In Situ Isotopic Analyses Using a New Generation Collision Cell Mass Spectrometry

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Recently, the discovery of planetary scale correlation of neutron-rich iron group isotopic heterogeneities in meteorites has been applied as fingerprint for exploring planetary evolution in the solar system [1-2]. The magic neutron number iron group isotopes, ^{48}Ca and ^{50}Ti, were possibly contributed from late stage of rare accretion induced high density supernovae [3]. However, the carrier phases of those isotopic anomalies are still unclear. Such phases need to be sought by *in situ* analysis but isobaric species from neighbouring isotopes, e.g. ^{48}Ti and ^{50}Cr, interfere during isotopic measurements without proper chemical separation.

A new generation mass spectrometer, the Proteus [4], has been installed at the Bristol Isotope Group in July 2015. This multi-collector, inductively coupled plasma source mass spectrometry incorporates a collision cell technique to remove elemental interferences during instrumental isotopic analysis without chemical purification process, such as ion chromatography. Therefore, it is possible to make calcium and titanium isotopic measurements with a laser ablation system on pre-solar phases and using reaction gases, such as oxygen to separate Ti from Ca and thus remove the critical isobaric interferences. Here we report on initial work to characterise the behaviour of the instrument, both in terms of separation of Cr, Ca and Ti in the collision cell and the performance of multiple multipliers to measure the small ion-beams generated by ablation of micron-sized ablation pits.

[1] Trinquier *et al*. (2009) Science 324, 374. [2] Chen *et al*. (2011) ApJ, 743, L23 [3] Woosley (1997) ApJ, 476, 801. [4] Elliott et al. (2015) Goldschmidt Abstracts 25, 824..