ED XRF – Rigaku

An analytical tool for the qualitative and quantitative determination of major and minor atomic elements in a wide variety of sample types. Versatile instrument capable of providing rapid, non-destructive, multi-element analyses – from low parts-per-million (ppm) levels to high weight percent (%) concentrations – for elements from Sodium (11Na) to Uranium (92U). The equipment has a capacity of 10 samples.

Samples

For auto-sampling runs (i.e. multiple measurements), samples may be liquid, loose powders, pressed powder pellets, solids or fused beads with a diameter between 32mm - 40mm. For individual analyses, larger (<12 cm) flat and homogeneous samples can be horizontally positioned within the instrument chamber and located using the internal optics (analyses will be close to the sample edge). The internal compartment is a cylindrical chamber and the individual sample cannot exceed the size of 24 cm in diameter to 9 cm in height. Sample materials include, metals (including thin films), cement, ceramic, glass, particulate matter on air filters, and polymers sample material accepted.

Samples must arrive to ESRL either as a liquid, preformed pressed powder pellets/fused beads or as pre-milled material (crushing and grinding facilities in TCD may be available by special request). The ESRL does not have the capacity to prepare fused beads at present.

Benefits

- Very low backgrounds
- Best detection limits for heavy elements
- Quantitative and qualitative analyses
- Stable results over months
- No dissolving and digestive of powder
- Low cost compared to other analytical equipment
- No glassware
- Fast Results
- Non-destructive technique
- Easy sample preparation
- No expensive reagents and waste disposal
- Complimentary to XRD and other analytical techniques

Limitations

- X-ray penetration of the sample is limited to the top 0.01 - 0.1 mm layer
- Light elements (below 13Al) have very limited sensitivity
- Liquids that give off corrosive vapour will not be analysed
- Radiation-sensitive materials may be damaged during analysis
- Magnetic and radioactive materials are unlikely suitable for analysis

Applications

Table 2 -Nex CG Applications (applications in grey may be possible in the future but require further development)

Application	**Geological Film**	**Geological Fusion**	**Geological Pellet**	**Other**	**Scan**
Analysis	Major oxides	Major oxides	Major oxides	Major oxides	Screening
Sample preparation	Loose powder	Fused glass beads	Pressed powder	Pressed powder, fused glass beads, solids or loose powder.	Pressed powder, fused glass beads, solids or loose powder.
Results unit	%	%	%	%	%
Sample type	Solid geological	Solid geological	Solid geological	Minerals, metals, cement, ceramic, glass, particulate matter on air filters, biological materials and polymers.	Minerals, metals, cement, ceramic, glass, particulate matter on air filters, and polymers.
Method	ED XRF + Fundamental Parameters	ED XRF + Fundamental Parameters	ED XRF + Fundamental Parameters	ED XRF + Fundamental Parameters	ED XRF
Analytes	Al_2O_3[5], CaO[5], Fe_2O_3[3], K_2O[2], MgO[7], MnO[1], Na_2O[1], P_2O_5[3], SiO_2[6], SO_3[4], TiO_2[1].	Al_2O_3[9, 11], CaO[8,10], Fe_2O_3[8, 11], K_2O[8,10], MgO[8,10], MnO[8,10], SiO_2[9,12,13], SO_3[8,10], TiO_2[8,10].	Al_2O_3[14,19,22], CaO[14,18,22], Fe_2O_3[14,19,22], K_2O[14,17,22], MgO[14,20,22], MnO[14,17,22], Na_2O[15,17,22], SiO_2[16,21,23] TiO_2[14,17,24].	Potential analyses requiring development and/or validation	Energy range (keV): 1 to 40
LLD	< 0.1 %	[8]: < 0.1 % [9]: < 0.3 %	[14]: < 0.1 % [15]: < 0.2 % [16]: < 0.5 %		Semi-quantitative
Maximum Concentration	[1]: < 10 % [2]: < 20 % [3]: < 40 % [4]: < 50 % [5]: < 60 % [6]: < 70 % [7]: > 90 %	[10]: < 10 % [11]: < 20 % [12]: > 70 %	[17]: < 10 % [18]: < 20 % [19]: < 30 % [20]: < 50 % [21]: < 80 %		
Deviation	≤ 0.6 %	≤ 0.06 % [13]: < 0.7 %	[22]: ≤ 0.07 % [23]: < 0.12 % [24]: < 0.3 %		
Average Precision	0.05	0.03	0.01		
Average Accuracy	0.09	0.04	0.09		
Approximate analysis time per sample	15 min	8 min	11 min	20 min	20 min