resin and  $^{210}\text{Bi}$  is not retained. The  $^{210}\text{Pb}$  source is recovered from Sr Resin with a small volume of 8M HCl. Following a suitable ingrowth period, the  $^{210}\text{Pb}$  can be diluted to 2.67M HCl and used to produce additional  $^{210}\text{Po}$  and  $^{210}\text{Bi}$ . The  $^{210}\text{Pb}$  is preserved nearly indefinitely and continuously purified from chemical and radiologic impurities run to run.  $^{210}\text{Po}$  is recovered from DGA resin with 0.05M  $\text{HNO}_3$ . The DGA/Sr Resin chemistry is an improvement over the UTEVA/Sr Resin chemistry previously described. The UTEVA/Sr Resin system required 6M  $\text{HNO}_3$  to recover the  $^{210}\text{Po}$ .

### Reagents

Sr Resin Cartridges (Eichrom SR-R50-S)  
DGA, Normal Cartridges (Eichrom DN-R50-S)  
Liquid Scintillation Cocktail  
 $^{210}\text{Pb}$  Source  
Deionized Water  
HCl  
 $\text{HNO}_3$

### Equipment

Glass vials for storage of  $^{210}\text{Pb}$  source.  
Glass or plastic vials/bottles for collection of  $^{210}\text{Po}$ ,  $^{210}\text{Bi}$  and waste.  
10, 20 or 30mL plastic luer lock syringes  
Liquid Scintillation System for measurement of  $^{210}\text{Bi}$  and  $^{210}\text{Po}$ .  
Gamma Spectrometry System for measurement of  $^{210}\text{Pb}$ .

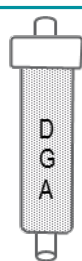


## $^{210}\text{Pb}/^{210}\text{Bi}/^{210}\text{Po}$ Separation

- (1) Precondition stacked 2mL cartridges of DGA and Sr Resins with 10mL 2M HCl.
- (2) Dilute  $^{210}\text{Pb}$  eluate from previous separation with 20mL DI  $\text{H}_2\text{O}$ . (If new  $^{210}\text{Pb}$  source, dilute to 20mL with 2M HCl.)\*
- (3) Load  $^{210}\text{Pb}/^{210}\text{Bi}/^{210}\text{Po}$  in 30mL 2.67M HCl. (20mL 2M HCl). Collect  $^{210}\text{Bi}$ .
- (4) Rinse DGA/Sr with 10mL 2M HCl. Collect  $^{210}\text{Bi}$ .
- (5) Elute 10mL 8M HCl through DGA/Sr, collecting  $^{210}\text{Pb}$  Source material. Save  $^{210}\text{Pb}$  for future use.

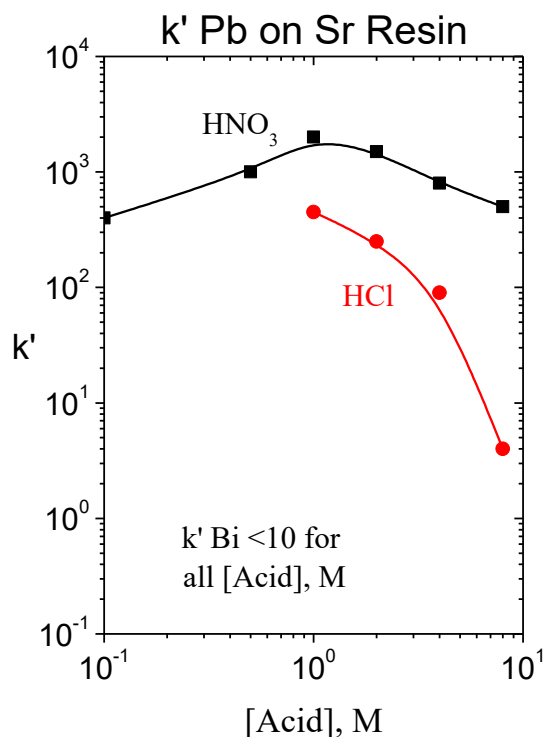
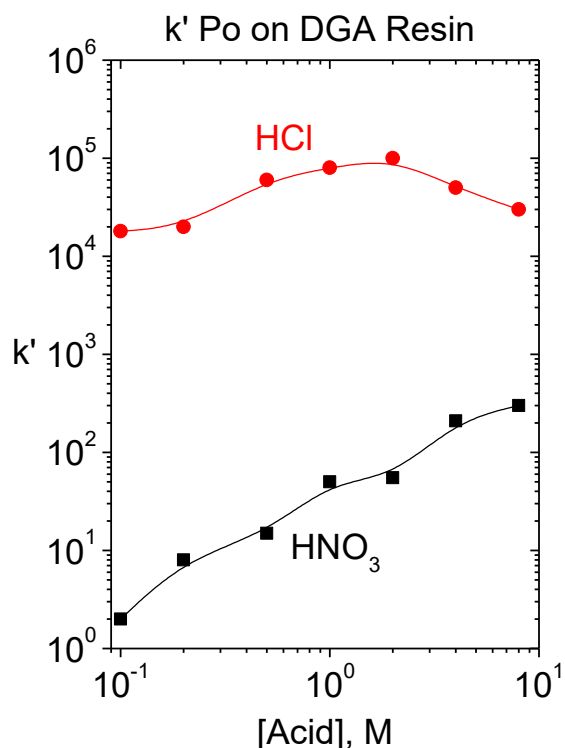


- (6) Separate DGA/Sr.
- (7) Rinse DGA with 10mL 8M  $\text{HNO}_3$ . Discard as waste.
- (8) Strip  $^{210}\text{Po}$  from UTEVA with 15mL 0.05M  $\text{HNO}_3$ .\*



\*Acidification of the  $^{210}\text{Pb}$  to 1M  $\text{HNO}_3$  is recommended to prevent hydrolysis and loss of the  $^{210}\text{Po}$  to the storage vial.

\*Adding 1mg of stable Pb to the  $^{210}\text{Pb}$  source can help improve  $^{210}\text{Pb}$  recovery from Sr Resin (do only once, not each time).



### References

- 1) McAlister and Horwitz, "Chromatographic Generator Systems for the actinides and natural decay series elements," *Radiochimica Acta*, 99:1-9 (2011).