

## Itrax XRF Drillcore scanner versus hand-held XRF

*Anders Rindby, PH. D. Cox Analytical Systems*

Cox Analytical Systems has conducted a comparison between a hand-held XRF unit, Thermo Niton XL3t Gold, and Itrax Drillcore scanner from Cox Analytical Systems. The handheld measurements were performed at **SP Technical Research Institute of Sweden**.

Two different Standard Reference materials were used;

1. NIST SRM 1834, Fused Simulated Ore for XRF Fluorescence Spectrometry.
2. USGS Green River Shale SGR-1 sediment standards

The SRM 1834 is a silica base glass disk which is supposed to be used as XRF standards for analysing rocks, ore and clay samples.

The SGR-1 is a powder sediment standard from the Mahogany zone of the green River Formation which is a petroleum – and – carbonate-rich shale.

For the analysis with handheld XRF, the two standards were analysed by a Thermo Niton XL3t Gold hand-held instrument, provided and carried out by SP Technical Research Institute of Sweden. The instrument was used in a s.c “mining” mode and each sample was exposed for 20 seconds in four different modes of tube voltage and tube anodes (in total 4x20, i.e. eighty seconds) to cover all elements from Al up to U. The instrument was held in close proximity with the sample surface during measurements. The exposed area was estimated to about 0.5 cm<sup>2</sup>.

The Itrax data were recorded from an Itrax Scanner were the standards were exposed for 2 (two) seconds. The exposed area was about 0.012 cm<sup>2</sup>.

Table I & II shows the estimated concentrations recorded from the two XRF instruments together with the certified concentrations. The tables also show the estimated Detection Limits (D.L), in concentrations, for the two instruments. The D.L.’s were estimated from the spectral peak/area ratio and calculated from the standard definitions given in XRF spectrometry (**Handbook of X-Ray Spectroscopy” 2’nd edition, ed; R van Grieken, A.Markowicz, Marcel Dekker, Inc 2002**).

**As seen** from Table I & Table II the Itrax scanner provides somewhat more precise analytical data, especially for light elements (where the hand-held instrument seems to give a systematic deviation) and also for heavy elements (Z>20) in low concentrations. For heavy elements in higher concentrations (> 2%) both instruments give reasonably good estimates. It is also apparent from table I & II that the hand-held instrument has lower detection limits for light elements like Al and Si, but for all heavier elements the

Itrax is comparable or superior, and Itrax in total detects many more heavy elements (see tables).

Note that while the hand-held instrument was recording an area of about 0.5 cm<sup>2</sup> over 80 seconds the Itrax used only 2 second over an area of 0.012 cm<sup>2</sup>. This means that the Minimum Detectable Amount (at a fixed measuring time) for the Itrax will be several orders of magnitude lower than the hand-held instrument for any given D.L in concentration. In practical work, this difference can show up e.g. when detecting fine laminations.

At the same time, the capacity of Itrax is much higher with a time for analysis of 1-2 seconds p.p as compared to the 20 seconds needed with the handheld device.

	Table I				
#1834	Thermo		Itrax		
element	calc. conc (%)	Det. limit (%)	calc. conc (%)	Det. limit (%)	certified conc (%)
Al	10.211	0.1400	21.6283	0.7523	20.700
Si	16.240	0.0430	23.1469	0.1934	20.200
P	0.178		Not detected	0.0601	
S	0.034		0.1176	0.0222	
Cl	Not detected		0.0602	0.0096	
K	0.282		0.4357	0.0027	0.420
Ca	0.106		0.0997	0.0017	0.095
Ti	0.970	0.0045	1.1873	0.0009	1.110
V	0.009		Not detected	0.0007	
Cr	0.015		0.0237	0.0006	
Fe	0.308	0.0012	0.3477	0.0005	0.320
Co	Not detected		0.0024	0.0005	
Ni	Not detected		0.0028	0.0005	
Cu	Not detected		0.0023	0.0005	
Zn	Not detected		0.0071	0.0005	
Ga	Not detected		0.0030	0.0005	
Se	Not detected		0.0007	0.0005	
Rb	Not detected		0.0010	0.0005	
Sr	0.098	0.00023	0.1108	0.0005	0.153
Zr	0.044		0.0299	0.0004	
Nb	Not detected		0.0004	0.0004	
Ba	0.041		0.0623	0.0013	0.062
La	Not detected		0.0073	0.0012	
Ta	Not detected		0.0062	0.0007	

	Table II				
SGR	Thermo		Itrax		
element	calc. conc (%)	Det. limit (%)	calc conc (%)	Det. limit (%)	certified conc.
Al	1.098	0.22	3.0631	2.1724	3.450
Si	9.350	0.05	12.9398	0.8031	13.1700
P	0.071		0	0.2495	0.1430
S	1.223		1.4928	0.0932	1.5300
Cl	0.007		Not detected	0.0411	
K	0.912		1.4901	0.0121	1.3700
Ca	5.098	0.009	6.0455	0.0079	5.9900
Ti	0.103		0.1393	0.0044	0.1510
V	0.011		0.0133	0.0036	0.0130
Cr	0.005		0.0051	0.0032	0.0030
Mn	Not detected		0.0297	0.0029	0.0267
Fe	1.417	0.0025	2.1630	0.0028	2.1180
Ni	Not detected		0.0084	0.0027	0.0029
Cu	Not detected		0.0106	0.0028	0.0066
Zn	0.004		0.0088	0.0028	0.0074
Ga	Not detected		0.0032	0.0028	
As	0.004		0.0055	0.0029	0.0067
Se	Not detected		0.0007	0.0029	
Rb	0.002		0.0080	0.0028	
Sr	0.016	0.0008	0.0319	0.0027	0.0420
Y	Not detected		0.0004	0.0027	0.0013
Zr	0.002		0.0025	0.0026	
Nb	Not detected		0.0009	0.0026	
Mo	Not detected		0.0033	0.0027	
Ba	Not detected		0.0761	0.0169	0.0290
W	Not detected		0.0172	0.0058	
Pb	0.002		0.0042	0.0053	0.0038

---

**Cox Analytical Systems**

[www.coxsys.se](http://www.coxsys.se)

[info@coxsys.se](mailto:info@coxsys.se)

