Exploring Russian-American Trade through Comparison of Chemical XRF Signatures of Glass from Colonial Russian Sites in Alaska and the Tal’tsinka Factory in Central Siberia

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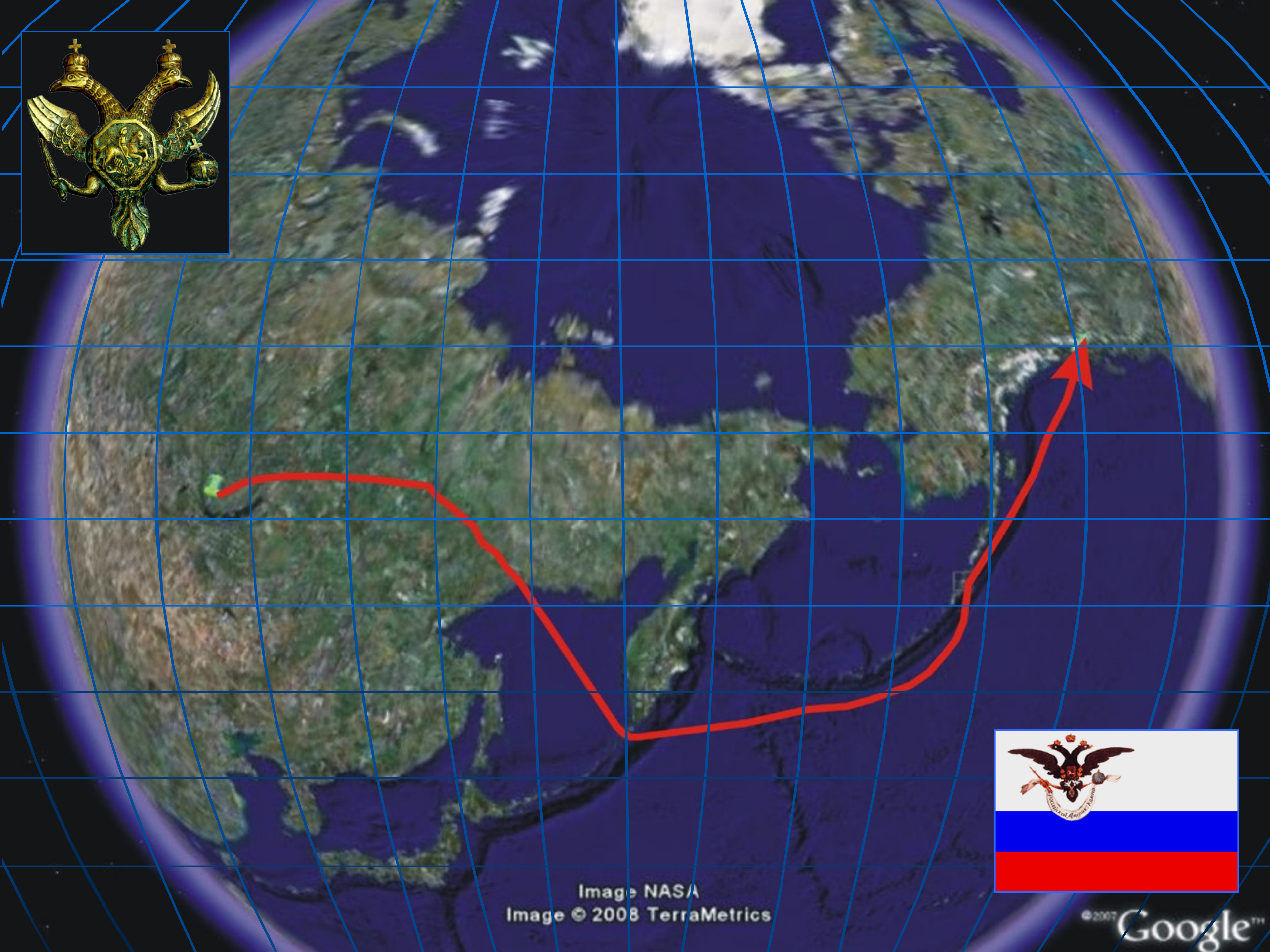
Image NASA
Image © 2008 TerraMetrics
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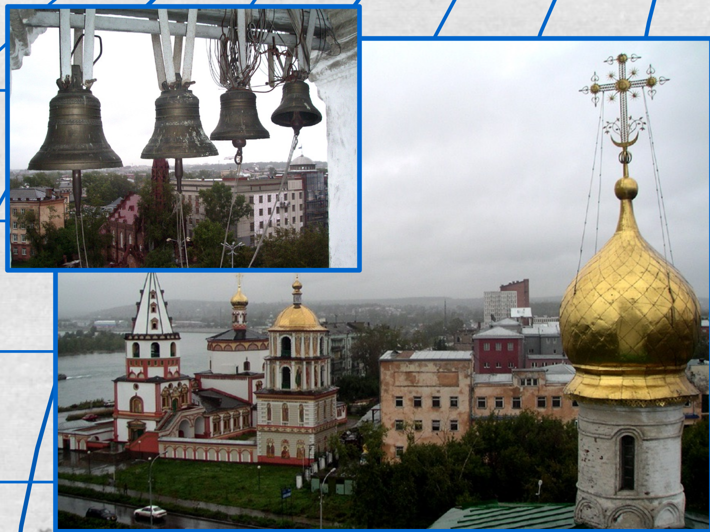
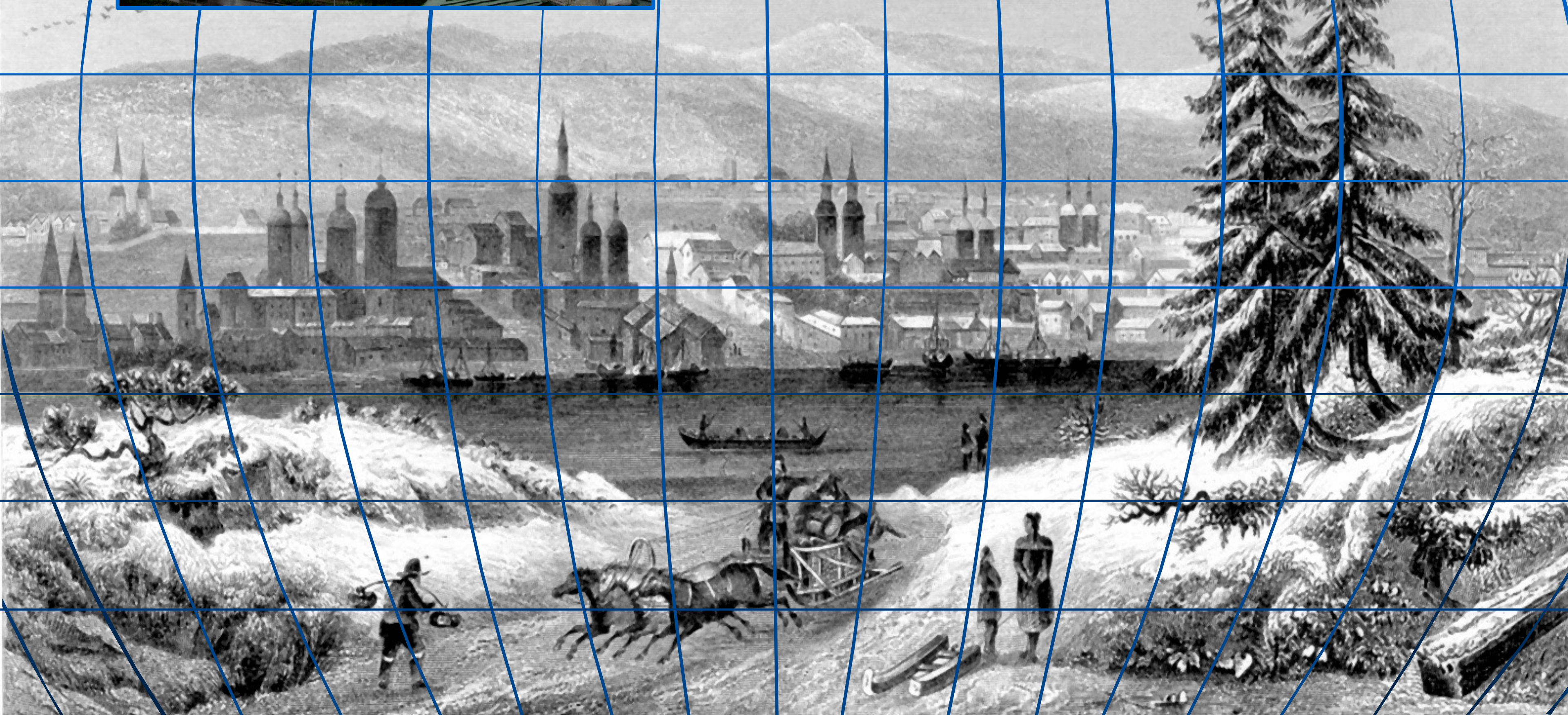
Иркутск






Kodak

1725: Bering's trek across Siberia from Irkutsk to Okhotsk (in red)

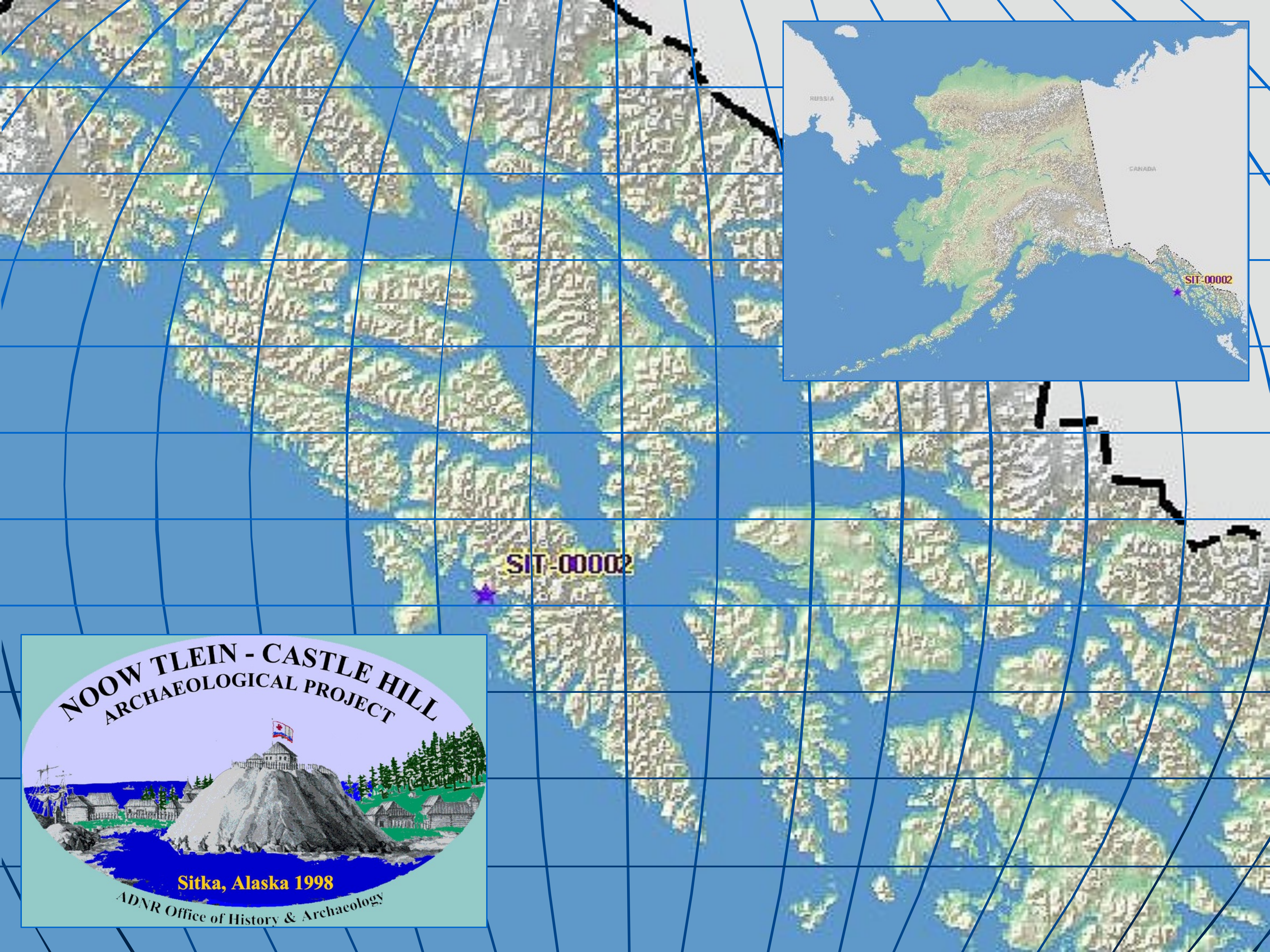
Tal'tsinka Glassworks: 1784

Making Glass III

(Generalized illustration from Diderot)

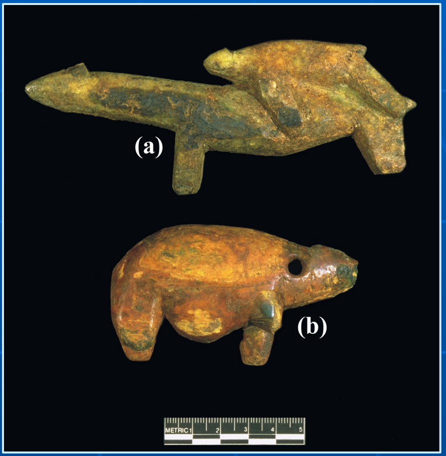
Vol. X, Verrerie en Bois, Pl. XVII.

Archaeology at the Baranov-Laxman Glass Factory: 2004-


SIT-00002
RUSSIA
CANADA
SIT-00002
NOOW TLEIN - CASTLE HILL
ARCHAEOLOGICAL PROJECT
Sitka, Alaska 1998
ADNR Office of History & Archaeology

Castle Hill Workshop Area / Architecture

Von Kittlitz 1827




(a)
(b)
(c)
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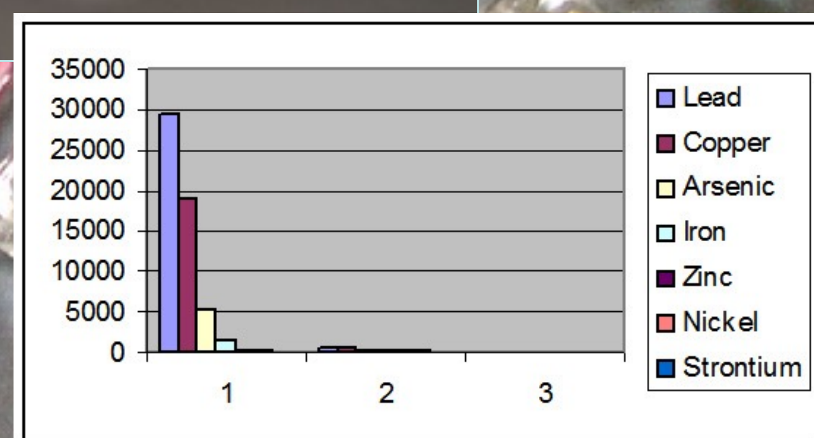
(e)
(f)
(g)
(h)
(i)
(j)
(k)
METRIC 1 2 3

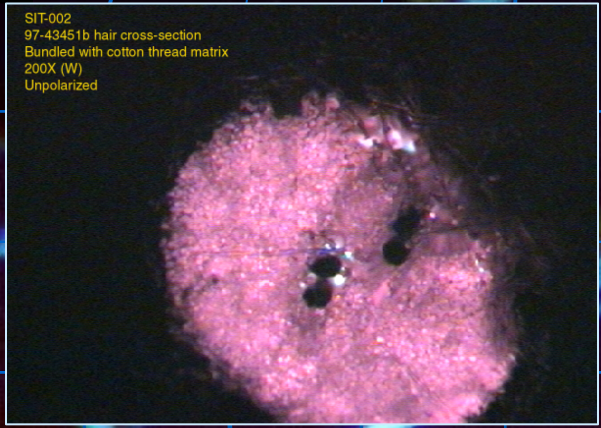
METRIC 1 2 3

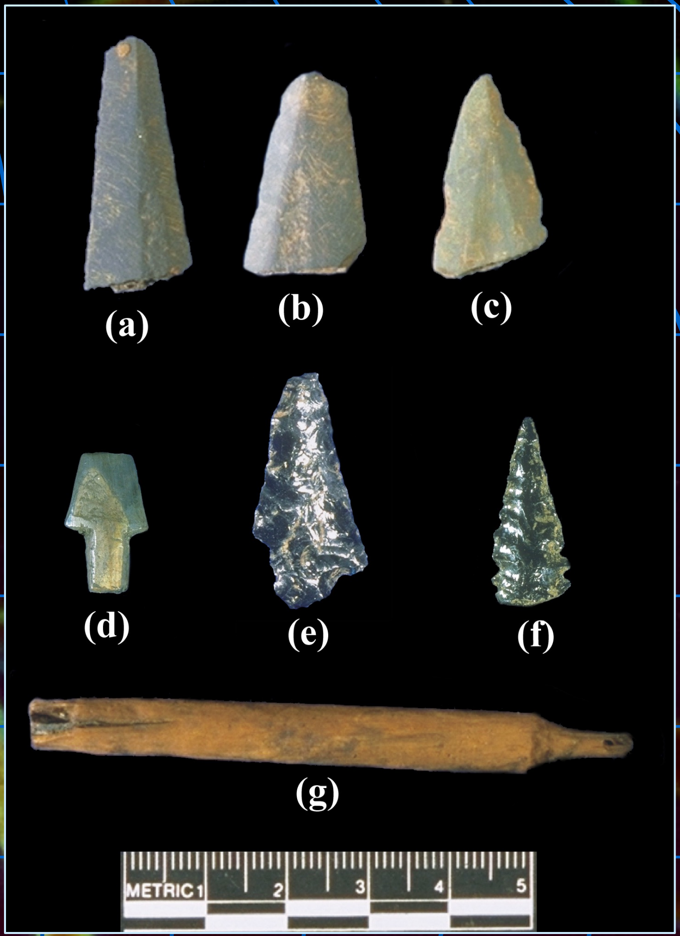

METRIC 1 2 3

METRIC 1 2

LOCATION	INSPECTOR	COR 1	NOTE	Mo	[illegible]	Zr	[illegible]	Sr	[illegible]	U	[illegible]
Alaska-Inkutsk	CLB	IKT-04-1			0.81	42.096	3.82	82.255	[illegible]		1.24
Alaska-Inkutsk	CLB	IKT-04-1			0.27	Not available	....	9.612	[illegible]		0.75
Alaska-Inkutsk	CLB	IKT-04-2			0.12	114.151	5.346	122.142	[illegible]	26.285	[illegible]
Alaska-Inkutsk	CLB	IKT-04-2		2.366	1.016	Not available	....	14.231	0.78	1.86	0.791
Alaska-Inkutsk	CLB	IKT-04-3			0.5	95.935	4.6	105.319	[illegible]		1.09
Alaska-Inkutsk	CLB	IKT-04-3			0.45	Not available	....	14.814	[illegible]		0.9
Alaska-Inkutsk	CLB	IKT-04-3	duplicate		0.29	Not available	....	25.364	[illegible]		0.82
Alaska-Inkutsk	CLB	IKT-04-4			0.5	86.041	4.915	232.207	[illegible]		2.58
		missing									
Alaska-Inkutsk	CLB	IKT-04-5			0.15	32.872	3.748	21.066	[illegible]		4.24
Alaska-Inkutsk	CLB	IKT-04-5			0.17	Not available	....	1.775	[illegible]		0.78
Alaska-Inkutsk	CLB	IKT-04-6			0.65						
Alaska-Inkutsk	CLB	IKT-04-6			0.32						
Alaska-Inkutsk	CLB	IKT-04-7			0.17						
Alaska-Inkutsk	CLB	IKT-04-7			0.28						
Alaska-Inkutsk	CLB	IKT-04-8			0.74						
Alaska-Inkutsk	CLB	IKT-04-8			0.46						
Alaska-Inkutsk	CLB	IKT-04-9		5.248	3.178						
Alaska-Inkutsk	CLB	IKT-04-9	duplicate		0.67						
Alaska-Inkutsk	CLB	IKT-04-9			0.35						
Alaska-Inkutsk	CLB	IKT-04-9	duplicate		0.35						
Alaska-Inkutsk	CLB	IKT-04-10			0.76						
[illegible]	CLB	IKT-04-10			[illegible]						




SIT-002
97-43451b hair cross-section
Bundled with cotton thread matrix
200X (W)
Unpolarized


(a)
(b)
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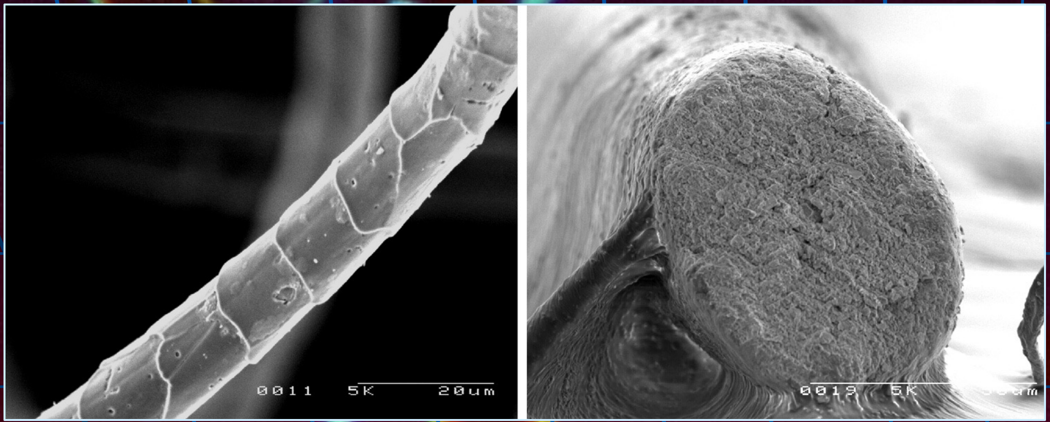
(f)
(g)
METRIC 1 2 3 4 5


0011 5K 20um

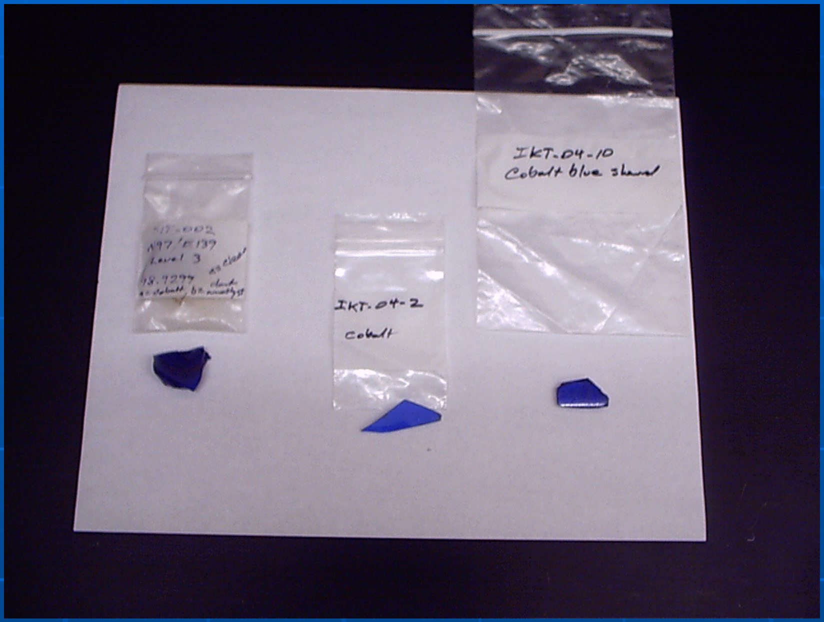
Finding the Differentiator

The Flux:

Laxman: Sodium Sulfate (Na_2SO_4)

Common Practice: potash (K_2CO_3)

Laxman's glass would have a lower K to Ca ratio than potash-based glasses.



Thermo Scientific NITON Analyzer

- *Helium (He) purge feature of these analyzers allows for analysis of light elements Mg, Si, P, S, K, Ca.*

- *Nondestructive Analysis*

- *Short analysis time*

- *Spectra and (semi)quantitative data*

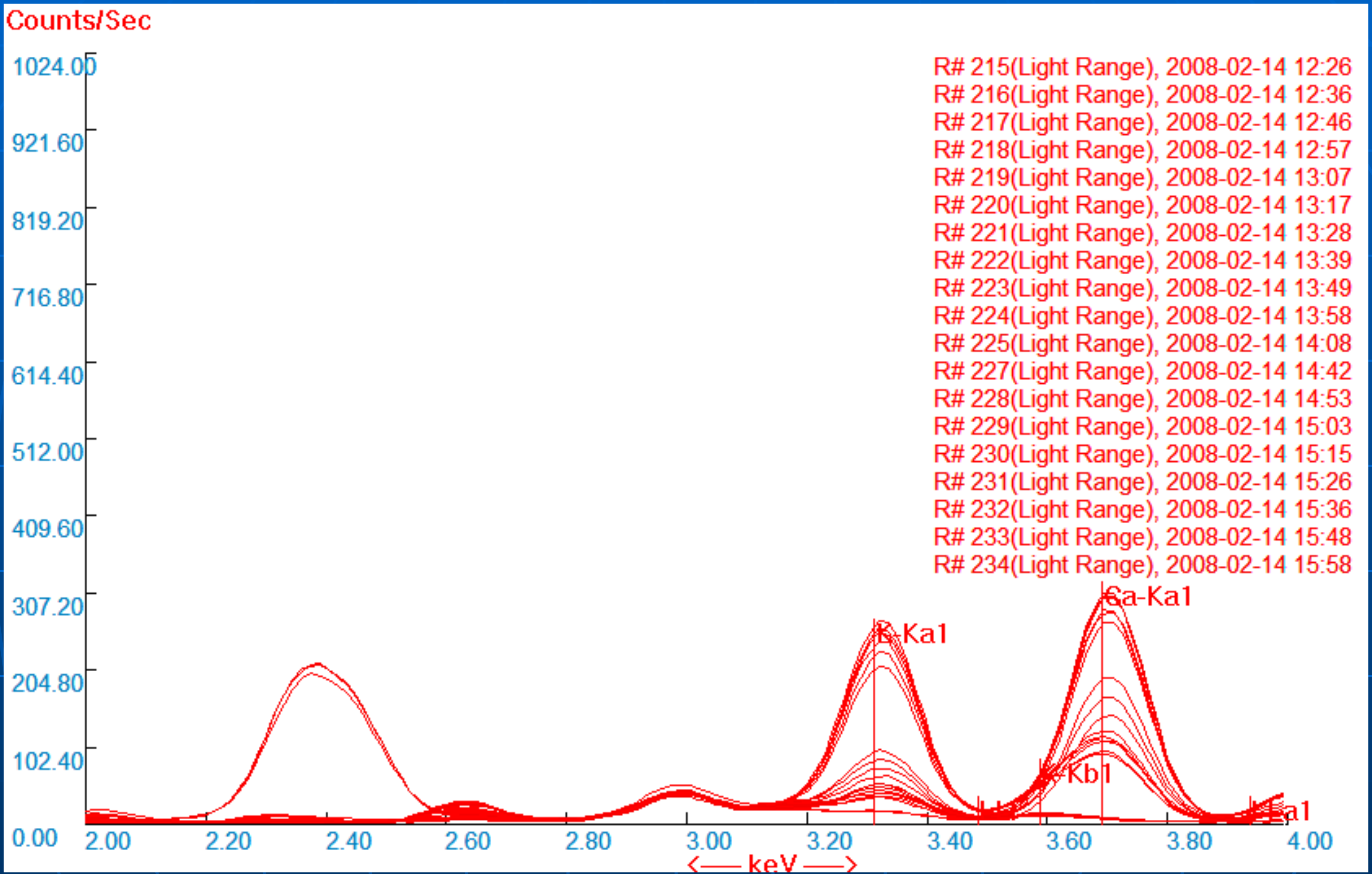


Figure 1. **Light energy spectra collected from glass samples from Castle Hill, Alaska. Potassium and calcium are labeled, showing an average K to Ca ratio between 1:2 and 1:1.**

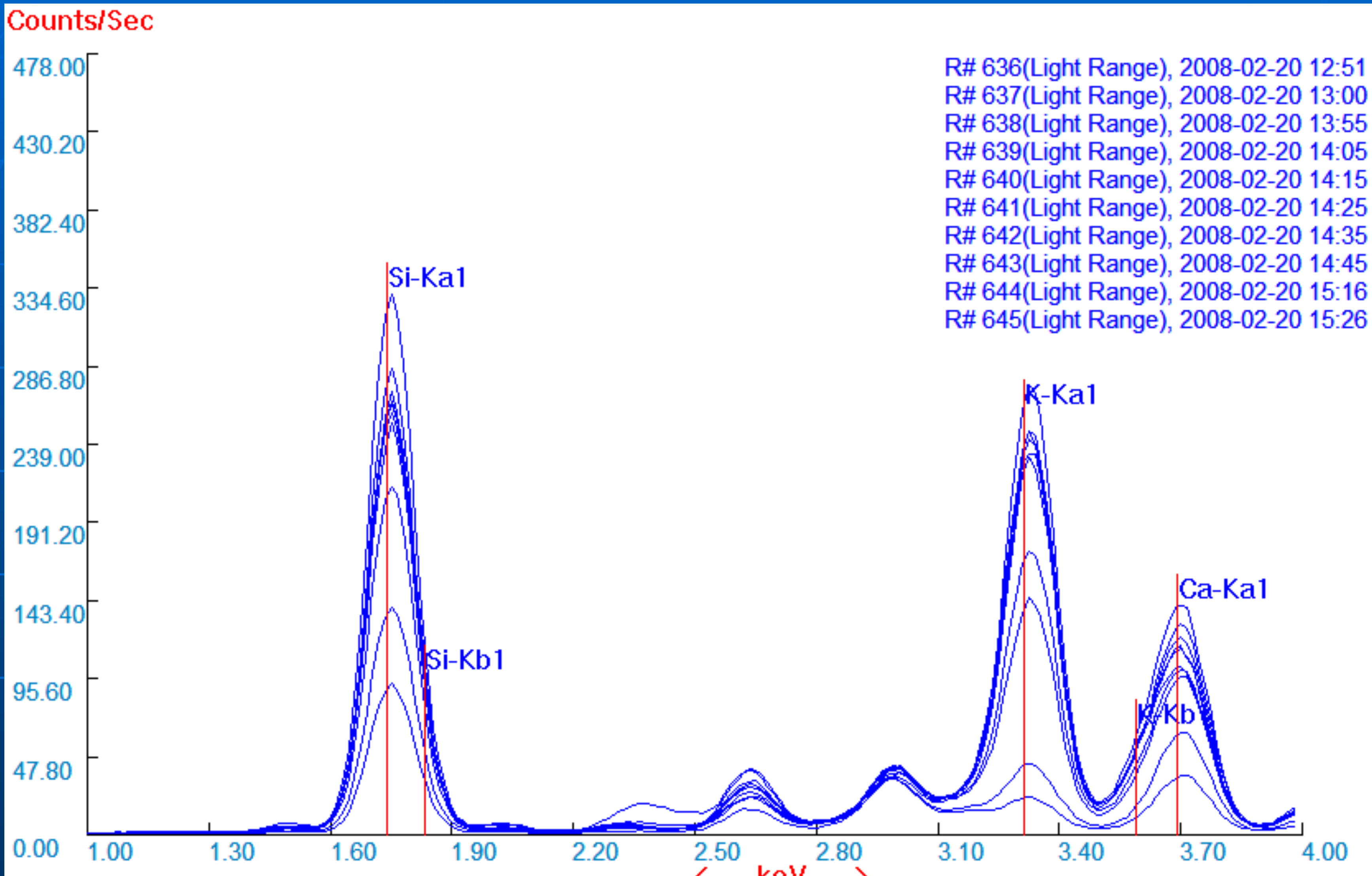


Figure 2. **Light energy spectra collected from glass samples from Yakutat, New Russia. Potassium and calcium are labeled, showing an average K to Ca ratio between 1:1 and 2:1.**

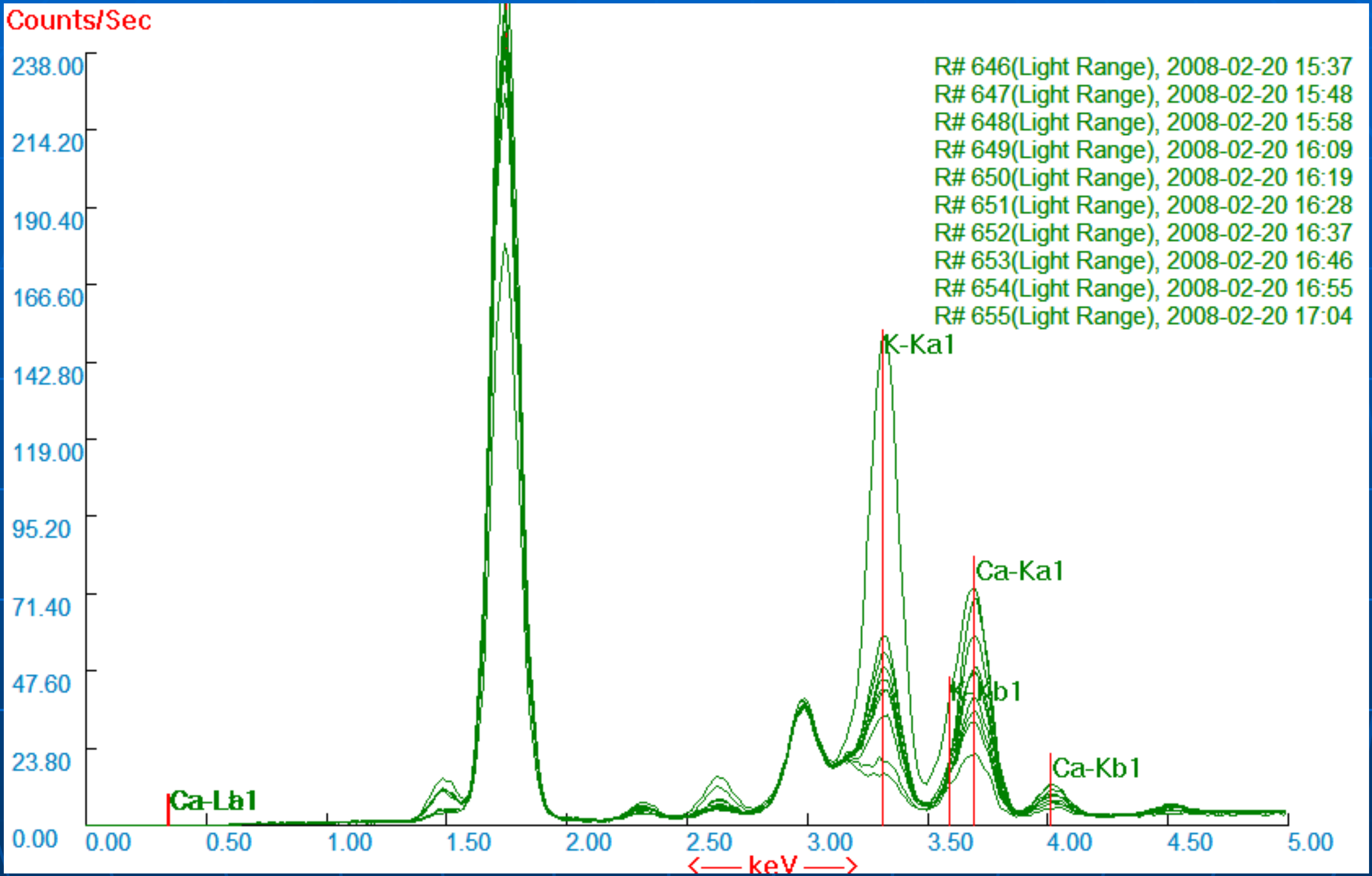


Figure 3. Light energy spectra collected from glass samples from Irkutsk, the site of Erik Laxman's glass factory. Potassium and calcium are labeled, showing an average K to Ca ratio between 1:2 and 1:1, with one unusual outlier with a much greater concentration of K.

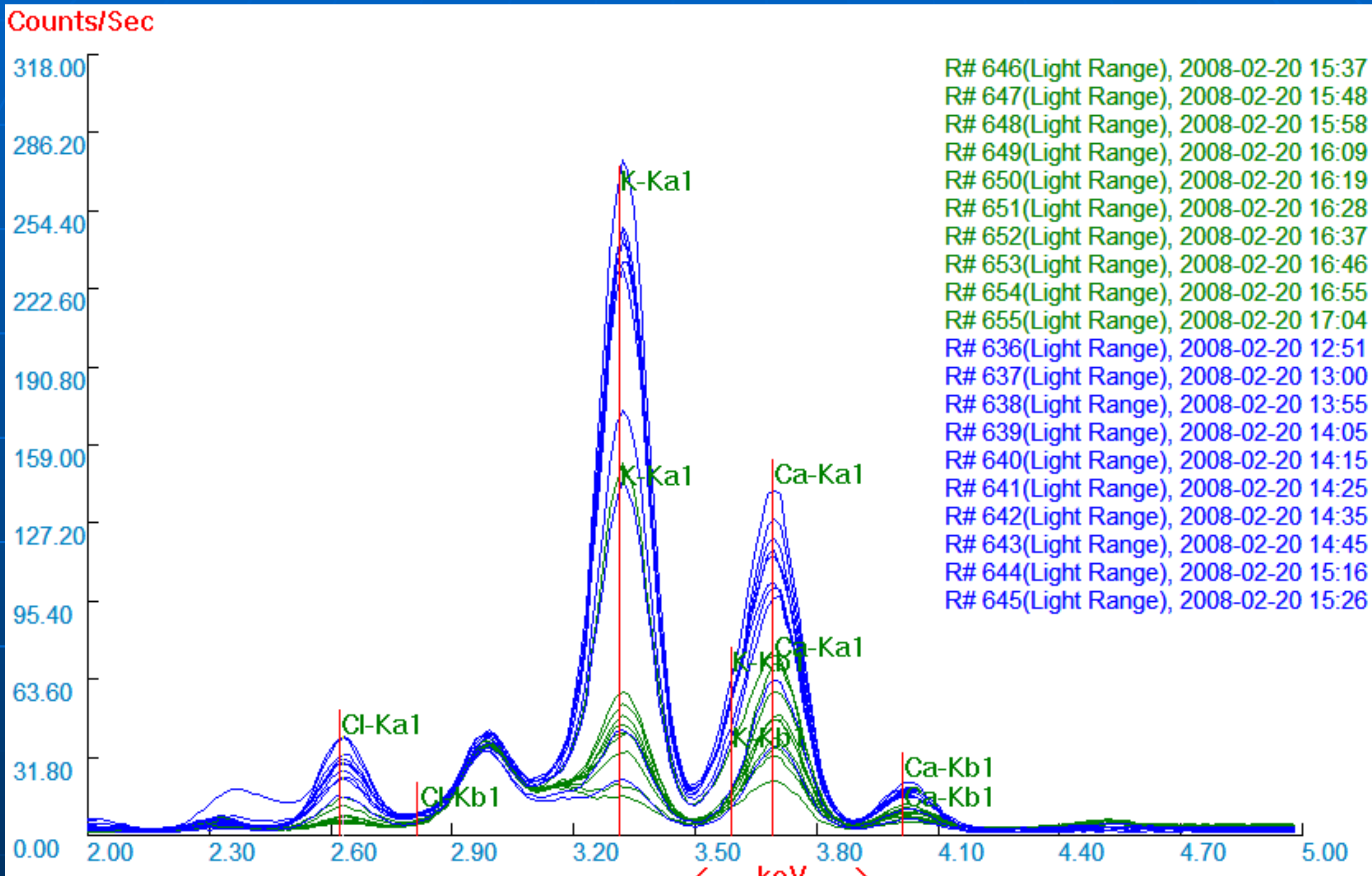


Figure 4. **Light energy spectra from both Irkutsk (green) and Yakutat (blue) overlaid.**

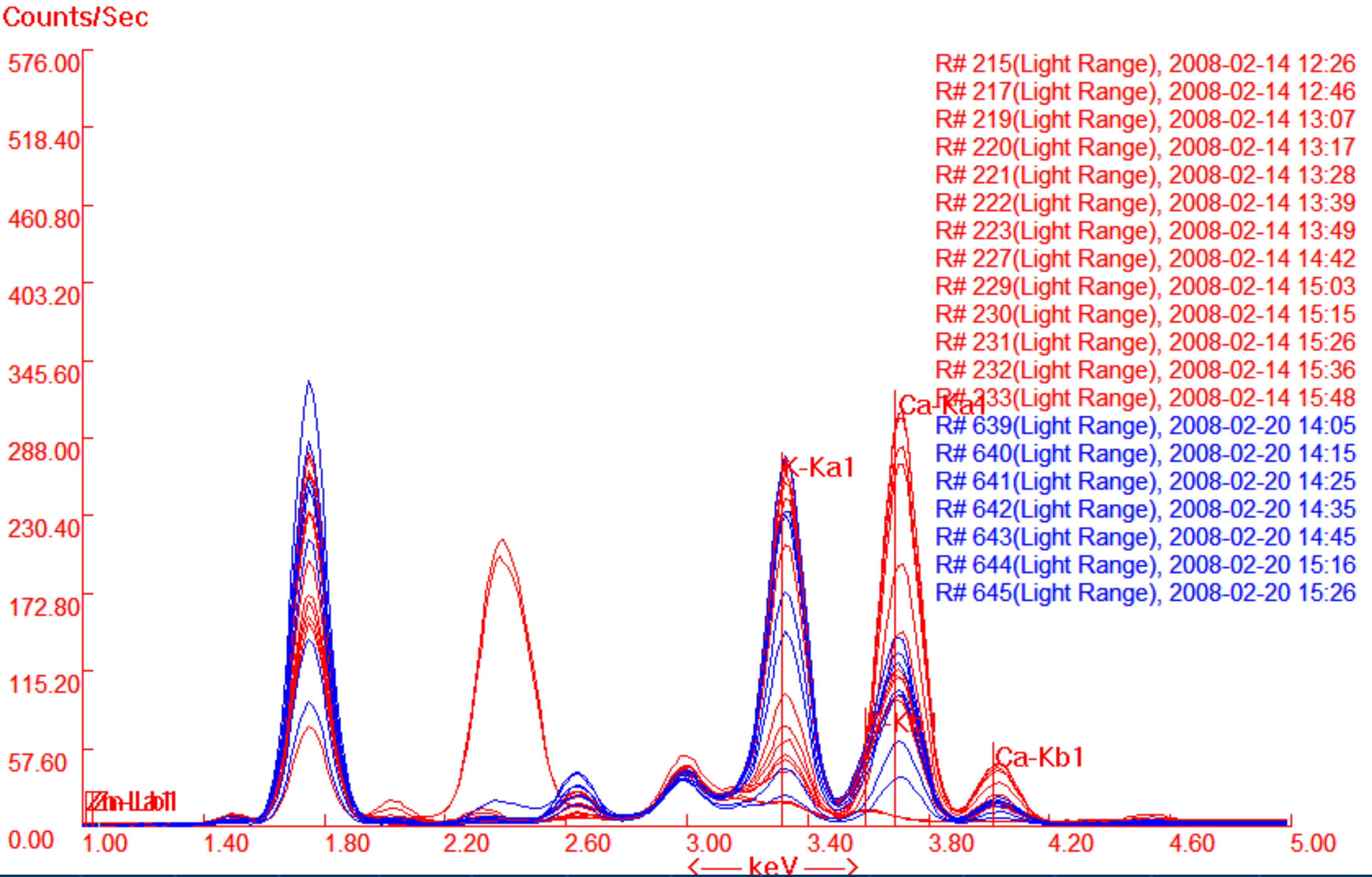


Figure 5. **Light energy spectra from both Castle Hill (red) and Yakutat (blue) overlaid.**

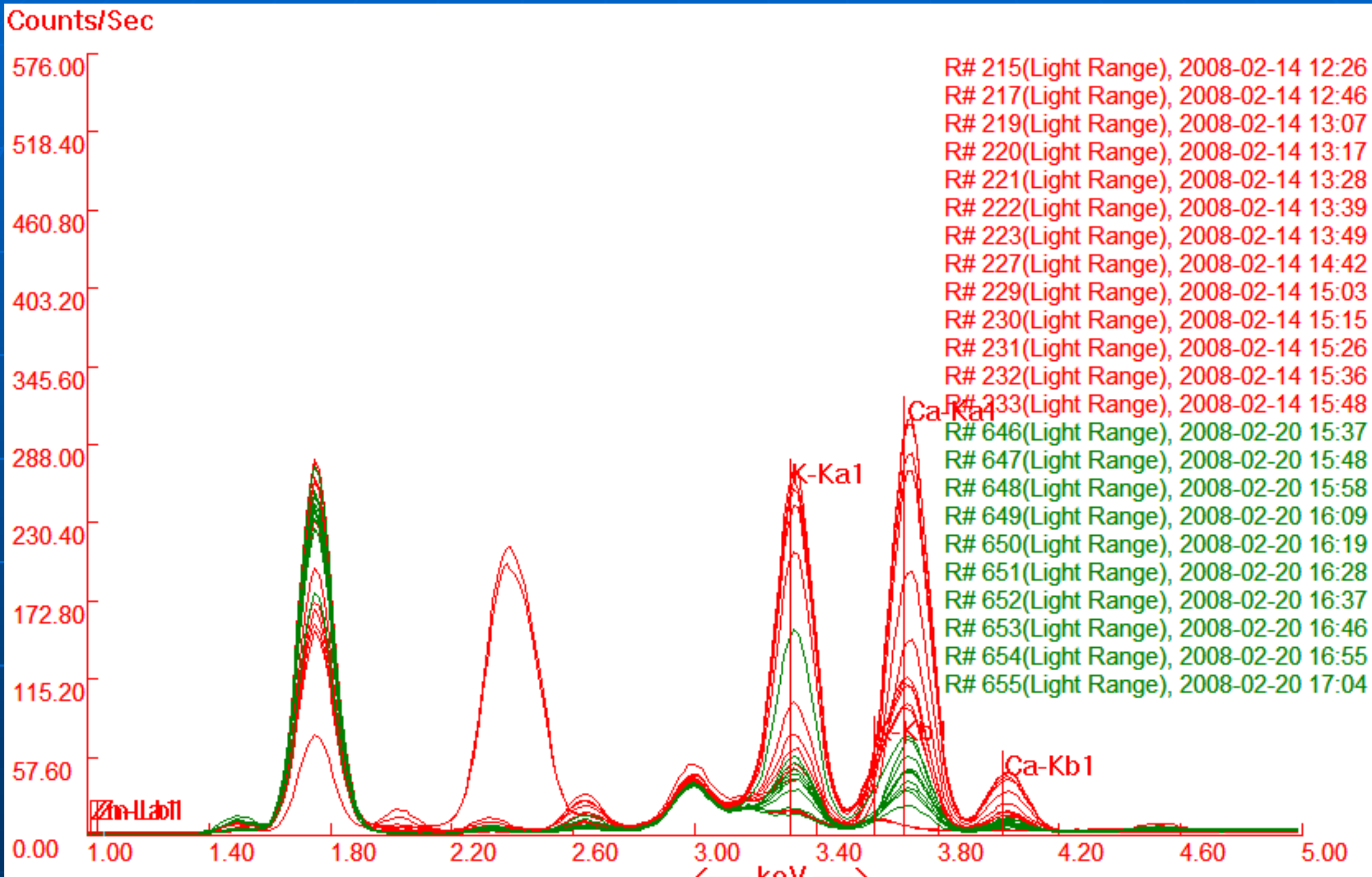


Figure 6. **Light energy spectra from both Castle Hill (red) and Irkutsk (green) overlaid.**

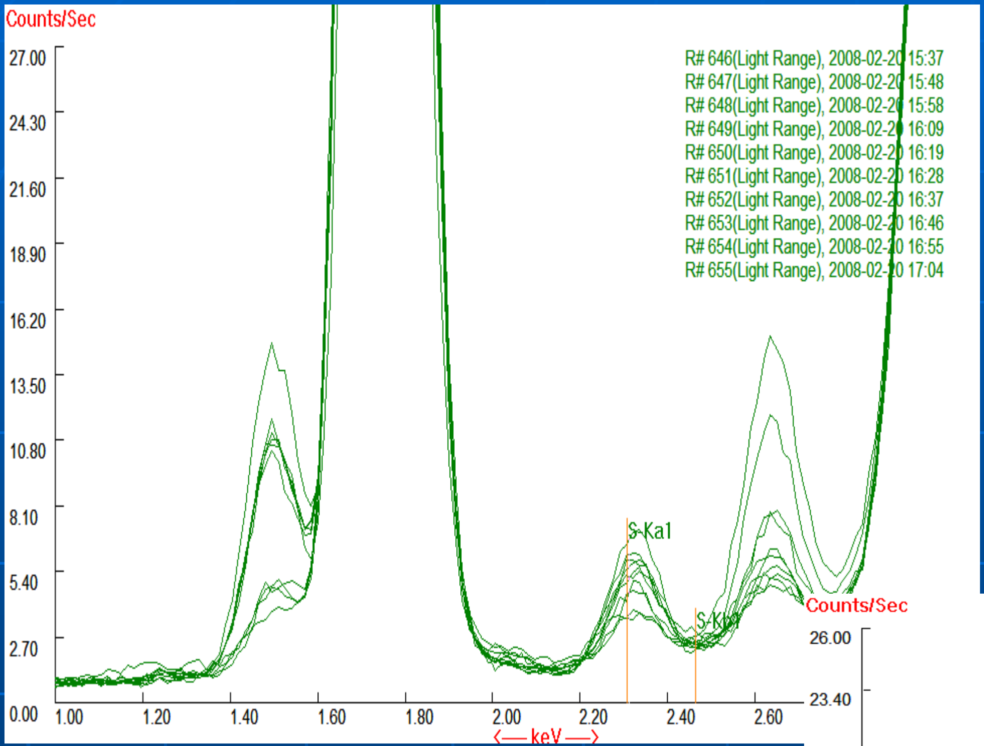


Figure 7. **Light energy spectra collected from glass samples from Irkutsk. Sulfur peak labeled.**

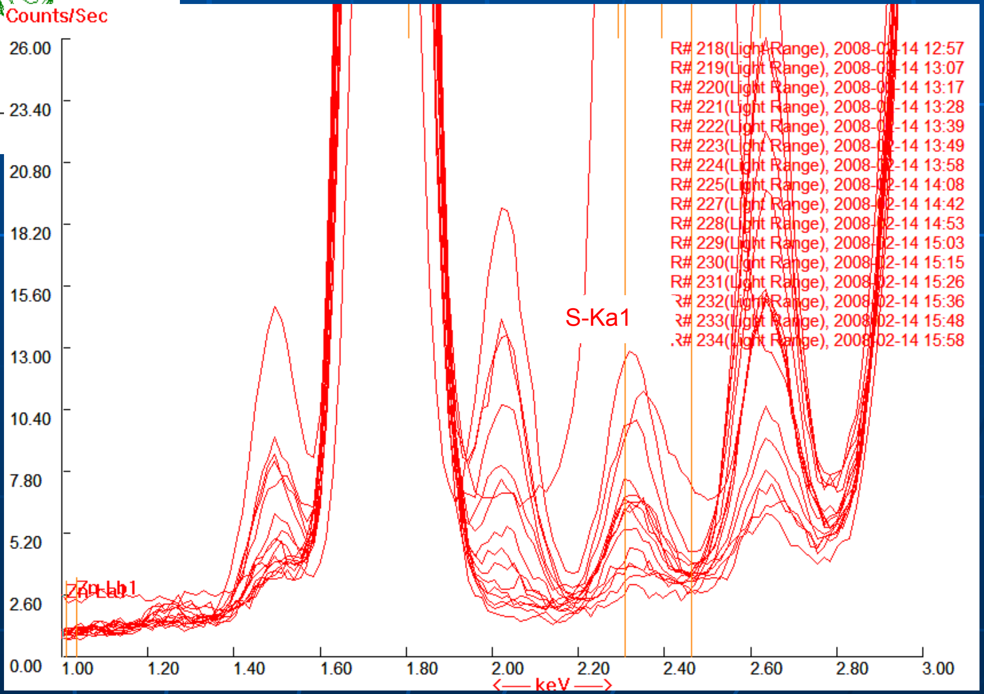


Figure 8. **Light energy spectra collected from glass samples from Castle Hill. Sulfur peak labeled.**

Discussion and Conclusions

- The Irkutsk glass samples have a lower K to Ca ratio as compared to the Yakutat samples, and a similar ratio as compared to the Castle Hill samples. We will need to look more closely at quantitative data, rather than spectra to better establish these ratios.
- The Irkutsk samples have a significantly lower concentration of potassium than both the Yakutat and Castle Hill samples. Further study is necessary to determine the degree of significance of ratio over concentration, or vice versa.
- Overall, the results lead us to believe that with better method and a more statistically significant number of samples, the handheld XRF is a viable tool for this research.
- Several follow-up steps need to be taken for more conclusive results:
  - A more statistically significant number of samples from each location needs to be analyzed
  - Samples need to be better matched (color, use, etc.) for comparison
  - Comparison of a greater number of elements needs to be undertaken
  - Ratios need to be more precisely established by using the available (semi)quantitative data.

References

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