D. PETROLOGICAL STUDIES OF THE MOON

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EXPERIMENTAL PETROLOGY AND PETROGENESIS OF APOLLO 12 BASALTS

D. H. GREEN
Australian National University, Canberra, Australia

Abstract. Experimental studies at 1 bar and up to 30 kbar establish the crystallization sequences for basalts 12021, 12065, 12022, 12009 and 12040. Olivine is the liquidus phase at low pressures, with minor chromium spinel and pigeonitic clinopyroxene joining the olivine at lower temperatures or accompanying the olivine in the less magnesian basalts (12021, 12065). At higher pressures, subcalcic clinopyroxene becomes the liquidus phase except in the most magnesian basalt (12040) where orthopyroxene joins the olivine and becomes the liquidus phase at pressures of 25 kbar. Integration of experimental studies with observed mineralogy of natural rocks shows conclusively that the basalt compositions studied do not lie on a plagioclase + pyroxene + spinel ± olivine cotectic nor have these rocks been derived by accumulation of olivine or pyroxene into such a low temperature cotectic liquid. The Apollo 12 basalts provide clear evidence for the genesis of olivine-rich basalts in the lunar interior. The nature of the source rock is deduced to be pyroxenite or olivine-bearing pyroxenite in which orthopyroxene is probably the major phase with lesser sub-calcic or pigeonitic clinopyroxene. The 100 Mg/(Mg + Fe) ratio of the source region in the deep lunar interior is 75–80.

Urey and Runcorn (eds.), The Moon, 123.