IMPROVING TRACE ELEMENT DETECTION IN EDXRF BY REDUCING PILEUP ARTIFACTS

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Pileup artifacts appear in energy-dispersive X-ray spectra at high count rates when X-rays arrive at the detector with time separations less than the resolving time of the pulse processor. These artifacts often appear as extra peaks in the spectrum and can mask (or be mistaken for) weak peaks of trace elements. In X-ray fluorescence (XRF) the background is very small compared to charged-particle excitation techniques. This makes it ideal for trace element quantification but also makes it particularly susceptible to pileup artifacts.

Recent improvements in high-speed digital discrimination have improved rejection of near-simultaneous events leading to pile-up at very high count rates. This new capability also improves the predictability of pileup rejection, which is essential for accurate modeling and reliable removal of the inevitable events that get past the pileup inspection. We have successfully reduced pileup artifacts by a combination of hardware changes and software correction. We will report the results for a variety of spectra to demonstrate their effectiveness.

To evaluate the effect of pileup artifacts on trace element determination, we will show spectra from trace amounts of Zr in a Ni alloy with and without the new pileup rejection methods.