HASP GLASSES IN APOLLO 17 ORANGE SOIL SAMPLE 74220. Yu. P. Dikov\textsuperscript{1}, J. Huth\textsuperscript{2}, F. Wlotzka\textsuperscript{2}, and A.V. Ivanov\textsuperscript{3}. \textsuperscript{1}Institute of Ore Deposit Geology, Petrography, Mineralogy, and Geochemistry, RAS, Moscow, Russia (dikov@igem.msk.su); \textsuperscript{2} Max Planck Institut für Chemie, Abteilung Kosmochemie, Mainz, Germany; \textsuperscript{3} Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS, Moscow, Russia.

We have examined the surfaces of about 100 undamaged glass spherules from Apollo orange soil sample 74220 in connection with the problem of the origin of these glasses. Their surfaces contain important information about the ambient gas media that transported these beads and formed condensates, but also dispersed material that was captured by the gas cloud in the decompression stage.

During this examination we found various kinds of sublimates. For instance the already well described micromounds enriched in Fe, Zn, S, Na, Cl, and more uncommon fluffy aggregates enriched additionally in P and K. Together with these we found frequently small areas enriched in carbon. In one case a paquet of mica-like hexagonal crystals showed the highest enrichment in carbon. This is probably graphite generated by a CVD process.

At the same time we investigated the small fragmental material dispersed and welded on the surface of the beads. The composition of many of these particles deviated from that of the uniform composition of the interior of the spherules. They showed a wide range in the element ratios for main elements like Na, Mg, Al, Si, Ca, Ti and Fe. Some showed about stochiometric ratios corresponding to minerals like olivine (with variable Fe/Mg ratio), pyroxene, anorthite and ilmenite. Most interesting were anorthite particles of 2 to 5 micron size. Usually their composition was close to anorthite with the atomic ratios Ca:Al:Si = 1:2:2, but sometimes they showed a noticeable deficit in Si. And in one interesting case we found anorthite partly transformed to a HASP - high-Al, Si-poor - glass (Figs. 1, 2) The HASP area has a close “hot” contact with a vesicular relatively high-Si glass with Mg, Al, Ti and Fe. Fig. 3 plots semiquantitative EDS analyses of the grain, starting with points on the lower left (high Si) and progressing to the upper right (high refractories). On top and right side of the grain a light rim is seen (Fig. 2), which is enriched in Zn and S and probably represents a late condensate.

Because the HASP glasses are generally accepted as derived by high-temperature impact transformations of anorthite [1], we can assume that in the early stage of formation of the Apollo 17 picritic glasses an impact event lead to the formation of HASP grains, which were later captured by the gas cloud and scat-

Figure 1. HASP grain on the surface of orange glass.

Figure 2. The same grain in higher magnification. Scale bar is two micron.
tered on the surface of the melt drops. We understand that this is so far a single grain and that it is necessary to undertake a systematic study of the composition of debris particles that escorted the generation and transport of the glass spherules. We hope in this way to learn more about the origin and source of the glass spherules themselves.

![Graph](image)

**Figure 3.** Semiquantitative EDS analyses of different points on the silicate grain shown in Figs. 1 and 2. Note the increase in refractory elements with decrease in Si.

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**References.**