Announcing the publication of a unique new XRF book

Guidelines for XRF Analysis

Setting up programmes for WDXRF and EDXRF

James Willis
Clive Feather
Ken Turner

Guidelines for XRF Analysis contains everything you've ever wanted to know about setting up successful XRF analytical programmes. This book is loaded with detailed analytical guidelines for geological materials, commodities and industrial materials that are suited to analysis by XRF.

It is a one stop XRF reference manual, and no XRF laboratory should be without it. Sample preparation describes well-tried and tested methods, and there is sufficient theory to enable the reader to gain maximum advantage from the book. Trace elements, grouped by spectral region, are carefully evaluated, and the authors, with a combined XRF experience of over 130 man years, share with you their accumulated knowledge, "tricks-of-the-trade", and information on

- Optimum settings for WDXRF and EDXRF instrumentation
- The most suitable analyte spectral lines
- The best background positions to measure
- Identification and correction of line overlap, and
- Choice of procedures for matrix correction

Determine with confidence fluorine to uranium, atomic number 9 to 92, in a wide range of materials.

If you are working on any of the following commodities or materials, you need this book. Commodities and materials chapters are self-contained and have all the information needed to analyse:

- Silicate rocks
- Exploration samples
- Alloys of precious metals
- Activated carbon and catalysts
- Ferrochrome & Ferromanganese
- Lateritic nickel ores
- Iron ores and slags
- Aluminium ores and alumina
- Mineral sands & heavy minerals
- Refractories and ceramics
- Plastics and polymers
- Fuels, oils and wear metals
- Metal alloys
- Coal and coke
- Environmental materials
- Sulphide base metal ores
- Uranium ores and "Yellow cake"
- Cements and carbonates

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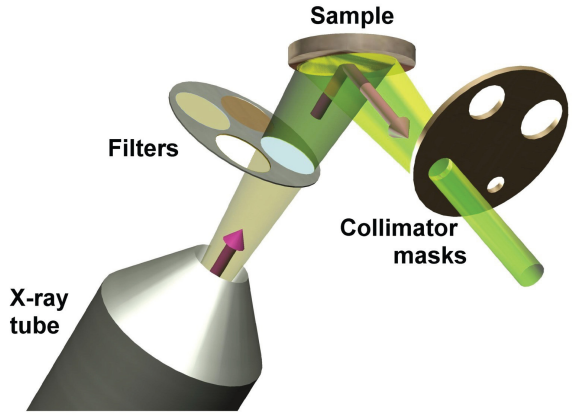

Figure 4-10. The location of primary beam filters and collimator masks in a WDXRF spectrometer. Collimator masks, with different apertures that match sample cup apertures, are located between the sample and the primary collimator. They are used to ensure that only radiation from the sample reaches the collimator.

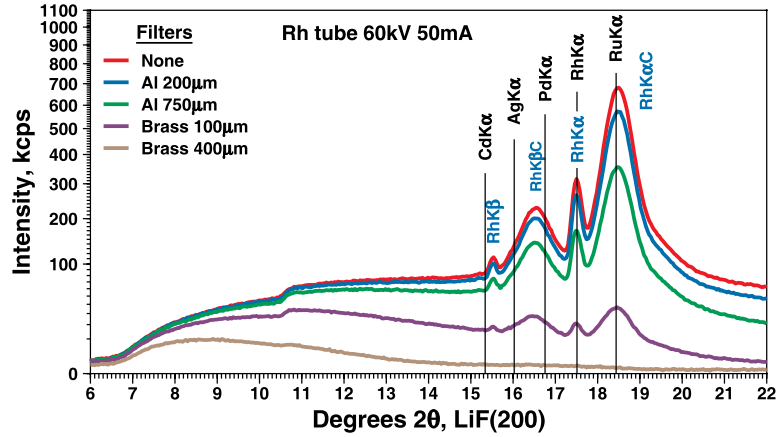

Figure 4-11. The removal using primary beam filters of Rh tube K lines interfering in the determination of Cd, Ag, Pd, Rh and Ru.

for these elements the FOM values are the same or better with or without a primary beam filter.

For elements such as Mo, Nb, Zr, Y, Sr and Rb the use of a "thick" or "thin" brass filter is counter productive. Although they reduce the background considerably, they also filter out all or most of the Rh K lines which are the prime exciting wavelengths of the K lines of elements Mo to Rb and the L lines of elements U to Pb.

Example of a page of the book showing WDXRF and EDXRF spectral scans, analyte peaks, background positions and potential line overlaps.

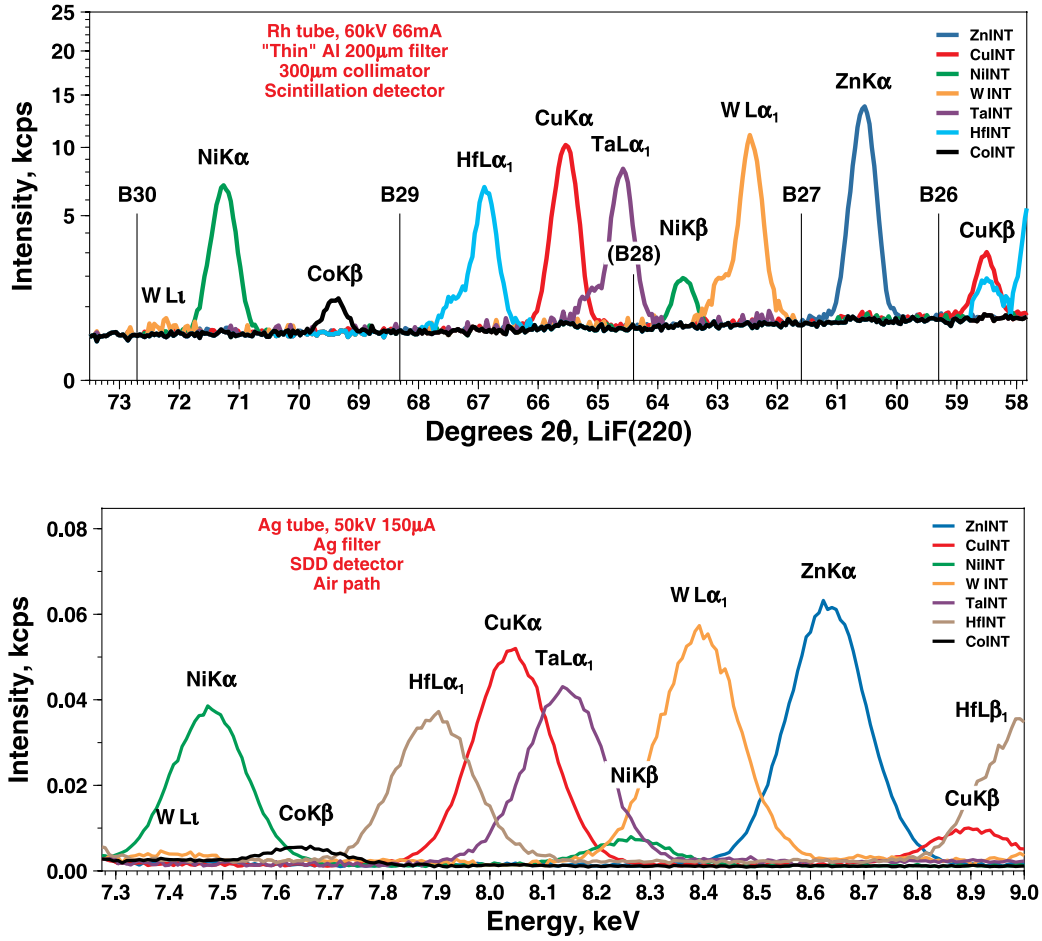

Figure 11-7. WDXRF (Top) and EDXRF (Bottom) spectra over Zn, Cu and Ni K lines and W, Ta and Hf L lines; 1000 ppm for K lines and 2000 ppm for L lines.

Select the counting time for each set of analysis conditions such that measurements will yield the required precision (counting errors) and LLDs (see Chapter 4, Section 4.3.12).

11.3 ADDITIONAL COMMENTS

A common problem with this group of elements is the presence of impurities in the tube target or tube housing, especially Cu and Ni. The result is small peaks of Cu and Ni in the tube spectrum that are scattered off the sample (Figure 11-8). The fact that the net intensities of the peaks are present in all blank samples, and in inverse proportion to the sample MAC, is a sure indication that the peaks are part of the tube spectrum and do not arise from Cu and Ni in the samples. The tube peaks are part of the background and their intensity must

Example of pages taken from Tables 32-4 and 32-5 in the Tables chapter.

Table 32-4 (cont). Recommended WDXRF instrumental parameters for the determination of major, minor and trace elements, and 2θ angles for peak and background positions for different analysing crystals.

		Rh tube					Analysing crystal degrees 2θ		
Element	Line	kV/mA	Filter	Crystal	Collimator	Detector	LiF(420)	LiF(220)	LiF(200)
B28								64.4	44.3
Ta	$L\alpha_1$							64.61	44.42
Cu	Kα							65.56	45.03
Hf	$L\alpha_1$							66.89	45.88
B29								68.3	46.8
Lu	$L\alpha_1$		None/ **"thin" Al**	**LiF(220)**/ LiF(200)	Fine/ **Medium**	SC		69.31	47.43
Co	Kβ	60/max						69.38	47.47
Ni	Kα							71.27	48.67
Yb	$L\alpha_1$							71.90	49.06
B30								72.7	49.6
Dy	$L\beta_1$							73.83	50.28
Tm	$L\alpha_1$							74.65	50.79
Fe	Kβ		No filter		Fine			76.16	51.73

Table 32-5 (cont.). Analyte elements, analyte lines and possible spectral overlaps.

Analyte element	Analyte line	Possible spectral overlaps
Ge	Kα	W $L\beta_2$, Hg $L\alpha_2$, Ta $L\beta_5$, W $L\beta_3$
Ga	Kα	Ta $L\beta_1$, Ta $L\beta_4$, Hf $L\beta_2$, Hf $L\beta_3$, Pb Lι
Zn	Kα	Cu Kα, Cu Kβ, W $L\alpha_{1,2}$, Ta Lη
Cu	Kα	Ta $L\alpha_{1,2}$, Ni Kβ, W $L\alpha_{1,2}$, Hf Lη
Ni	Kα	W Lι, Zr Kα(2), Co Kβ
Co	Kα	Fe Kβ, Er $L\alpha_1$, Hf Lι, Tb $L\beta_1$, Er $L\alpha_2$, Nd $L\gamma_{3,2}$
Fe	Kα	Mn Kβ