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LA-ICP-MS and EMP relationships on pyrite grains from the Sheba, Fairview, and New Consort Gold Mines, Barberton Greenstone Belt, South Africa: An attempt for quantification.

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Laser Ablation Induced Coupled Plasma Mass Spectrometry (LA-ICP-MS) count per seconds (cps) results were tested for quantification, using the same spot analyses of Electron Microprobe Analyses (EMP) in wt. %, which obtained from selected pyrite grains from Sheba, New Consort, and Fairview gold mines of the Barberton Greenstone Belt (BGB). Theoretically, data obtained from the same pyrite grains, using two different techniques must represent, to some extent, the same composition, but not exclusively the same values. This comes because they applied to the same spots, and within the same pyrite grains. Yet, the results of the two techniques used here are not directly comparable. In order to avoid any unpredictable fluctuation in ablation rate due to intrinsic differences between pyrite grains, the data for each analysis were summed up, and normalized to the sum of the all reported isotopes. In this way, analytical errors, which can cause by lower detection limits and the heterogeneity nature of the analysed grains, and inter-element fractionation, which might result from non-stoichiometric sampling during the ablation process, or incomplete vaporization of large particles (>125 nm) in the plasma, could be compensated. Regardless of the all corrections in the (cps) values, uses of the raw (cps) data, uses of sum of all counts, uses of sulphur as internal standard, and uses of iron as internal standard, no kind of any elemental relationships was observed between the results of the two techniques.

The compatibility between LA-ICP-MS and EMP data distributions, which observed from probability plot, indicates possible (uncertain) relationships between the two datasets. This implies that there are relationships, but it is not noticeable. The arithmetic mean can't be practice as descriptive parameters for these data sets, since the datasets are not normally distributed. The regularity of the distribution for the EMP and LA-ICP-MS results was tested using probability plot (P-P) technique. It shows slight indication for normal distribution for both (Fe and Ni) values of EMP and LA-ICP-MS results, also it generally reflects that the distributions of both datasets at the same analysed spot are very similar, suggesting thought of well-matched distributions of both techniques can be existed. Boxplot graphical technique was also used to depict any existing relationship between EMP and LA-ICP-MS results (Figure 1). However, plotting doesn't indicate any kind of similarity in the distributions of major or trace-elements in pyrite of both datasets. The comparative statistical methods show that the data obtained by EMP and LA-ICP-MS are log-normally distributed, it also suggests to some extent, that there are similarity patterns of the two techniques distribution. However, these similarities are not reflecting any kind of direct or linear (systematic) relationships. This believed to be caused by one or more of these factors: **(a)** the differences in the ablation rate during the LA-ICP-MS machine running, **(b)** the instrumental problems, **(c)** variations in spot size and depths that used in both techniques, **(d)** inclusions effect, and **(e)** probably the sensitivity and limits of detection for the two techniques.

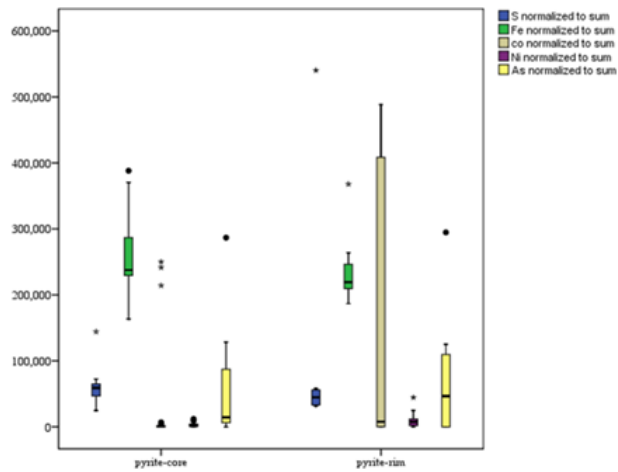


Figure 1: Variation in element contents between cores and rims of the selected pyrite grains from the Fairview Mine, which cusses the observed variations between the isotopes of two pyrite types.

