
**A LUNAR FELDSPATHIC PERIDOTITE (12036)
AND ITS MELT INCLUSIONS****Martin Prinz, Klaus Keil, Gero Kurat***The University of New Mexico
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Igneous rock 12036 is a feldspathic peridotite of poikilitic texture consisting mainly of olivine, pyroxene and minor amounts of plagioclase. Cumulus phases are chromite, olivine, and large homogeneous pigeonite and augite grains. Post-cumulus phases, excluding those in melt inclusions, are plagioclase, inhomogeneous pyroxenes, ilmenite, ulvöspinel, troilite and cobaltian Ni-Fe. Broad beam electron microprobe bulk analysis gives the following results (weight percent): SiO₂ - 39.7; TiO₂ - 2.82; Al₂O₃ - 5.5;

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Cr₂O₃ - 0.44; FeO - 25.6; MnO - 0.26; MgO - 17.8; CaO - 6.2; Na₂O - 0.18; K₂O - 0.04; P₂O₅ - 0.07; Total - 98.61.

Melt inclusions were found within olivine, pyroxene, and ilmenite grains; others are found along the margins of ilmenite crystals, or are interstitial between mineral grains. Melt inclusions in olivines are usually small (10-80μm) and ellipsoidal, but some are large (up to 540μm) and irregular. The olivine host has not reacted with the melt inclusion. Olivine inclusions contain glass plus plagioclase, pyroxene, silica and ilmenite; ilmenite and sometimes plagioclase, grow to large size within the inclusion. Pyroxenes are often dendritic and grow at right angles to boundary walls; they are rich in TiO₂ (2-4%) and Al₂O₃ (6-9%) and are believed to be metastable. Bulk compositions of the melt inclusions, excluding large ilmenites, show that they are rich in SiO₂ (59%), Al₂O₃ (15.5%), and CaO (13.5%), and poor in FeO (7%), and MgO (3%). Pyroxene melt inclusions are more complex; they are always irregular and are smaller than the original inclusions due to host pyroxene growth. The inclusion-remainders are highly aluminous (20.5%) and hercynite-rich spinel was found in some of them. Melt inclusions in and around ilmenites are usually enriched in SiO₂ with or without high K₂O. They appear to represent melt at a later stage of crystallization than those within olivine and pyroxene crystals. Large melt areas interstitial between mineral grains represent the latest segregations of melt and are rich in phases containing elements not taken up by common minerals (K₂O-SiO₂-rich glass, barian K-feldspar, whitlockite, baddeleyite, and zircon, as well as plagioclase, pyroxene, ilmenite, troilite and cobaltian Ni-Fe). U-bearing zirkelite was also found in one of these areas and yielded a U-Th-Pb microprobe age date of 3.5 billion years.

The presence of ultramafic rocks in Apollo 11 (as evidenced by some glasses) and Apollo 12 samples (lithic fragments and glasses) indicates that differentiation by crystal settling has been effective on the Moon. Differentiation for 12036 may have occurred within a lava lake as the phases show no evidence of high pressures.