

ASU-NWA-216 (K519)

Fabien Kuntz

TKW 475.9g

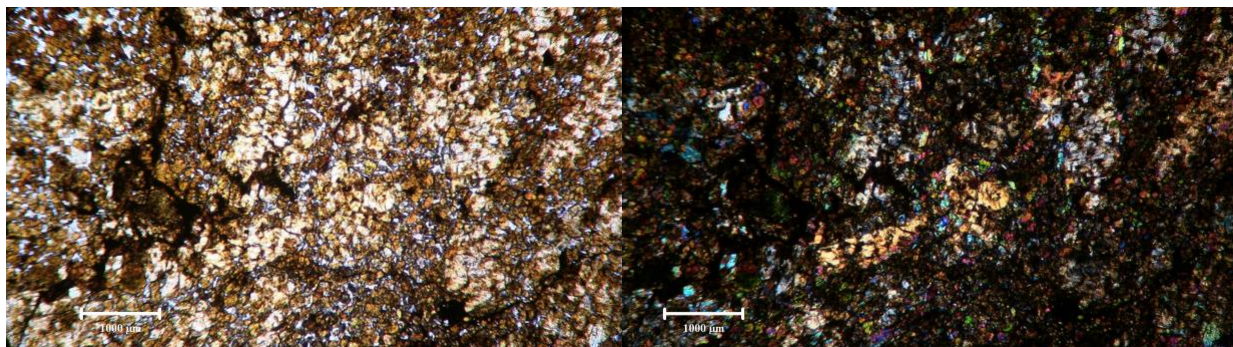
History: Fabien Kuntz purchased the 475.9g sample from a meteorite prospector in Tindouf, Algeria in 2020.

Physical Characteristics: The exterior is dark-brownish orange and irregular shaped. The interior is weathered, dark-brown and has a crystalline texture.

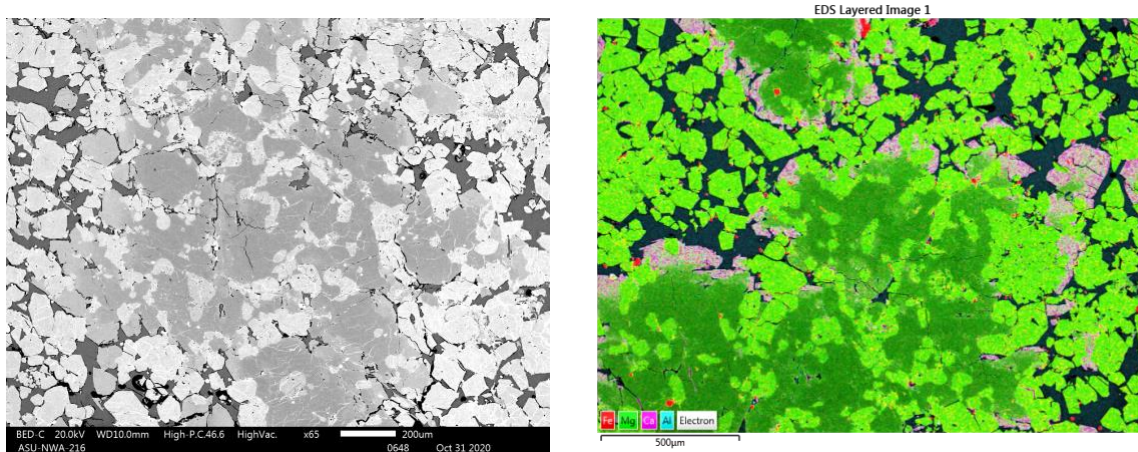
Petrography: Description and classification (A. Love, App) Sample shows poikilitic texture composed of (vol%): 2mm (n=15) orthorhombic pyroxene oikocrysts (31), 114 μ m (n=46), yellow to brown stained, subhedral-euhedral olivine (52) occurring as chadacrysts and phenocrysts. Some pyroxenes are lath-shaped have rims of Ca-rich pyroxene. These phases are set within a vesicular, high-Si (~70wt% SiO₂) glass containing rounded FeS and euhedral chromite. Chondrules are absent. Additional minerals are: rounded blebs of troilite, chromite, apatite, FeOH.



Figs. 1 & 2 Overview photo (F. Kuntz) showing irregular shaped individual and overview photomicrograph showing yellow crystalline texture.



Figs 3 & 4 Detail photomicrograph showing poikilitic texture dominated by olivine chadacrysts and phenocrysts viewed using plane and cross polarized light.



Figs. 5 & 6 BSE image (left) showing poikilitic texture and zoned pyroxene oikocryst surrounded by abundant subhedral-euhedral olivine. Note inclusion free glass and false color X-ray map of same area showing: high-Ca pyroxene rims (pink); phenocrysts surrounding low-Ca pyroxene oikocryst (dark green); interstitial olivine (light green); and feldspathic glass (dark blue).

Shock: Sample contains shock veins and multiple melt pockets. Olivine is stained yellow from shock and shows mosaic extinction.

Weathering: FeNi metal has been altered to FeOH minerals.

Magnetic Susceptibility: Mass magnetic susceptibility was measured using a ZH Instruments SM-30 pocket MS meter. Quadruplicate measurements of the sample produced $\log \chi \times 10^{-9} \text{ m}^3/\text{kg} = 3.86$. Magnetic susceptibility falls within the range measured for LL chondrites (Rochette et al, 2003).

Geochemistry: (A. Love, App) Geochemistry of sample was measured using the JEOL ITS300 SEM with Oxford XMax EDS in the Dewel Microscopy Lab at Appalachian State University. An accelerating voltage of 20kV was used to analyze 3 spots per grain. Compositions are equilibrated.

Olivine ($\text{Fa}25.9 \pm 1.5$, $\text{Fe}/\text{Mn} = 45.1 \pm 1.7$, $n=14$); low-Ca Pyroxene ($\text{Fs}18.2 \pm 0.9$, $\text{Wo}2.3 \pm 1.1$, $\text{Fe}/\text{Mn} = 29.7 \pm 1.7$, $n=5$); high-Ca pyroxene ($\text{Fs}15.0 \pm 1.2$, $\text{Wo}30.7 \pm 2.9$, $\text{Fe}/\text{Mn} = 23.3 \pm 2.8$, $n=7$); glass (wt%: $\text{Na}_2\text{O} = 3.6$; $\text{Al}_2\text{O}_3 = 19.6$; $\text{SiO}_2 = 71.0$; $\text{K}_2\text{O} = 0.92$; $\text{CaO} = 3.3$; $\text{FeO} = 1.4$).

Oxygen Isotopes: (Karen Ziegler, UNM) analyses of acid-washed subsamples by laser fluorination gave (all per mill): $\text{d}17\text{O} = 3.917, 3.730$; $\text{d}18\text{O} = 5.590, 5.095$; $\text{D}17\text{O} = 0.966, 1.040$.

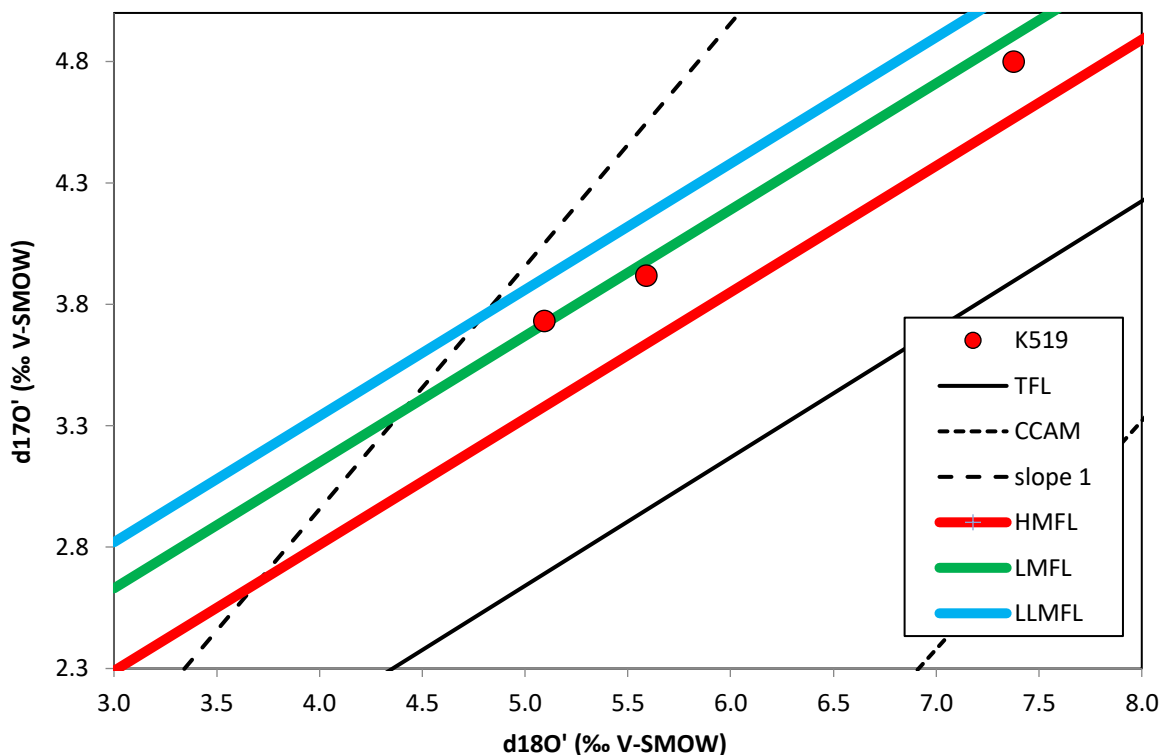


Fig. 7 Oxygen isotope composition diagram showing mass fractionation lines for ordinary chondrite groups. Sample K519 occurs as the red dots spread parallel to the equilibrated L chondrite mass fractionation line of Clayton et al (1991).

Classification: Achondrite (ungrouped) strong shock, moderate weathering. Sample shows igneous texture, pyroxenes with compositional zoning and has mineralogic and isotopic similarities to L ordinary chondrites.

Specimens: Fabien Kuntz holds the main mass. Three fragments weighing 34.04g and a polished thin section are on deposit at App.

References: Clayton, R. N., Mayeda, T. K., Goswami, J. N., Olsen, E. J., 1991. Oxygen Isotope studies of ordinary chondrites. *Geochemica et Cosmochemica Acta* V. 55 pp. 2137-2337.

Rochette, P., Sagnotti, L., Bourot-Denise, M., Consolmagno, G., Folco, L., Gattacceca, Osete, M. L. and Pesonen, L., 2003. Magnetic classification of stony meteorites: 1. Ordinary chondrites. *MAPS* 38, N.5, pp. 251-268.