Activity ③

Name:

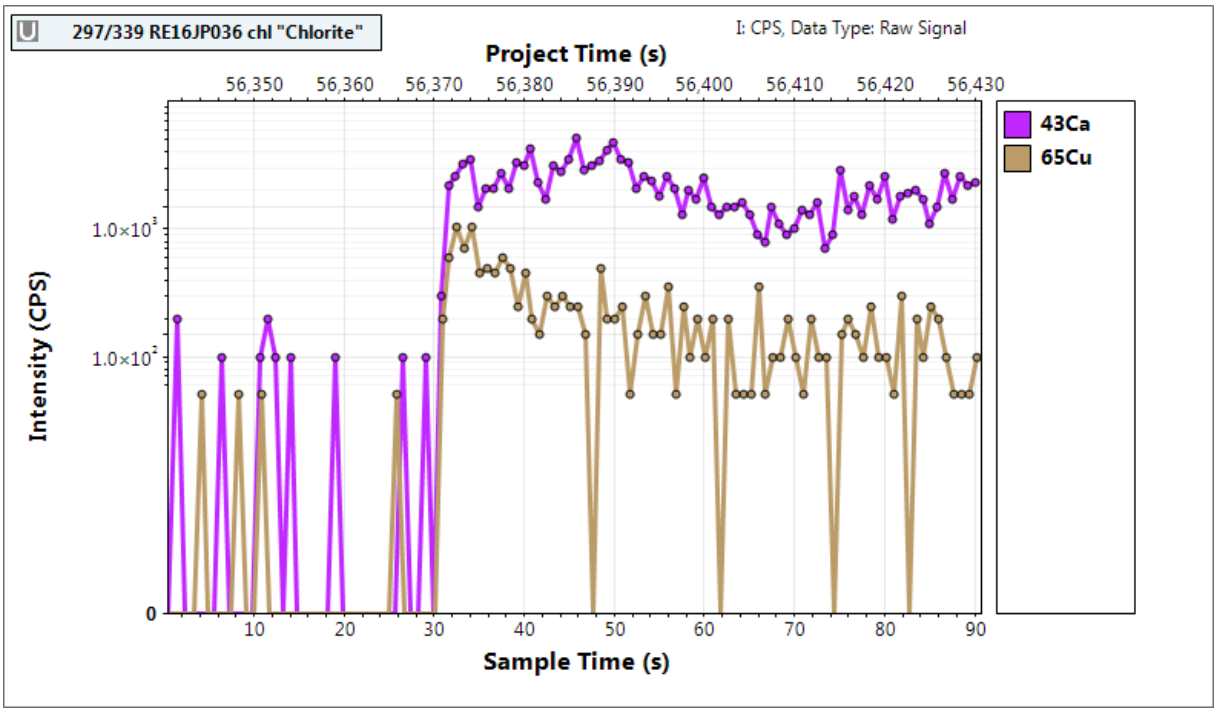
Norris Scientific

LA–ICP–MS Data Reduction Short Course

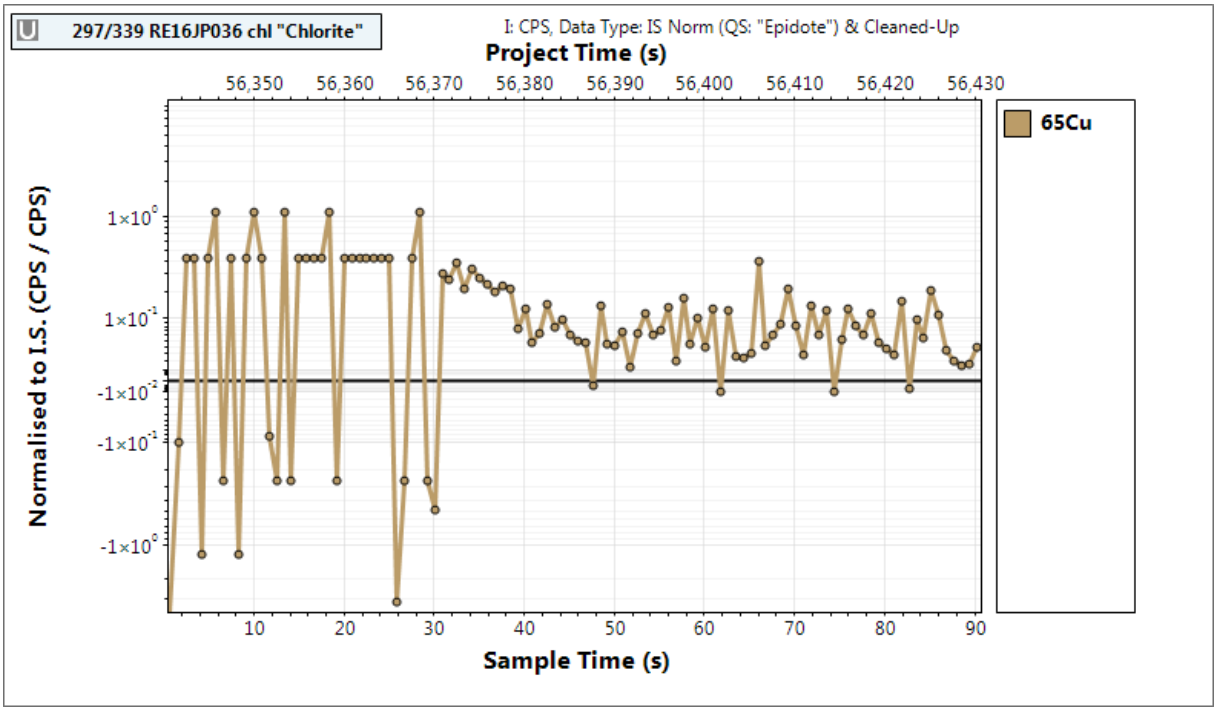
Integration Exercise

The charts show an ablation of ^{43}Ca and ^{65}Cu from a natural chlorite mineral.

Unknown – Chlorite (Raw Signal in CPS)



Unknown – Chlorite (BG-Subtracted and Normalised to IS=^{43}Ca)



Unknown – Chlorite (Summarised Data Table, Background-Subtracted)

Sweep #	**^{65}Cu (CPS)**	**^{43}Ca (CPS)**	**^{65}Cu/^{43}Ca**
1	450	2100	0.214
5	450	3100	0.145
10	300	2800	0.107
15	500	3400	0.147
20	150	2100	0.071
25	100	2000	
30	50	1300	
35	200	900	
40	100	700	
45	300	1800	

1) Calculate the remaining ratios of ^{65}Cu/^{43}Ca in the last column of the table (to save some time I calculated the first handful for you).

2) Calculate the mean value of each column to complete the table below:

	$\overline{^{65}\text{Cu (CPS)}}$	$\overline{^{43}\text{Ca (CPS)}}$	$\overline{^{65}\text{Cu}/^{43}\text{Ca}}$

3) Compute the Ratio of Means:

$$Ratio\ of\ Means = \frac{\overline{^{65}Cu}}{\overline{^{43}Ca}} =$$

4) Compute the Mean Ratio:

$$Mean\ Ratio = \overline{\left(\frac{^{65}Cu}{^{43}Ca}\right)} =$$

5) Compute the difference between the results as a percentage:

$$Diff = 2 \times \frac{|A-B|}{A+B} \times 100\,\% =$$

6) Turn each ratio value into a quantified concentration using the expression and terms supplied.

$$\frac{C_{STD}^{EL}}{C_{STD}^{IS}} = 0.0004\,;\, R_{STD}^{-1} = 21.74\,;\, C_{UNK}^{IS} = 13458\,\mu g\,.\,g^{-1}$$

$$C_{UNK}^{EL} = C_{UNK}^{IS} \times R_{UNK} \times \frac{C_{STD}^{EL}}{C_{STD}^{IS}} \times R_{STD}^{-1} \;=$$

7) Compute the difference between the quantified results as a percentage:

$$Diff = 2 \times \frac{|A - B|}{A + B} \times 100\,\% \;=$$

Sorry, it's a trick question, this should give the same result as (6) above.

Notes

Obviously it is tedious to compute these terms by hand, but simple to do with a spreadsheet or basic programming language.

Do you think the difference between the two results is significant?

When computing the final concentrations, I supplied a single calibration curve value to use for both calculations. Do you think the calibration values should be computed using the same method (Mean Ratio or Ratio of Means) as the signal on the unknown?