Matrix Correction For Improving the Calibration Accuracy of FP Model

XRF process is accurately modeled by fundamental parameter algorithm (FP). There are two widely used flavors of FP algorithms:

1) The FP algorithm that is based on x-ray physics and fundamental parameters such as x-ray emission probability and absorption coefficients
2) Lachance-Traill algorithm that is an approximation of the first flavor.

The advantage of the first flavor is that the model is accurate. If all the input parameters are accurate, the calculated chemistry should be accurate. The disadvantage is that in practice, the inputs including fundamental parameters have errors, and only a few major x-ray lines are actually used in computer modeling. Consequently, the calculated chemistry has errors.

The advantage of the second approach is that it is simple to implement and it has adjustable parameters to compensate for the errors introduced by input parameter errors. The disadvantage is that the empirical model is an approximation and its application range is limited.

Our work combines the benefits of both together: use flavor 1 to calculate chemistry as the first step; then use empirical adjustable parameters called matrix correction factors to compensate for the errors introduced by fundamental parameters as the second step. The resulting algorithm is better than either flavor: its application range is not limited and its overall accuracy is a much better than flavor 1.