

POTENTIAL RELATIONSHIP BETWEEN TITANIUM AND ZIRCONIUM ISOTOPE HETEROGENEITIES WITHIN SOLAR SYSTEM MATERIALS.

N. H. Williams¹, W. M. Akram¹ and M. Schönbachler¹. ¹SEAES, The University of Manchester, M13 9PL, UK. E-mail: Niel.Williams-2@postgrad.manchester.ac.uk.

Introduction: Isotopic heterogeneities in the neutron-rich isotopes ⁹⁶Zr and ⁵⁰Ti between bulk carbonaceous chondrites and the Earth-Moon system are now well established [1, 2, 3]. Previous work indicated that ⁹⁶Zr and ⁵⁰Ti anomalies in calcium-aluminum rich inclusions (CAI) might be correlated [4, 5]. This raises the question, whether Ti and Zr anomalies in bulk solar system materials are linked to the same carrier phase (i.e., CAI), which was heterogeneously distributed within the solar system. A potential ⁹⁶Zr-⁵⁰Ti correlation may help to identify (i) a common nucleosynthetic site, in which these anomalies were generated and/or (ii) the processes experienced by the carrier phase(s) that allowed the specific nucleosynthetic signature to be preserved. A recent study revealed a linear relationship between ⁴⁶Ti and ⁵⁰Ti isotope anomalies within CAIs, bulk meteorites and the Earth, when normalizing to a fixed ⁴⁹Ti/⁴⁷Ti ratio [3]. The isotopes ⁴⁶Ti and ⁵⁰Ti have a different nucleosynthetic production site [6], which indicates that most likely processes within the solar system lead to the observed ⁴⁶Ti-⁵⁰Ti correlation.

In order to better constrain the potential relationship of Zr and Ti isotope anomalies in our solar system, we will obtain high precision Ti isotope analyses on a wide variety of solar system materials, which were previously analyzed for Zr isotopes [1].

Analytical techniques: Titanium is separated via a two-step ion exchange procedure previously described in [7, 8]. The Zr data is reported elsewhere [1]. Samples are further purified using an additional separation step involving AG50-X8 cation resin. The resin is cleaned with 4M HNO₃, then preconditioned and the samples are loaded onto the column in 0.25M H₂SO₄ - 1% H₂O₂. Titanium is separated from Ca, Cr and V and other matrix elements in 4M HNO₃.

All five Ti isotopes are analyzed simultaneously on a HR Nu plasma MC-ICPMS at high resolution. The samples are bracketed by an Alfa Aesar Ti standard solution. Instrumental mass fractionation is corrected using the exponential law relative to ⁴⁹Ti/⁴⁷Ti. Calcium, V and Cr corrections are applied to account for isobaric interferences on ⁴⁸Ti (Ca) and ⁵⁰Ti (V and Cr). Samples are introduced in 0.5M HNO₃ - 0.005 M HF mixtures by means of desolvating nebulizer.

The samples to be analyzed include solar system material from various heliocentric distances: the geostandards BHVO2 and Cody Shale, four carbonaceous chondrites (Allende, Murchison, Colony and Orgueil), two ordinary chondrites (Richardton and Forest Vale), two eucrites (Pasamonte and Sioux County), CAIs from Allende and lunar basalts.

References: [1] Akram W. M. et al. 2011. Abstract #1908. 42nd Lunar & Planetary Science Conference. [2] Leya I. et al. 2008. *Earth and Planetary Science Letters* 266:233-244. [3] Trinquier A. et al. 2009. *Science* 324:374-376. [4] Leya I. et al. 2009. *The Astrophysical Journal* 702:1118-1126. [5] Harper C. L. et al. 1991. Abstract #1257. 22nd Lunar & Planetary Science Conference. [6] Clayton D. 2003. *Handbook of Isotopes in the Cosmos: Hydrogen to Gallium*. Cambridge Univ Press. [7] Schönbachler M. et al. 2004. *Analyst* 129:32-37. [8] Leya I. et al. 2007. *International Journal of Mass Spectrometry* 262:247-255.