A STUDY ON SUBOPHITIC AND "UNIQUE" STRANGERS IN KREEP-RICH POIKILITIC APOLLO 16 IMPACT MELT ROCKS.

Reimold, W.U., Borchardt, R., and Möllers, F., Institute for Mineralogy, Univ. MÜnster, D-4400 MÜnster, FRG.

The matrices of Apollo 16 impact melt rocks 65015, 62235, and 65777 display some common characteristics: all three samples have poikilitic texture , rather similar mineralogy, and belong to the poikilitic rocks of highest KREEP-content (1). Despite this they are not cogenetic, as the ages of 65777 (3.72±.02 AE) and 65015 (3.88±.05 AE) differ considerably. In all three samples areas of subophitic texture can be observed, which is an unique phenomenon among the suite of Apollo 16 poikilitic melt rocks (the occurrence of poikilitic patches in subophitic rocks has been described more often (2) and has also been observed -and explained- in dynamic crystallization experiments(3)). An electron microprobe study of some subophitic areas within thin sections 65015,88, 62235,66, and 65777,11 was undertaken in order to answer the question whether matrix and "strangers" share a common genesis or form clast-matrix relationships. Two unique clasts -a chondrule-like (Fig.1) and a granulitic (Figs.4,5)- were discovered and analyzed, too. DBA analyses of matrix and 'strange objects' were recalculated into CIPW normative compositions, and the main normative mineral abundances are presented in Fig. 10. Mineral chemistry is presented in Fig.11.

65777,11: Fig.1 shows the nearly round, chondrule-like, plagioclase-pyroxene±olivine aggregate. One half of it is surrounded by an olivine rim and an olivine clast served as nucleus for the spherolitic crystallization. Plagioclase composition (Fig.11) ranges from An_{73} to $An_{87.5}$, pyroxene composition is comparable to that of matrix pyroxene (4), and olivine contains 71 mole% Fo. Composition of Fe-Ni metal (Fe 93.1±.19, Co .47±.11, Ni 6.28±.26 wt%) is similar to that of matrix metal (5). The chemical bulk composition is similar to matrix or bulk rock chemistry (Fig.10). Thus there is no evidence for a foreign origin of the "chondrule", as the An content of "chondrule" plagioclase lower than that of matrix plagioclase can be explained if assuming that the high An analyses (4) of matrix feldspar contain a number of plagioclase clast data measured in relics of anorthositic target rock. Two of the numerous subophitic areas in 65777,11 (SI - Fig. 2; SII - Fig. 3) were also analyzed by DBA and show high TiO_2, K_2O, and P_2O_5 contents otherwise only characteristic of poikilitic KREEP-rich melts. The CIPW mineral abundances for I areclose to that of the bulk composition (Fig.10), but I is more Fe-and Mg-rich than the matrix. Plagioclase in I ranges from An_{75-88}, olivine -minor constituent- has Fo_{74}; armalcolite was analyzed to have the same composition as the matrix mineral, and orthoclase ($An_{12.95}Ab_{12.09}Or_{74.97}$) was found, too. Due to the evidence presented here and the texturally distinct boundaries of many such patches, area I can be clearly identified as clast and as a fragment of an unique KREEP-rich subophitic melt complex. Its CIPW normative composition can only be compared to that of 64455 (1), but the KREEP (and Fe, Mg) content of 65777I is still higher. Subophitic area II -more olivine-rich than I- seems to be another fragment of the SI forming melt. Texturally both clasts are identical.

62235,66: Subophitic area I is an ophitic-subophitic aggregate of lathy to bulky plagioclase ($An_{92-96.6}$), roundish olivine (Fo_{52-66}) and anhedral pyroxene filling interstices between plagioclase crystals (Fig.6). Mineral chemistry, bulk analysis, and clear-cut margins to poikilitic matrix leave no doubt that area I is xenolithic. Area II counts for the same conclusion. It is an anorthositic aggregate of plagioclase laths with interstitial areas filled by pyroxene and > 2vol% of opaques and mesostasis. Its bulk and mineralogical composition is similar to the highly feldspathic melts of 63415 or 65795 type, from which it only differs in its most evident clast content (Fig. 7) and fine grain size. The most interesting feature of section 62235,66 is a 2x1 mm large granulitic clast (Figs.4,5), an accumulate of totally recrystallized prismatic to anhedral plagioclase (An_{91-94}) and prismatic to roundish olivine ($Fo_{65.4-67.8}$). The texture is similar to Apollo 17 granoblastic rocks or granulitic rake sample 67746. Contrary, the bulk chemistry (Fig.10) is totally distinct from any previously analyzed granulitic rock. This does not hold for the mineral chemistry (Fig.11), which suggests a crystallization and cooling history similar to those of other granulites. Fig. 10 shows how far the compositional range of granulitic rocks can be extended now. This fact, and the age dating results of (6) - coarse fine granulitic fragments of 3.9 - 4.0 AE ages - and (7) - a 3.85 AE age for 67746 - could mean, that various phases of thermal metamorphism are recorded during which heterogeneous parts of the lunar crust were metamorphosed.

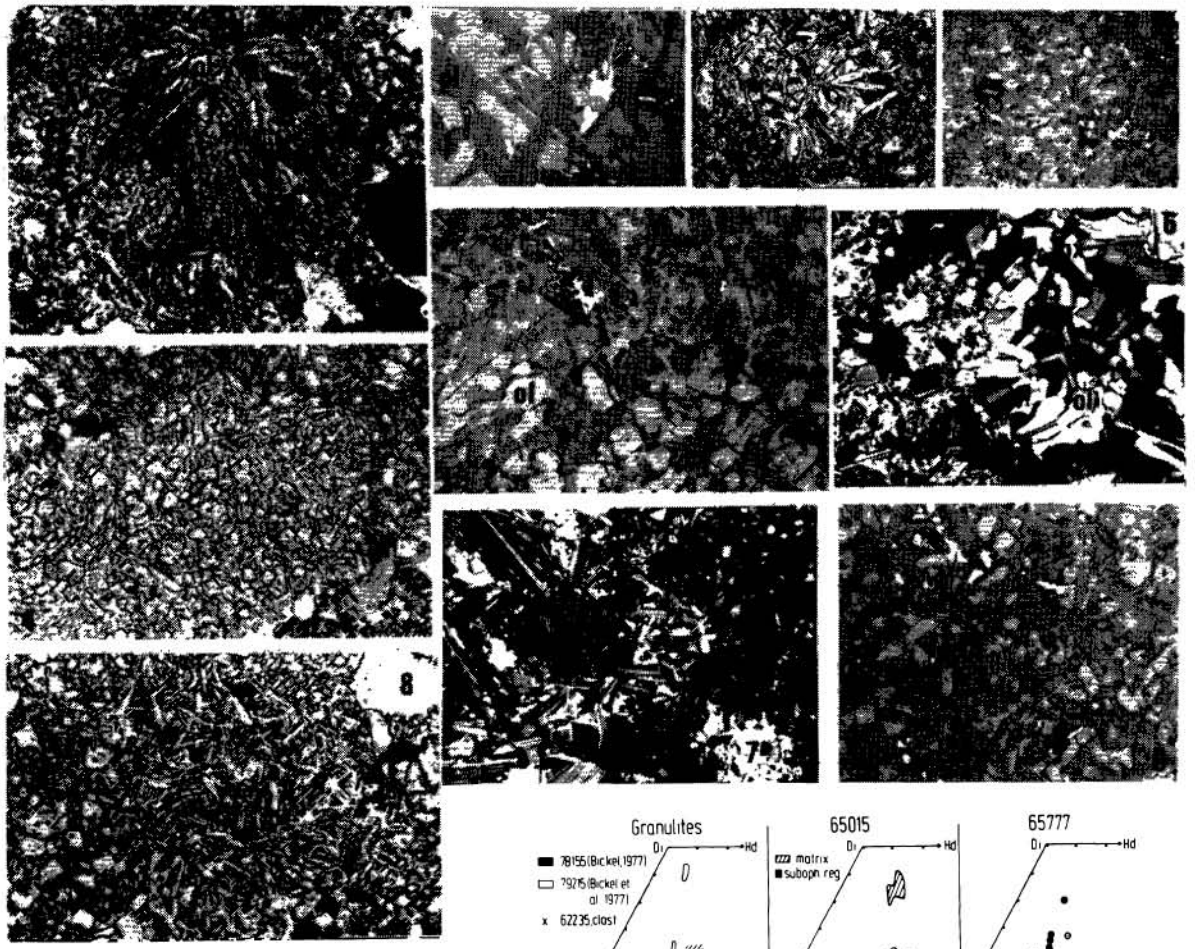
65015,88: Matrix and one subophitic area (Figs.8,9) were analyzed in this thin section. The latter is an extremely fine-grained (20-35µm) aggregate of ~60 vol% plagioclase laths (An_{90-92}), pyroxene ($En_{56.2}Fs_{34.3}Wo_{9.5}$) and olivine ($Fo_{58.5}$) at about 20vol% each. Accessory phases are ilmenite, Fe-Ni metal, and probably apatite. Both olivine and pyroxene are slightly enriched in FeO compared to the matrix minerals, and the bulk chemistry, too, does not leave any doubt about the xenolithic nature of this area.

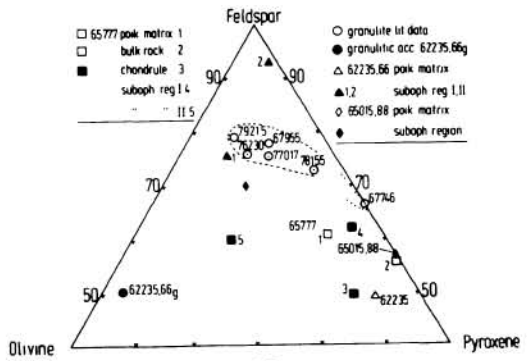
By now we cannot rule out that some of these subophitic clasts might represent fragments of the target

Reimold, W.U. et al.

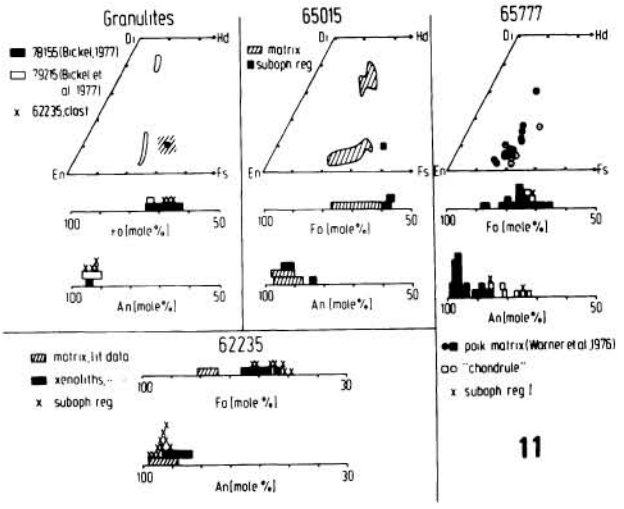
rocks from which the poikilitic impact melt were formed, but additional analyses of metal phases in the clasts might solve this problem.

References: (1)Reimold, W.U. et al.(1983) The mineralogical, chemical, and chronological characteristics of the crystalline Apollo 16 impact melt rocks - revisited. Submitted to Geochim. Cosmochim. Acta; (2)Ryder, G. and Norman, M.D.(1980) Catalog of Apollo 16 rocks.NASA publ. 52; (3)Lofgren, G.E. (1977) PLSC 8th, 2079 -2096; (4)Warner, R.D. et al.(1976) Spec. publ. No. 13, UNM Inst. of Meteoritics; (5)Dowty, E. et al.(1976) Spec. publ. No. 14, UNM Inst. of Meteoritics; (6)Maurer, P. et al. (1978) GCA 42, 1687-1720; (7)Jessberger, E.K. -pers. comm..





10



11

Legend: (1) "Chondrule" in 65777,11, parall. nicols; (2) Subophitic area I in 65777,11, refl. light; (3) Subophitic area II in 65777,11, crossed nic. and refl. light; (4) granulitic clast in 62235,66, parall. nic; (5) as (4), lower half: granulitic clast, upper half: poikilitic matrix, refl. light; (6) (Sub)ophitic area I in 62235,66 poik. matrix, crossed nicols; (7) Subophitic area II in 62235,66, crossed nic.; (8,9) Subophitic area in 65015,88, parall. nic.(8) and refl. light (9). Widths of field of view: (4,6,7,8) - 1100µm, (1,3, 5,9) - 570µm, (2) - 220 µm. pl = plagioclase, ol = olivine, px = pyroxene, m = matrix; (10) CIPW normative mineral contents; (11) Mineral compositions in analyzed samples compared to literature data.