A NEW Cr-SPINEL BEARING POIKILITIC MARTIAN SHERGOTTITE NORTHWEST AFRICA 14713

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Introduction: Northwest Africa 14713 is a new poikilitic Martian meteorite discovered in 2021 with a total mass of ~3 kg. Martian meteorites are currently the only samples of Mars available for direct study by Earth-based laboratories. The shergottites are the youngest of the Martian meteorites predominantly having formed during the late Amazonian period with crystallization ages ranging from 165 to 225 Ma [1]. They represent ~82% by mass of the known Martian meteorites and can be divided further into four distinct sub-groups: pyroxene-phyric (basaltic), olivine-phyric, gabbroic and poikilitic [2]. There are currently only ~276 examples of shergottites, and of those only ~12% display a poikilitic texture (Meteoritical Bulletin Database). With such a limited number of examples available it is important that we continue to expand this sampling through the continued analysis and classification of newly discovered Martian meteorites to better understand the petrogenic relationship that exists between the shergottite subgroups and Martian meteorites in general.

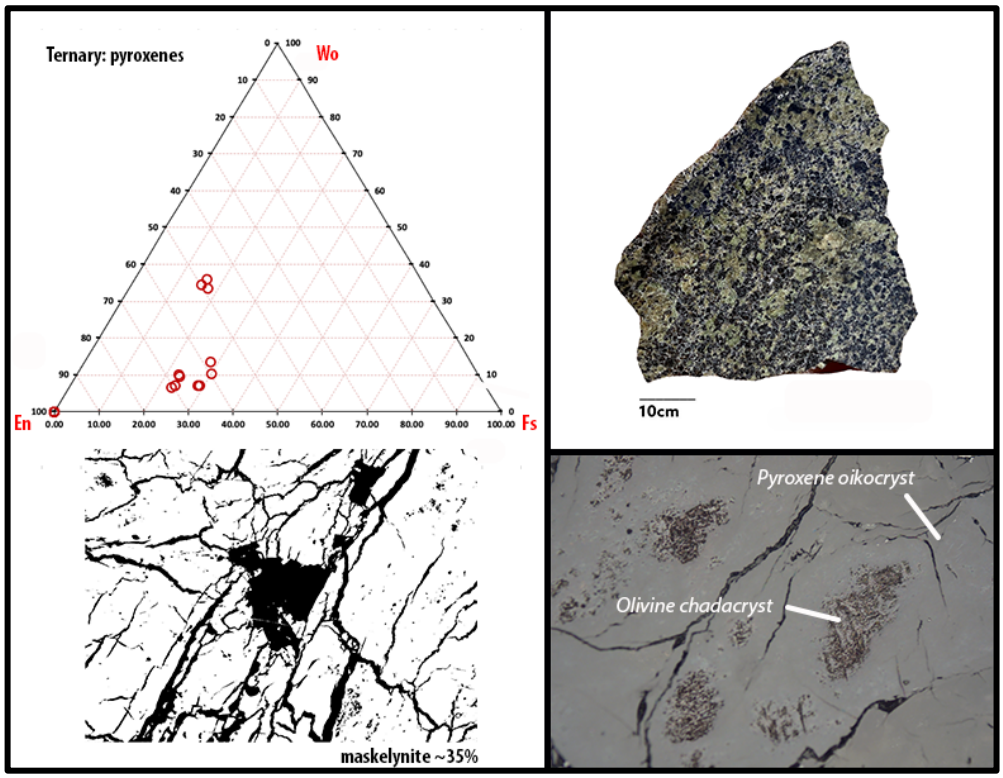

Diagram 1. Pyroxene ternary plot for NWA 14713; **Image 1.** Photograph of hand sample of NWA 14713; **Image 2**. BSE image of NWA 14713 converted to binary using ImageJ showing maskelynite in black. **Image 3.** 200x reflected light image of poikiloblastic texture with olivine chadacrysts embedded in pyroxene oikocrysts.

Petrography: NWA 14713 was studied using a polished microprobe mount. Examination of the mount with electron microprobe and image analysis using ImageJ shows it contains numerous poikiloblastic olivine chadacrysts embedded within pigeonite and augite oikocrysts. Modal analysis shows ~25% igneous-zoned olivine, ~35% igneous-zoned pyroxene and ~35% maskelynite. Augite is subcalcic with pyroxene phases dominated by relatively low-Ca pigeonite. No lo-Ca pyroxenes were detected. Three types of Cr-spinels were detected and analyzed: high-Cr Ti-spinel with Ti8.81, Cr17.35, high-Ti Cr-spinel with Ti4.58, Cr27.49, and low-Ti Cr-spinel with Cr38.74, Ti0.63 (all Wt%). Other minor phases observed were ilmenite, merrillite, and troilite.

Geochemistry: Olivine $Fa_{35.4\pm2.8}$ n=10; pigeonite $Fs_{25.7\pm3.2}Wo_{9.2\pm2.4}$, n=8; augite $Fs_{16.5\pm1.0}Wo_{34.6\pm1.3}$, Fe/Mn=26±3, n=3; plagioclase $An_{54.8\pm1.2}Ab_{43.9\pm1.2}$, Or 1.3±0.2, n=5.

Discussion: Microprobe analysis indicates this meteorite is a Martian poikilitic shergottite. It is a Martian based on Fe/Mn ratios of both olivine and pyroxenes. It is a poikilitic shergottite based on pyroxene plots, modal abundances, and poikiloblastic embedding of olivine chadacrysts within pyroxene oikocrysts [3].

References: [1] Brennecka et al., (2014) *Meteoritics & Planetary Science* **[2]** A. Udry, et al., (2020) *JGR Planets*. [3] Papike et al., (2009) *Geochimica et Cosmochimica Acta*