



CONTINUING SIMS TRACE ELEMENT STUDY OF PRESOLAR GRAPHITE GRAINS

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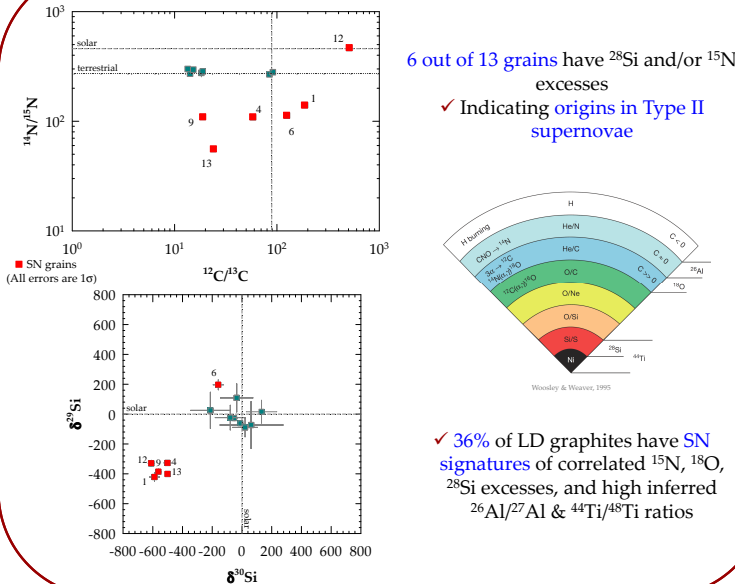
Previous trace element studies – SiC & graphite

- Quantitative trace element studies have been carried out on **bulk SiC fractions** [1, 2] and **individual presolar SiC grains** [e.g., 3 – 6].
 - Amari et al. [3] compared trace element abundance patterns in SiC grains to results of **condensation calculations for circumstellar environments** [7] in order to associate grains with different C-rich stellar environments.
- Very few** published studies attempt to quantify the **abundance and distribution of trace elements in presolar graphite grains**.
 - Isotopic & TEM studies indicate **lower trace element abundances** compared to presolar SiC grains [e.g., 8 – 13].
 - Mg, Al, Si, Ca – incorporated in **parent grain** during primary graphite crystallization
 - Ti, Zr, Ru, Mo, Fe, and Ni – concentrated within early crystallizing **subgrains**
 - Low density (LD) graphites** are good accommodators of trace elements in their structure. Also, each grain is known to contain abundant TiC subgrains (~2400 ppm) [12] that have their own unique trace element compositions.
 - Excellent candidates** for trace element measurements compared to HD grains

Experimental details

- 13 LD Orgueil graphites** (OR1d: $\rho \sim 1.75 - 1.92 \text{ g cm}^{-3}$; diameters = 5 – 11 μm)
- Cameca ims 1280 ion microprobe** at the University of Hawai'i
 - Scanning ion images** in a combination of multi-collection & peak-jumping mode
 - 30-60 pA O⁻** primary beam focused to ~1 μm , rastered over 12x12 μm^2 regions
 - Stage 1: ¹²C, ²⁴Mg, ²⁸Si, ⁴⁴Ca, ⁴⁷Ti, ⁵¹V, ⁵⁶Fe
 - Stage 2: ¹²C, ⁴⁵Sc, ⁵⁶Fe, ⁶⁰Ni, ⁶²Ni, ⁸⁵Rb, ⁸⁶Sr, ⁸⁹Y, ⁹⁰Zr, ⁹³Nb
 - Cs⁺** primary beam: C, N, and Si isotopes
 - O₂ flooding used to increase ion yield
 - Measured synthetic SiCs and USGS24 as standards
 - L'image used for data reduction

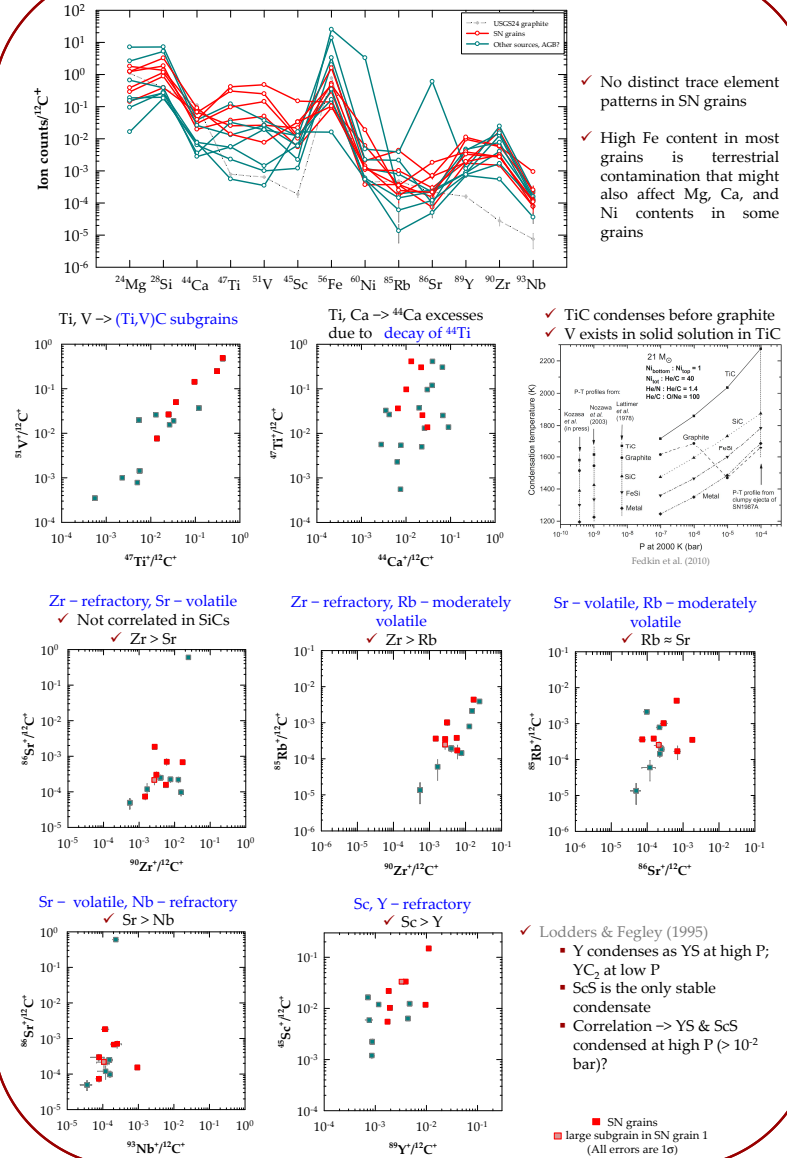
C, N, and Si isotopic characteristics



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References
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Trace element data



Future perspectives

- Standardization
 - Absolute elemental abundances
 - Enrichment & depletion relative to chondritic values
 - Enrichment & depletion relative to SiC abundances → compare chemistry of circumstellar environments of SiCs and graphites
 - Provide abundance estimates for measurements with CHILI
- Examine evidence for contamination