Determination of low concentrations of calcium and iron in fluid inclusions by laser ablation dynamic reaction cell or medium resolution ICP-MS

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Plasma based interferences are a severe issue for determining low concentration of calcium and iron (e.g. a few μg/g or lower) by LA-ICP-MS in small features like fluid inclusions. To get rid of those interferences to achieve lower detection limits, either enhanced mass resolution or chemical resolution can be used to separate analyte ions from interferences. Sector field instruments can use a higher mass resolution to distinguish between an interfering ion and the analyte ion. Whereas a resolution of 4000 is required to separate $^{40}Ar^{16}O^+$ from $^{56}Fe^+$, a separation of $^{40}Ca^+$ and 40Ar+ is beyond the scope of those instruments. On the other hand, chemical resolution by e.g. a dynamic reaction cell (DRC), can reduce the contribution of $^{40}Ar^+$ on the major isotope of calcium and $^{40}Ar^{16}O^+$ on the major isotope of iron heavily, providing lower detection limits for these elements [1]. However, using a DRC has the risk of introducing new interferences undermining the multi-elemental possibility of the method.

Since the occurrence of suitable fluid inclusions for LA-ICP-MS is limited and they contain a limited amount of material, the multi-element capability of an optimized method for calcium and iron determination is important. In this study, the suitability of using a DRC with a quadrupole or higher resolution on a sector field ICP-MS for fluid inclusion analyses for lower iron and calcium detection limits while maintaining the multi-element capability of the method was investigated. The detection limit for calcium and iron could be lowered with the e.g. DRC by an order of magnitude while keeping the sensitivity on most of the other elements. Only elements with a high ionization potential like sulphur and chlorine suffered from a severe depression in the DRC.

[1] Günther *et al*. (2001) *J. Anal. At. Spectom*. **16**, 1085-1090.