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A COMPARISON OF THE IGNEOUS MÁAZ FORMATION AT JEZERO CRATER WITH MARTIAN METEORITES

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Introduction: The Mars2020 *Perseverance* rover landed in Jezero crater on February 18th 2021. During the first ~380 sols (martian days), the rover explored two different formations: the Máaz and the Séítah formations, both representing igneous lithologies. Here we focus on the SuperCam (SCAM) results of the Máaz formation and compare these rocks to the martian meteorites, currently our only samples that we possess from Mars. The SCAM instrument is a mast-based, remote science instrument that measures rock chemistry with Laser Induced Breakdown Spectroscopy (LIBS, see [1]), mineralogy with Raman and VISIR (Visible Infrared), and textures using Remote Micro Imager (RMI; see [2]). *Perseverance* has explored the Máaz formation from Sols 1 to 201 and then from 343 until Sol 382, including the Artuby ridge from Sol 170 to 201 and from Sols 343 until Sol 382. This study also comprises the Content member (mb) of the Séítah formation, as it shows compositions similar to those of the Máaz lithologies.

The Máaz formation: The Máaz rocks show varied igneous textures, mineralogies, and compositions, expected for basaltic lithologies. Máaz formation rocks display both vesicular and non vesicular textures, also including aphanitic and phaneritic textures (> 1 mm grains). Some of these rocks show a flowy texture and conchoidal fractures, indicating the presence of glass (e.g., Hastá'áadah target, Sol 87). Abraded patches (conducted in the three Máaz rocks that were sampled) of Guillaumes, Bellegarde, and Alfafa, show mostly an ophitic texture [e.g., 3, 4].

Bulk compositions and Mineralogy. We divided the Máaz compositions between fine and coarse-grained textures. Both Máaz textures and the Content mb show similar bulk composition with 52 wt.% SiO₂, 9.0–13 wt.% Al₂O₃, 15 – 20 wt.% FeO, and Mg# of 17–21 (= 100*molar MgO/MgO+FeO). These compositions indicate that the Máaz rocks with different grain sizes and the Content member could be petrogenetically linked. The Artuby rocks are slightly more primitive with a SiO₂ content of 45 wt.%, Al₂O₃ of 6.5 wt.%, CaO of 8.4 wt.%, and Mg# of 28. Several pure mineral LIBS analyses were identified using different stoichiometric conditions in the Máaz formation. Pyroxene has been recognized through LIBS analyses having 4 (±0.2) total cations with 6 O. The observed pyroxene include augite grains (W_{0.30-50}En₁₀₋₂₂Fs₂₉₋₅₅) and Fe-rich grains (W_{0.3-9}En₄₋₁₈Fs₇₃₋₉₃). One plagioclase grain was analyzed in the Content mb (An₂₈Ab₆₆Or₆), but no olivine was detected in any of the abrasion patches.

Comparison with martian meteorites: The ophitic textures and basaltic mineralogy observed in the Máaz and Content lithologies, are extremely common in martian meteorites, especially shergottites [5]. However, no recovered martian meteorites show vesicular textures: this difference of texture likely indicates more volatiles/degassing processes in Jezero rocks. This difference in texture likely reflects the more comprehensive view of the igneous rocks in Jezero relative to the martian meteorites. Although the Máaz lithologies show general basaltic compositions, they are more enriched in alkali elements most than martian meteorites, displaying similar compositions to Northwest Africa (NWA) 7034 and paired meteorites [6]. Máaz rocks resemble basaltic shergottites in regard to their CaO and Al₂O₃ contents, but they have lower MgO and Mg# rocks compared to most martian meteorites, they are most similar to Fe-rich meteorites, such as the basaltic shergottites Dhofar 378 [7], and Los Angeles [8], the gabbroic shergottite NWA 7320 [9], the augite rich NWA 8159 [10], and some NWA 7034 clasts [6]. The pyroxene composition resembles pyroxene analyzed in NWA 7320 [9] and augite-rich NWA 8159 [10]. We interpret the Máaz formation lithologies to be lavas with complex textures and compositions similar to pyroxene-bearing meteorites (with no olivine). Earth-based analyses of the Máaz samples [10,11] will help better constrain their formations and petrogenetic link to these martian meteorites and lead to be a broader view of the igneous history of Mars.

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