ISOTOPIC ANOMALIES PRESERVED WITHIN INTERNAL GRAINS IN HIGH-DENSITY PRESOLAR GRAPHITES. T. K. Croat[1], T. J. Bernatowicz[1], and M. Jadhav[2]. [1]Laboratory for Space Sciences and Physics Dept., Washington University, St. Louis, MO 63130, USA. tkc@wustl.edu. [2]Dept. of Geophysical Sciences, Univ. of Chicago, USA.

Introduction: Large high-density (HD) graphites (> 5 µm) available from the Orgueil meteorite [1] present new opportunities for correlated NanoSIMS-TEM analyses. The internal grains found within HD graphites are often less susceptible to isotopic exchange and dilution than their host graphite, and thus direct SIMS measurements of these small inclusions can provide more accurate and often revelatory isotopic information. Here, we report NanoSIMS isotopic measurements of internal grains within HD graphites found during prior TEM studies [2], including a new ^{29,30}Si-enriched SiC-C grain.

Experimental Methods: Large graphites (>5µm) from the Orgueil OR1f (2.02-2.04 g cm^{-3}, >1 µm) density and size separate were measured for C, N, O, Mg-Al, Si, Ca, and Ti with the NanoSIMS [3, 4]. After isotopic studies, OR1f3m-26 and OR1f3m-34 were embedded in resin, ultramicrotomed and studied in TEM with EDXS, imaging and diffraction [2]. Subsequent NanoSIMS measurements of C, N, O, and Si were made on graphite ultramicrotome sections concentrating on those with inclusion of other refractory phases (including rutile, TiC and SiC).

Results and Discussion: OR1f3m-26 lacked TiCs but did contain a single ~100 nm SiC. Despite its small size, the SiC was obviously detected in Si ion images and isotopic ratios of ^{12}C/^{13}C = 542 ± 40, δ^{29}Si = 202 ± 117 and δ^{30}Si = 251 ± 146 (all w/ 2σ errors) were measured. Despite the large Si errors from limited counting statistics (e.g. only ~ 400 ^{30}Si counts from the SiC), its combined ^{12}C, ^{29}Si, and ^{30}Si enrichments indicate it is a SiC-C grain. The measured graphite cross-sections (excluding the SiC region) showed ^{12}C/^{13}C=611 ± 8, δ^{29}Si = -34 ± 30 and δ^{30}Si = -27 ± 30 (in rough agreement with the prior bulk measurement [3]) and thus lacked a significant Si anomaly. The properties of OR1f3m-26 (e.g., ^{29,30}Si enriched SiC and SiC presence instead of TiC) are similar to two previously-reported SiC-C grains in HD graphite [5], suggesting that both traits are characteristic of this new type of massive star condensate.

Further TEM studies of OR1f3m-34 graphite cross-sections (of suspected AGB origin) have revealed rutile grains (TiO_2; tetragonal; a = 4.8Å, c = 3.2Å) along with the s-process enriched TiCs and metallic RuFe grains reported previously [2]. N and O NanoSIMS measurements of OR1f3m-34 cross-sections that fell on Cu grid bars (e.g. not mapped for Ti-rich inclusions) showed comparable N and O ion yields to low-density SN graphites, but lacked N and O anomalies. They also did not show O hotspots at carbide locations of the type seen in carbide-containing SN graphites [6]. Further NanoSIMS measurements of cross-sections already mapped for Ti-rich inclusions (e.g., those with known TiC and rutile positions) will be presented.

References: [1] Jadhav M. *et al*., (2013) *Geochimica et Cosmochimica Acta* 113, 193. [2] Croat T.K. *et al*., (2014) *Lunar Planet. Sci.* XLV, Abstract #1441. [3] Jadhav M. *et al*., (2011) *Lunar Planet. Sci.* XLII, Abstract #1599. [4] Jadhav M. *et al*., (2010) *Met. Planet. Sci.* 45, A79. [5] Croat T.K. *et al*., (2010) *Astronomical Journal* 139, 2159. [6] Stadermann F.J. *et al*., (2005) *Geochimica et Cosmochimica Acta* 69, 177.