Benefits of improved resolution for EDXRF

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The accuracy and precision of energy dispersive X-ray fluorescence (EDXRF) clearly get better with improvements in detector energy resolution, count rates, and sensitivity. However, there is always a trade-off between the highest energy resolution and the highest count rates, there are practical difficulties in achieving the very best energy resolution, and there are many system level issues beyond energy resolution alone. Energy resolution is commonly used to differentiate systems but it is not entirely clear how much one benefits from improved energy resolution, in terms of the accuracy and precision of the analytical results in a realistic system. In the results reported here, EDXRF analysis has been carried out on a set of reference alloys. Several different detectors were used, including Si-PIN, silicon drift diodes (SDD), and CdTe detectors. Their operating parameters were adjusted to give a range of energy resolutions. At 5.9 keV, the resolution ranged from 134 eV FWHM for the SDD, to 300 eV for 25 mm2 Si-PIN at elevated temperature, to 600 eV for the CdTe. The source was a 40 kVp Ag anode X-ray tube used in a backscatter geometry and the spectra were analyzed using the XRF-FP software. The accuracy and precision of the analysis results versus detector resolution and count rate will be presented.