

NWA 10597 – A NEW UNBRECCIATED MARE BASALT.

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NWA 10597, a single stone weighed 350 g, was found in Morocco in 2015. It is almost entirely covered by a relatively fresh fusion crust (Fig. 1). The meteorite is a medium-grained unbrecciated low-Ti mare basalt mainly composed of elongated, zoned pyroxene (up to ~1.2 mm) prisms and plagioclase (up to ~1.4 mm) laths (Fig. 2). Most pyroxenes are pigeonite and augite, with minor pyroxferroite. Some pigeonite grains have augite rims. Plagioclase was partly converted to maskelynite. Minor high-Mg olivine occurs sparsely as phenocrysts (up to ~1 mm) which are zoned from Fo_{62.7-46.2} (cores) to Fo_{32.4-40.7} (rims) and commonly have inclusions of Ti-Al-rich chromite, ulvöspinel, pigeonite or a few melt inclusions composed of augite, silica and Ca-rich glass. Late-stage phases include silica, fayalite, Fe-rich pyroxene (En_{1-7.2}Wo_{11.9-17}), K-rich glass, baddeleyite, tranquillityite, zirconolite and elongated, skeletal apatite and merrillite. Baddeleyite (µm-sized) occurs broadly in association with ulvöspinel, ilmenite, merrillite, fayalite, Fe-rich pyroxene, silica-rich glass, mesostasis, and symplectitic intergrowths of fayalitic olivine, silica, and hedenbergitic pyroxene. Phosphates are adjacent to pyroxene, anorthite, fayalite, ilmenite, troilite, and silica. Other opaque phases include chromite, ilmenite, troilite, and a few FeNi metal. Shock veins and impact melt pockets are present. Mineral modes (vol%): olivine = 6, pyroxene = 52, plagioclase = 32, silica = 3, Fe-oxide = 4, mesostasis + impact melt = 3.

Pyroxene grains retain strong chemical zoning from magnesian cores of pigeonite and subcalcic augite (En_{40.1-57.7}Wo_{8.9-26.4}) to Fe-rich rims (En_{7.2-40.3}Wo_{15.3-34.7}). The molar Fe/Mn ratio for pigeonite and augite ranges from 31 to 82 with an average of 60. Plagioclase has a core-to-rim zonation and exhibits a small intergranular compositional range (An_{90.4-78.5}Or_{0.18-3.8}). Olivine has a bimodal chemical distribution with most clustered at Fo_{36.6-58.2} and others at Fo_{2.3-13.5}. The Fe/Mn ratio of olivine ranges from 82 to 107 with an average of 90. Chemical compositions (wt.%) of fusion crust: MgO 7.0, FeO 23.3, Al₂O₃ 8.7, SiO₂ 44.4, CaO 10.7, TiO₂ 3.1, K₂O 0.1, Na₂O 0.4, P₂O₅ 0.1, Cr₂O₃ 0.3, MnO 0.3.

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Fig. 1 NWA 10597, weighed 350 g

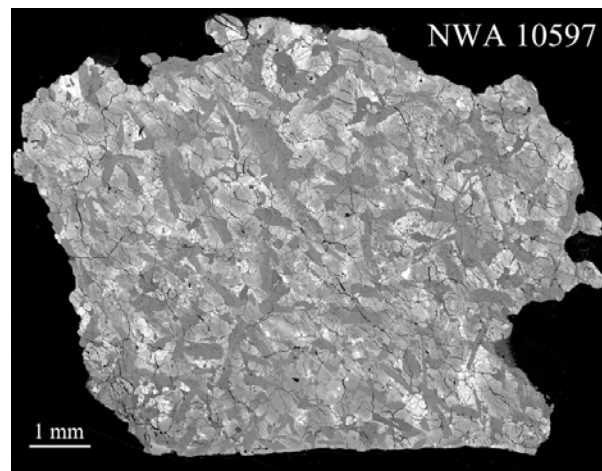


Fig. 2 BSE image of NWA 10597