15536 MEDIUM-GRAINED OLIVINE-NORMATIVE MARE BASALT ST. 9A 317.2 g

INTRODUCTION: 15536 is a medium-grained, olivine-bearing mare basalt (Fig. 1) in which small pyroxenes are enclosed in poikilitic plagioclases and olivine phenocrysts are common. The mafic grains show clear clustering, macroscopically observed as pyroxene-rich and plagioclase-rich narrow bands (Fig. 1). The sample is coarser-grained than 15535, chipped from the same boulder. Chemically it is an average member of the Apollo 15 olivine-normative mare basalt group. The sample is light olive gray, and is tough, slabby, and angular to subangular. The non-broken surface had a light soil cover and a few zap pits. Small vugs occupy about 5% of the sample.

15536 was chipped with 15535 from a 0.75 m boulder about 20 m east of the rim of Hadley Rille, from the north rim of a moderately fresh, blocky, 3 m-diameter young crater. The boulders are probably bedrock excavated by the crater-forming impact event. The orientation of 15536 was documented.

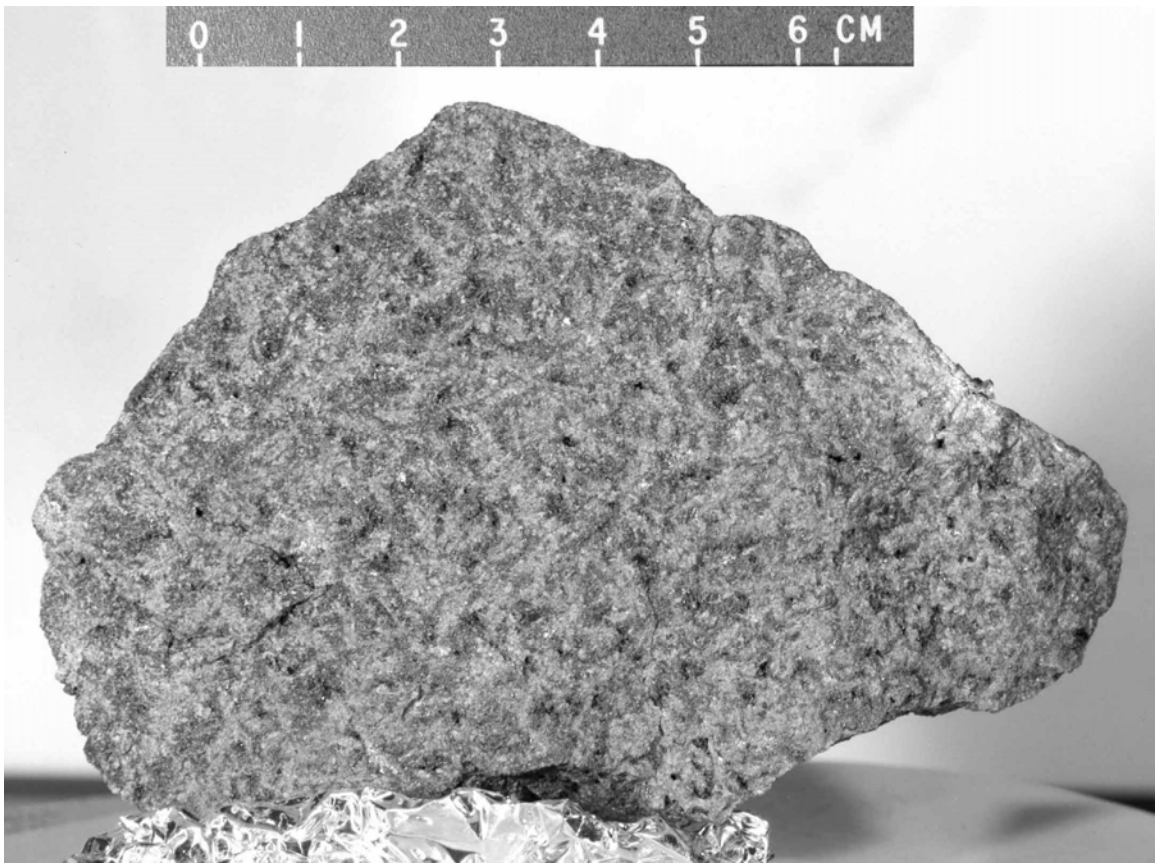

Figure 1. Broken face of 15536, pre-chipping. S-71-47277

PETROLOGY: 15536 is a plagioclase-poikilitic mare basalt with olivine phenocrysts (Fig. 2). It is similar to 15535 except that the olivines and pyroxenes are larger and there is a distinct tendency for pyroxene-rich bands and plagioclase-rich bands to segregate. Some areas are quite densely packed with pyroxene (and some olivine) and with little plagioclase. These mafic-rich zones contain olivine (including "sieved" fayalite), conspicuous cristobalite, troilite, and opaque minerals. Chromite is not as common as ulvospinel and most is in olivine phenocrysts, which are zoned and up to 2 mm across. The olivine phenocrysts commonly contain silicate inclusions. Ilmenite is a late-stage mineral with fayalite. The pyroxenes are granular, zoned, and many are twinned. The plagioclase-rich areas contain poikilitic plagioclase 1 to 2 mm across enclosing granular pyroxenes and some olivines, but only rarely opaque minerals, cristobalite, or fayalite.

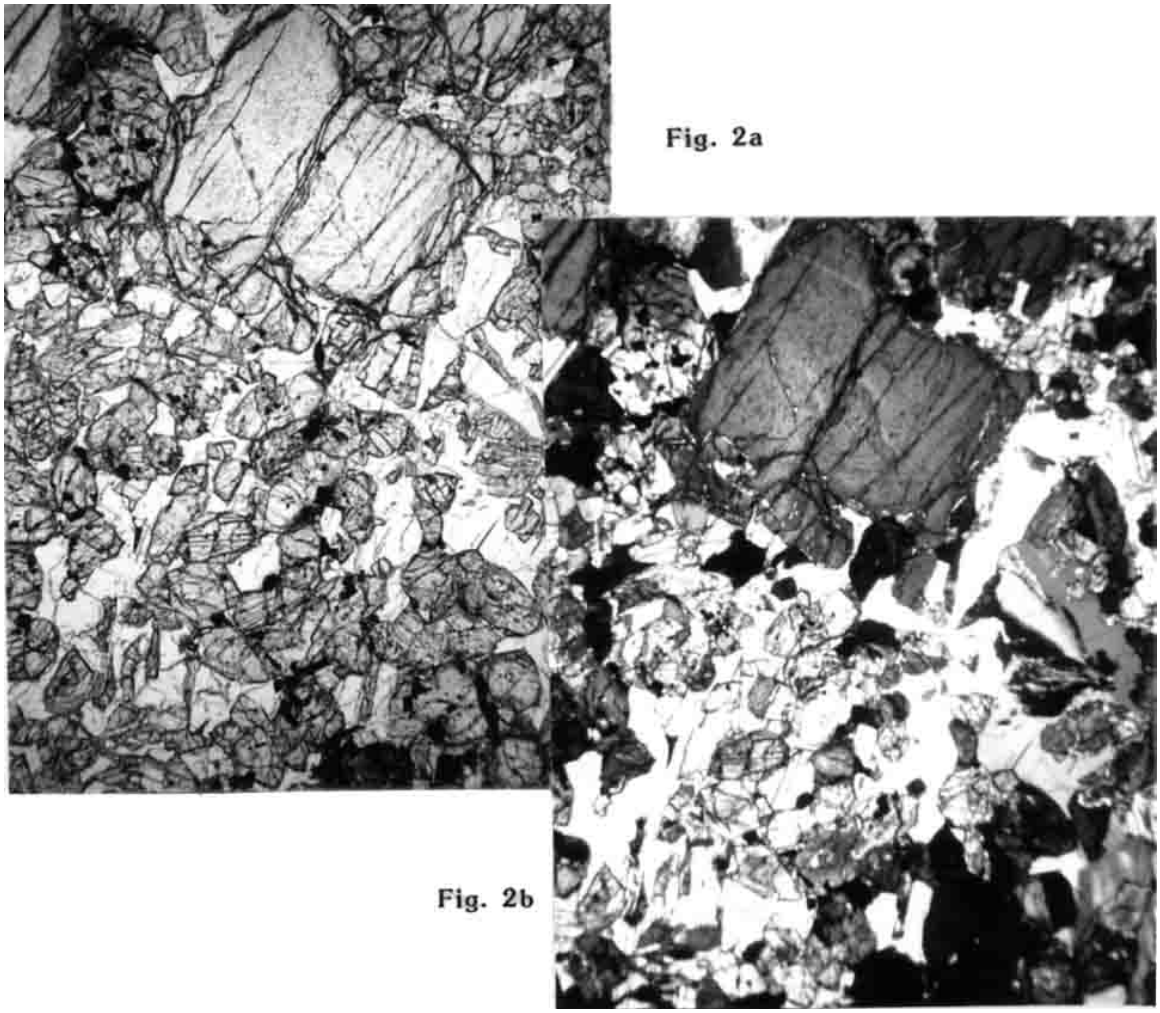


Figure 2. Photomicrographs of 15536,7, showing olivine phenocryst, plagioclase-poikilitic area (right, lower), and mafic-cluster area (top, left). Widths about 3 mm. a) Transmitted light; b) crossed polarizers.

Very little has been published on 15536. Brown et al. (1972a) noted it as being an olivine-normative mare basalt (PET Type III) with a fine grain size, granular texture, and the mineral chemical characteristics of that basalt type, but gave no specific data. Taylor and McCallister (1972a,b) and Taylor et al. (1973) studied the partitioning of Zr between ilmenite and ulvospinel (Fig. 3). The ratios suggest a quenching-in at high temperatures (about 1225°C or more), from a comparison with experimental data. The cooling rate was fast enough that ulvospinel was not reduced to Fe-metal and ilmenite. Taylor et al. (1972b) and Taylor et al. (1973) measured the chromium content of Fe-metal in various associations (Fig. 4). 15536 was the only sample of those studied which showed a correlation of the Cr in metal with its association: metal in association with chromite had higher Cr. Experiments in the temperature range 800-1000°C of Fe-metal and chromite coexistence showed the metal to have 2.5 ± 0.3% Cr, higher than the natural samples (the amount depends perhaps also on the Ni content of metal and the Cr activity of the chromite). There is not sufficient chromium content dependency for the Cr-in-metal to be used as a geothermometer; there is perhaps also an $fO_2$ dependency.

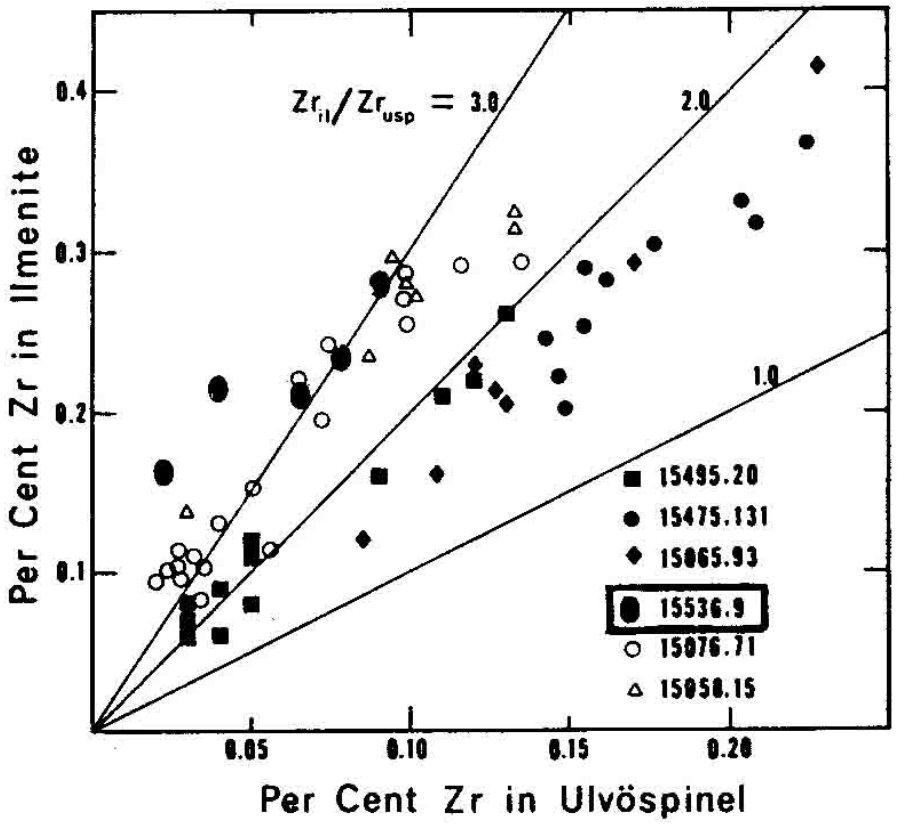


Figure 3. Zirconium contents of coexisting ilmenite and ulvospinel in 15536,9 and other Apollo 15 samples (Taylor et al., 1973).

CHEMISTRY: Rhodes and Blanchard (1983) reported that they had made an analysis of 15536 for major and trace elements (XRF, INAA). This analysis was similar to those of 15529 and 15598 and showed the sample to be an Apollo 15 olivine-normative mare basalt.

PROCESSING AND SUBDIVISIONS: Chips ,1 and ,2 were taken from the E-N end. ,1 was partly used for thin sections ,5 and ,7 to ,9. ,2 was used for chemical analyses. In 1982, further chipping from the E-N end produced several chips, including the 2 g piece used by Rhodes and Blanchard (1983). ,0 is now 293.79 g.

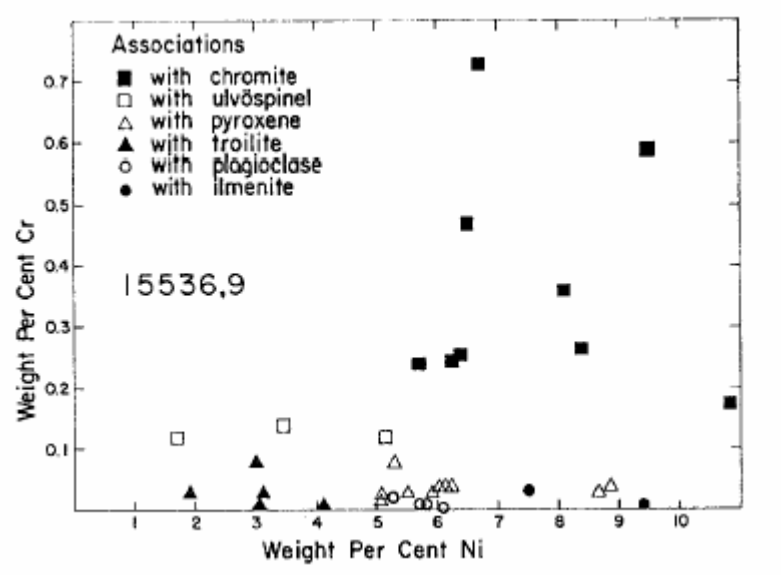


Figure 4. Cr and Ni contents of metal grains in 15536,9 (Taylor et al., 1973).