Chapter 4
CONCLUSIONS

From this present study it can be concluded that: (1) The use of pure Cu as the single conducting compacting material for nonconducting powder GDAES analysis is insufficient. This is because of the persistent present of the OH species present in the GD plasma during the sputtering of the pure Cu disk. The OH species can negatively affect the sputtering and excitation process. (2) Matrix modification with Ta at a ratio of 7:3 (Cu:Ta) can effectively remove reactive species such as OH which interfere with the GD plasma atomic emission measurements. NH and H species appear to be persistent in the GD plasma in the pure Cu and Cu-Ta compacted disks, however these species do not interfere with plasma atomic emission measurements. (3) Quantitative application for the analysis of $BaSO_4$ and metal oxides in the geological reference material, DNC-1, has been demonstrated to be feasible. The persistency of oxygen-rich reactive species when using pure Cu as the compacting matrix material causes emission intensity of the analytes to be lowered. Matrix modification with Ta at a ratio of 7:3 (Cu:Ta) is able to remove OH species plasma which comes from these oxygen containing samples effectively from the GD plasma. Emission intensity of the analytes were therefore higher than when using the pure Cu as compacting material. The calibration plots for Ba, Al, Ca, Fe, Mg, Si and Ti from these nonconducting powder material demonstrated satisfactory linearity. This shows that matrix effects due to variable textural and chemical composition between the sample and Cu-Ta conducting material is small. (4) Spectral interference especially in elements which show weak emission intensity is due to the poor resolution of the spectrograph-PDA detector system; the lesser stability of the PDA detector also make accurate and precise intensity measurement difficult.

Suggestions for Future Work

Improvements to the present GDAES system can be made so as to enable this system to conduct accurate and precise quantitative analysis.

Optical detection system with higher resolution and photon detector of higher stability can be utilized to improve sensitivity and detection limits, for example the use of a polychromator coupled to photomultiplier tubes (PMT) tubes as detector. The polychromator system is able to overcome spectral interference since it is able to give higher spectral lines resolution. PMT which are more stable and sensitive compared to PDA detectors allows for more reproducible and precise emission intensity measurements.

Improvement in the fabrication of the GDAES source by using more precise and accurate cutting tools to fabricate parts of the GD source can better the physical performance of the GDAES source. Besides this, betterment in the powder mixing and disk compacting procedures are also necessary to form a more “solid” compacted disk to further reduce the time for attaining the steady state.