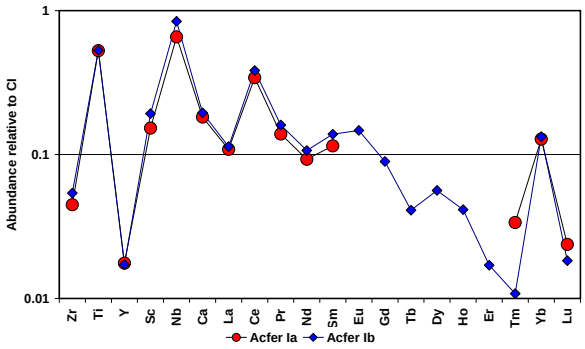
CHONDRULE ACFER I: TRACE ELEMENT ABUNDANCES REFLECT VAPOR FRATIONATION

M.E. Varela[1], E. Zinner[2], and G. Kurat[3] [1]ICATE/CONICET, San Juan, Argentina, evarela@icate-conicet.gob.ar, [2]Dept. Physics, Washington University, St. Louis, MO, USA. [3]Dept. Lithosph. Sci., University of Vienna, Austria.

Introduction: Acfer 182 is a member of the CH-carbonaceous chondrite group characterized – among other features – by chondrules being smaller (~90 μm) than those in most other chondrites and remarkable Ca,Al-rich inclusions [e.g., 1-2].

Results: Acfer 182 (PTS from M6013, NHM, Vienna) is very rich in perfectly round cryptocrystalline (CC) and radiating pyroxene (RP) chondrules. Chondrule Acfer I is a RP chondrule, 140 μm in apparent diameter, with a tiny (~5μm) Ni-free euhedral metal grain in its center. It has a chemical composition (n=4) of: SiO_2: 55.5 wt%, Al_2O_3: 0.23 wt%, MgO: 43.9 wt%, FeO: 0.47 wt%, CaO: 0.26 wt%, $[En_{98.9}Fs_{0.66}Wo_{0.42}]$, with a Ca/Al CI ratio. The tiny metal is rich in Cr (Fe: 96.2 wt%, Cr: 1.97 wt%). Trace element abundances in Acfer I (Acfer Ia and Ib) are very low (0.01- 0.8 x CI) and fractionated. The light REE (LREE) and Eu are around 0.1 x CI, but Ce is relatively high (0.4 x CI). The high REE (HREE) are depleted (~0.02 x CI) with respect to the LREE, except for Yb which is at the same level as the LREE (0.13 x CI). The refractory Y has an abundances similar to Lu (~0.02 x CI), while those of Zr, Sc and Ti are 0.05 x CI, 0.19 x CI and 0.5 x CI, respectively. Niobium shows the highest abundance, close to chondritic (Fig.).



Discussion: The spherical shape of the RP chondrule Acfer I indicates that it was created as a liquid droplet. Its trace element pattern (Fig.) is comparable to that found in Type II CAIs [3] and is very common among CAIs from CH chondrites [e.g., 2, 4]. This pattern reflects vapor fractionation and gives evidence of the formation of chondrule Acfer I by condensation form a vapor that was depleted in refractory elements. The fact that Eu and Yb have comparable abundances indicates that both elements were not fractionated by the refractory phase. Because elements from Gd to Er show smoothly decreasing abundances, with Tm being the least abundant of all HREE the removal of refractory elements must have occurred at very high temperatures.

References: [1] Bischoff et al., (1993) GCA **57**, 2631-2648; [2] Weber et al., (1995) GCA **59**, 803-823; [3] Martin P.M. and Mason B. (1974), Nature **149**, 333; [4] Weber D. and Bischoff A. (1994) GCA **58**, 3855-3857.