Differentiation trends of the early lunar crust deduced from some new lunar meteorites and our future lunar missions.

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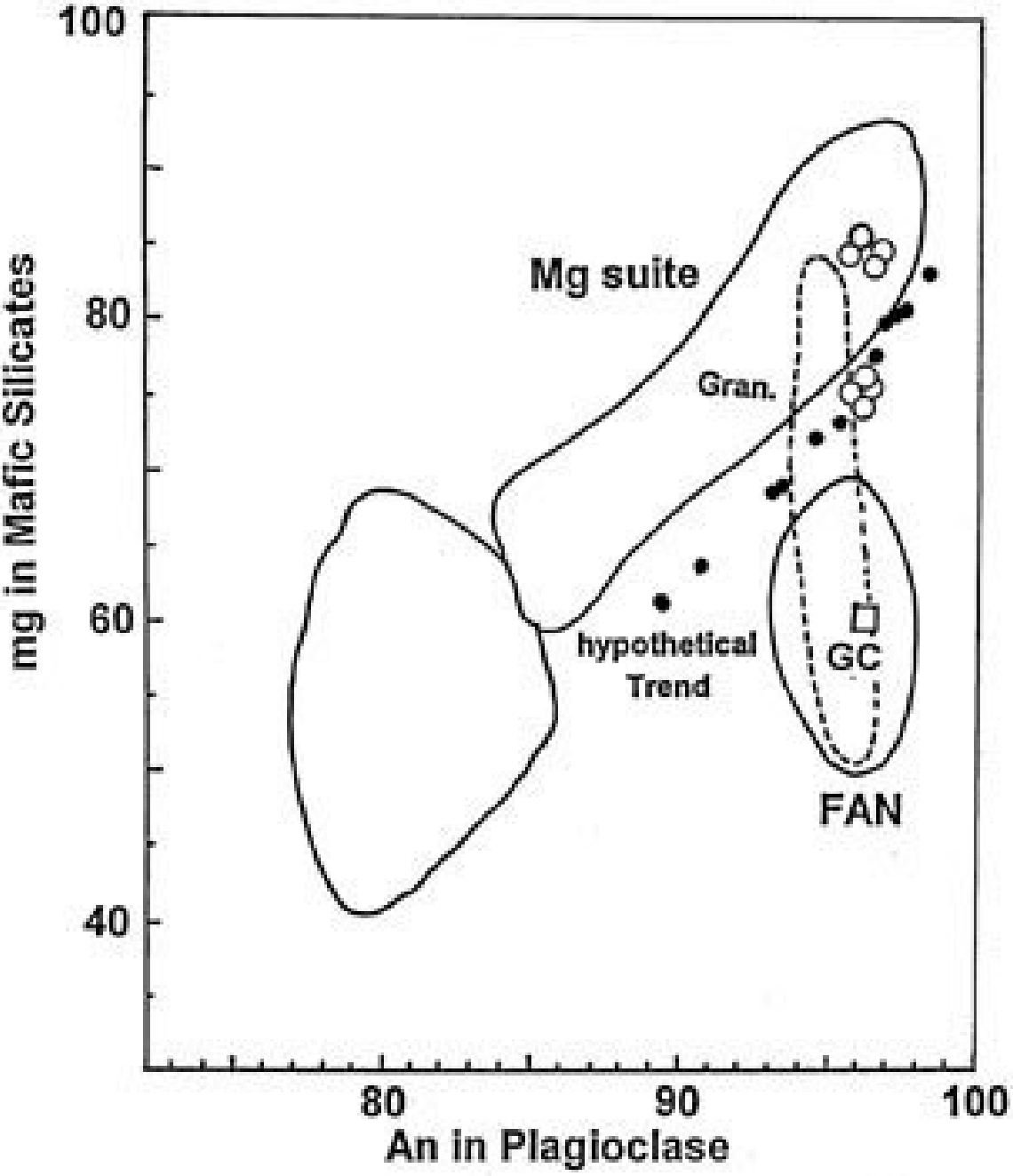
Basic concept of differentiation of the lunar crust is going to be changed by researches on new lunar meteorites from Antarctica and hot deserts. We reinvestigated lunar meteorites Dhofar (D) 489 and Yamato (Y) 86032 by mineralogical techniques, and compared their textures and mineralogy with those of lunar granulites in the Apollo collections and granulitic clasts in lunar meteorites. Compositions of coexisting plagioclase, olivine, and low-Ca pyroxene in the Apollo granulites and granulitic clasts in the Apollo breccias and lunar meteorites, bridge the gap between ferroan anorthosites (FAN) and Mg-suite (MgS) rocks in the An vs. mg number diagram. Such granulites could be metamorphosed rocks with mixed lithologies, containing contributions from MgS rocks and FANs. The mg numbers of mafic silicates in D489 are higher than those of the FAN trend in the An vs. mg number diagram and extend into the top of the MgS rocks. However, D489 does not show such granulitic texture, and the matrix is completely recrystallized with fine acicular plagioclase. This magnesian anorthositic (MAN) trend may represent an early crystallized anorthositic crust. In order to see an differentiation tend of the far side from Y86032, which is proposed to come from the far side, we reconstructed a hypothetical trend by combining the mg numbers of individual pyroxene fragments and the An values of individual plagioclase fragments. Both were found in the same matrix separately. We made hypothetical pairs starting with the highest mg numbers and the highest An value and in decreasing order up to the lowest mg number and the lowest An value of mineral fragments in the matrix of Y86032. This trend defines an MgS-like trend, but is located at the bottom of the near side trend with steeper slope. The mineral fragments in the Y86032 matrix may come from a local intrusive rock, but there is still possibility of different differentiation trend of the far-side crust. We could also hypothesize a trend of a magnesian anorthosite from the D489 data, rather than a mixed MgS and FAN lithology. We propose to search for such magnesian anorthosites in lunar highland in our future SELENE mission and a sample return mission from this site.


100
80
60
40
mg in Mafic Silicates
Mg suite
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hypothetical
Trend
GC
FAN
80
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An in Plagioclase