

### POTENTIAL NUCLEOSYNTHETIC SOURCES OF THE TITANIUM ISOTOPE VARIATIONS IN SOLAR SYSTEM MATERIALS.

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**Introduction:** Different neutron rich isotopes (<sup>50</sup>Ti, <sup>54</sup>Cr, <sup>62</sup>Ni and <sup>96</sup>Zr) display well documented isotopic heterogeneities between various meteorite groups and the Earth-Moon system [1-6]. The origin of these variations is not well understood. It has been suggested that the observed Ti isotope pattern in bulk solar system materials was generated by thermal events during solar system formation [2]. An alternative explanation is that these anomalies are due to distinct presolar carrier phases, which were heterogeneously distributed within the solar system. In order to evaluate the nucleosynthetic site(s) responsible for the observed Ti isotope signatures, a comprehensive sample suite of solar system materials were analyzed to complement previous studies [1, 2, 6]. Nucleosynthetic models for (i) Ia supernovae [7], (ii) supernovae II [8] and (iii) TP-AGB stars [9] are evaluated to establish the nucleosynthetic source of isotopic correlations observed in Iron group elements and Zr.

**Analytical techniques:** Titanium was separated following the procedure described in [10] for Zr purification. An additional separation step was added, which was adapted from the first ion exchange column of [10]. All five Ti isotopes were analyzed simultaneously on a Neptune MC-ICPMS at medium and high resolution. The samples were bracketed by an Alfa Aesar Ti standard solution. Instrumental mass fractionation was corrected using the exponential law relative to <sup>49</sup>Ti/<sup>47</sup>Ti. Calcium, V and Cr corrections were applied to account for isobaric interferences on <sup>46</sup>Ti (Ca), <sup>48</sup>Ti (Ca) and <sup>50</sup>Ti (V and Cr).

**Results and discussion:** Three Allende CAIs, fifteen carbonaceous (CI, CM, CV, and CR), three ordinary and two enstatite chondrites, seven eucrites, an ureilite, a lunar basalt and four terrestrial samples were analysed. Our results are in good agreement with previous studies [1, 2, 6]. Interestingly, Murchison (CM2) dissolved by a microwave digestion yielded a  $\epsilon^{50}\text{Ti}/^{47}\text{Ti}$  of  $+5.2 \pm 0.1$ , while the more rigorous Parr bomb digestion yielded a  $\epsilon^{50}\text{Ti}/^{47}\text{Ti}$  of  $+2.9 \pm 0.1$ . This indicates that anomalous <sup>50</sup>Ti is hosted in a presolar phase that is not destroyed by the microwave digestion and this excludes silicon carbide grains as a carrier phase. The  $\epsilon^{50}\text{Ti}/^{47}\text{Ti} - \epsilon^{46}\text{Ti}/^{47}\text{Ti}$  diagram reveals a strong positive correlation with a slope of  $5.6 \pm 0.1$  similar to previous studies [2, 6]. Preliminary results using the SNII model of [8] confirms the result of [11] and indicates that the correlation observed between  $\epsilon^{50}\text{Ti}/^{47}\text{Ti} - \epsilon^{46}\text{Ti}/^{47}\text{Ti}$  can be reproduced in the O/Ne zone.

**References:** [1] Leya I. et al. 2008. *EPSL* 266:233-244. [2] Trinquier A. et al. 2009. *Science* 324:374-376. [3] Trinquier A. et al. 2007. *APJ* 655:1179-1185. [4] Steele R.C.J. 2011. *GCA* 75:7906-7925. [5] Akram W. M. et al. 2011. Abstract #1908. 42<sup>nd</sup> LPSC. [6] Zhang J. et al. 2012. *Nature Geoscience* 5:251-255. [7] Travaglio C. et al. 2004. *APJ* 425:1029-1043 [8] Rauscher T. et al.2002. *APJ* 576:323-348.[9] Cristallo S. et al. 2009. *APJ* 696:797-820. [10] Schönbächler M. et al. 2004. *Analyst* 129:32-37. [11] Steele R.C.J. et al. 2012. Abstract #2354. 43<sup>rd</sup> LPSC.