# $^{176}Hf/^{177}Hf$ ratios: Chemical resolution of $^{176}Yb$ and $^{176}Lu$ interferences using an MS/MS capable ICP-MS

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The measurement of Hafnium isotope ratios is important as this can provide insight into the different geological environments and events that the mineral underwent during its formation/metamorphosis. The isotopes of interest are $^{176}Hf$ and $^{177}Hf$; the 177 isotope is relatively free from interference but the 176 isotope suffers isobaric overlap from both $^{176}Lu$ and $^{176}Yb$.

The "Physical" Resolution required to separate Hf from its isobaric interferences is far higher than commercial High Resolution Sector Field Inductively Coupled Plasma Mass Spectrometers (SFICP-MS) can achieve (~140,000 for $^{176}Lu$ & >150,000 for $^{176}Yb$) meaning sample preparation is required prior to analysis; this also means the in-situ measurement for example by Laser Ablation (LA) is not possible.

An alternative approach is "Chemical" Resolution; this is where a targeted ion-molecule reaction is used to either a) react with an interfering species to eliminate it or b) react with the analyte and move it to a different non-interfered mass. The second approach is used in this situation as Hf efficiently reacts with ammonia to form Hf-ammonia clusters whilst Lu and Yb barely react.

Control over the reaction process is essential especially if isotopic information is to be preserved and potential new interfering species are to be eliminated. To this end a MS/MS capable ICP-MS (or Triple Quad; QQQ-ICP-MS) was used to investigate the potential for this application using ammonia Chemical Resolution in a varied Lu, Yb and mixed REE environment. Further benefits of this reaction scheme can be applied for the simultaneous Chemical Resolution of $^{204}Hg$ on $^{204}Pb$.