**ISOTOPIC COMPOSITION OF PRESOLAR SILICON CARBIDE GRAINS ANALYZED WITH CHILI.**

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**Introduction:** The Chicago Instrument for Laser Ionization (CHILI), a resonance ionization mass spectrometry (RIMS) instrument, is designed for isotopic and chemical analysis at the ~10 nm scale with a useful yield of ~40 % [1,2]. After several years of instrument development, we report the first analyses of presolar grains performed with CHILI. Preliminary results on a subset of the grains were reported previously [3].

**Samples and analytical procedures:** Twenty-two presolar SiC grains from Murchison separate KJG were analyzed for Sr, Zr, and Ba isotopes. Six tunable Ti:sapphire lasers allow simultaneous resonance ionization of three elements with two-photon ionization schemes. Atoms were desorbed with a 351 nm laser beam, focused to ~1 µm using a Schwarzschild optical microscope. Standards showed isotopic precision in the few ‰ range.

**Results and discussion:** Ten of the 22 grains selected had sufficient Ba content for isotope analysis with CHILI, and eight of these ten grains also had sufficient Sr concentration. However, none of the grains had detectable Zr. The reason for the nondetection of Zr is unclear. Previous analyses [4–7] suggested that 30–50 % of presolar SiC grains should have detectable Zr.

Seven grains have Sr and Ba isotopic ratios similar to those previously observed in mainstream SiC grains [8,9], consistent with formation in low-mass asymptotic giant branch (AGB) stars.

Relative to $^{86}$Sr and $^{136}$Ba, another grain is depleted in $^{84}$Sr, $^{87}$Sr, $^{134}$Ba, and $^{135}$Ba and enriched in $^{88}$Sr, $^{137}$Ba, and $^{138}$Ba. This is consistent with formation in a neutron burst caused by a shock wave passing through ejecta of a type II supernova. Calculations predict that $^{137}$Ba and $^{138}$Ba should be similarly enriched relative to $^{136}$Ba after complete decay, but much of the $^{137}$Ba comes from $^{137}$Cs ($t_{1/2}$ = 30 a) [10]. Our results, $\delta^{137}$Ba = (+310±100) ‰ and $\delta^{138}$Ba = (+1670±180) ‰ (2σ errors), would indicate grain formation within a few years of a supernova explosion.

Two other grains are depleted in $^{84}$Sr, $^{87}$Sr, and $^{88}$Sr (or enriched in $^{86}$Sr) and enriched in $^{134}$Ba/$^{136}$Ba relative to mainstream grains [8,9]. These patterns are very difficult to produce in AGB stars, but might be produced in supernova ejecta.

**Conclusions and outlook:** CHILI has analyzed its first natural samples and provided first relevant data from presolar grains. Although optimization of CHILI continues, CHILI is already more capable than earlier RIMS instruments. A wide variety of cosmochemical problems will be explored in the near future, including isotopic studies of presolar grains, CAIs, and samples returned to Earth by the Genesis and Stardust spacecraft.

**References:** [1] Stephan T. et al. 2013. *Lunar & Planetary Science* 44:#2536. [2] Stephan T. et al. 2014. *Lunar & Planetary Science* 45:#2242. [3] Stephan T. et al. 2015. *Lunar & Planetary Science* 46:#2825. [4] Nicolussi G. K. et al. 1997. *Science* 277:1281–1283. [5] Amari S. et al. 1995. *Meteoritics* 30:679–693. [6] Lugaro M. et al. 2003. *Astrophysical Journal* 593:486–508. [7] Kashiv Y. et al. 2010. *Astrophysical Journal* 713:212–219. [8] Liu N. et al. 2014. *Astrophysical Journal* 786:66. [9] Liu N. et al. 2015. *Astrophysical Journal* 803:12. [10] Rauscher T. et al. 2002. *Astrophysical Journal* 576:323–348.