60095 GLASS SPHEROID 46.6 g

INTRODUCTION: 60095 is a fractured spheroid of yellow-green to light brown glass (Fig. 1). Internal vesicles are numerous. Cooling cracks and zap pits are present but rare on all surfaces. The sample was collected about 175 m southwest of the Lunar Module at the heat flow hole site.

FIGURE 1. S-72-39424.

PETROLOGY: Schaal et al. (1979) and Mehta and Goldstein (1979) provide petrographic information. The sample is nearly holohyaline. A few partially digested and recrystallized clasts of plagioclase act as nucleation sites for areas of devitrification and quench-crystal growth (Fig. 2). Rounded blebs of metal with associated troilite and schreibersite are abundant, ranging in size from ~50 μm down to a few Angstroms. Submicron metal particles are peppered through the glass, sometimes aligned in flow planes. Mehta and Goldstein (1979) provide detailed information on the metal in this rock.

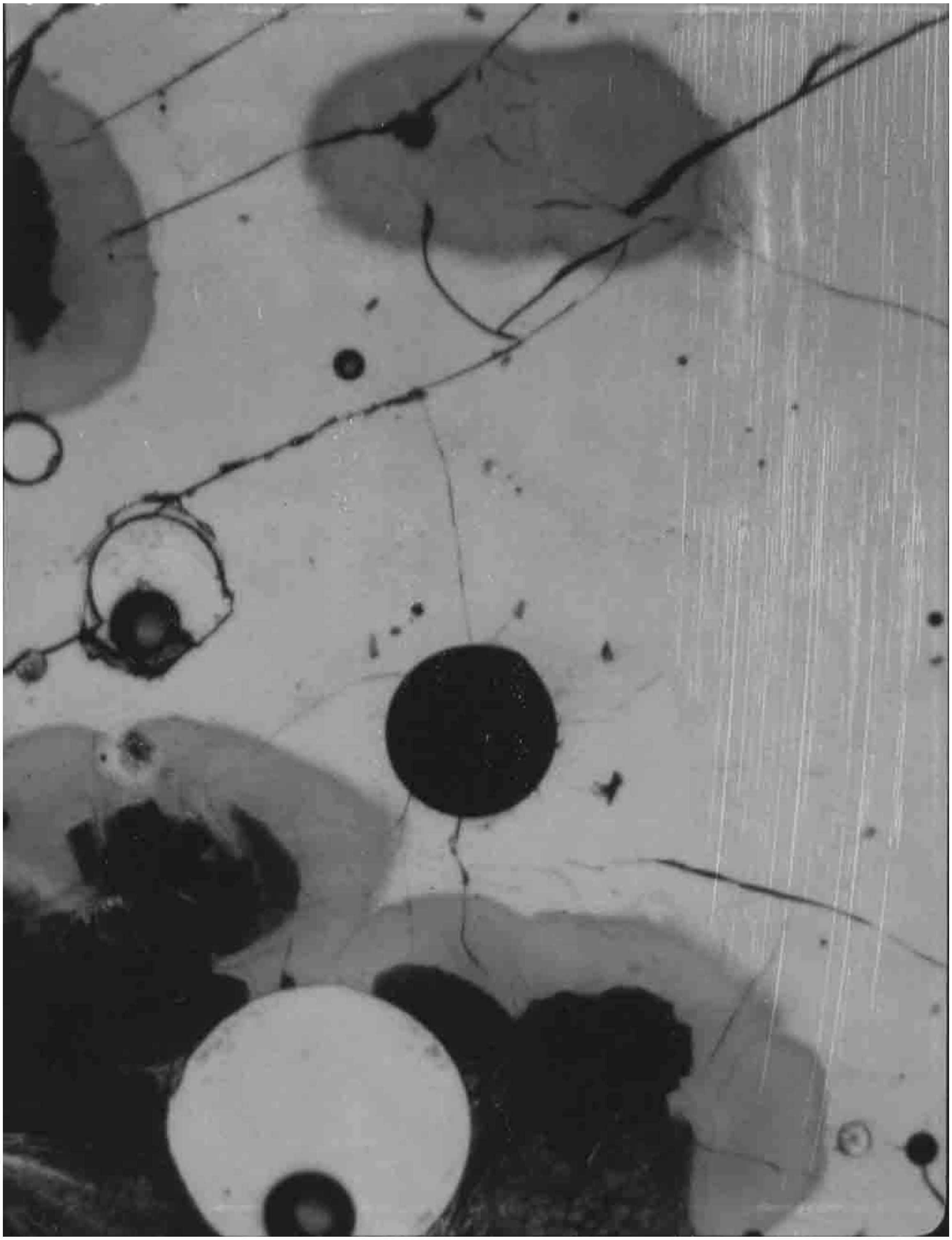

FIGURE 2. 60095,30. General view, ppl, width 2 mm.
ppm except as noted.

CHEMISTRY: Schaal (unpublished) analyzed for major elements by defocussed electron beam (DBA) and Ganapathy et al. (1974) report siderophile and volatile abundances. In terms of major elements 60095 is equivalent to local Apollo 16 soil (Table 1). Siderophiles are very high. Hertogen et al. (1977) assigned this meteoritic component to group 5H, probably derived from the South Ray Crater projectile. Ganapathy et al. (1974) discuss other possibilities for the presence of this meteoritic group.

MICROCRATER SAND SURFACES: Neukum et al. (1973), and Brownlee et al. (1975) studied the microcraters on this sample (Figs. 3, 4 and 5). The surface has had a complex exposure history and is in production. Blanford et al. (1974) briefly mention glass droplets on the surface.

TABLE 1. Summary chemistry of 60095.

SiO_2	44.87
TiO_2	0.51
Al_2O_3	25.48
Cr_2O_3	0.14
FeO	5.75
MnO	0.07
MgO	8.11
CaO	14.52
Na_2O	0.28
K_2O	0.09
P_2O_5	
Sr	
La	
Lu	
Rb	1.67
Sc	
Ni	560
Co	
Ir ppb	25.4
Au ppb	7.11
C	
N	
S	
Zn	1.55
Cu	

Oxides in wt%; others in ppm except as noted.

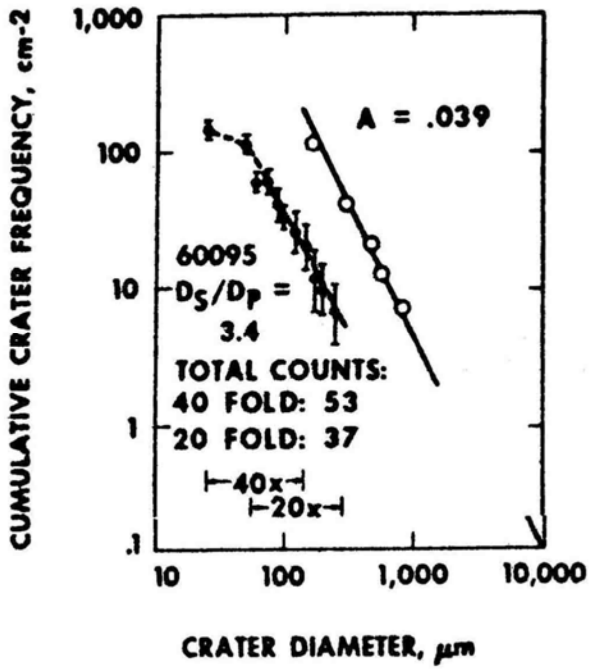

FIGURE 3. Microcraters; from Neukum et al (1973).

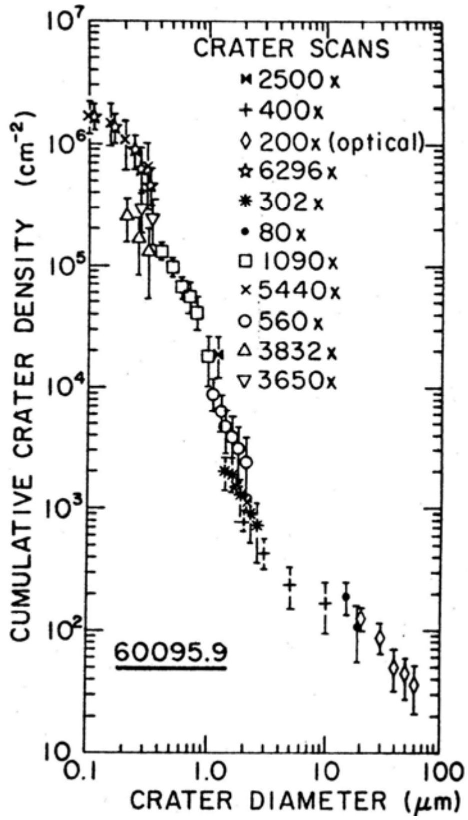

FIGURE 4. Microcraters; from Brownlee et al. (1975).

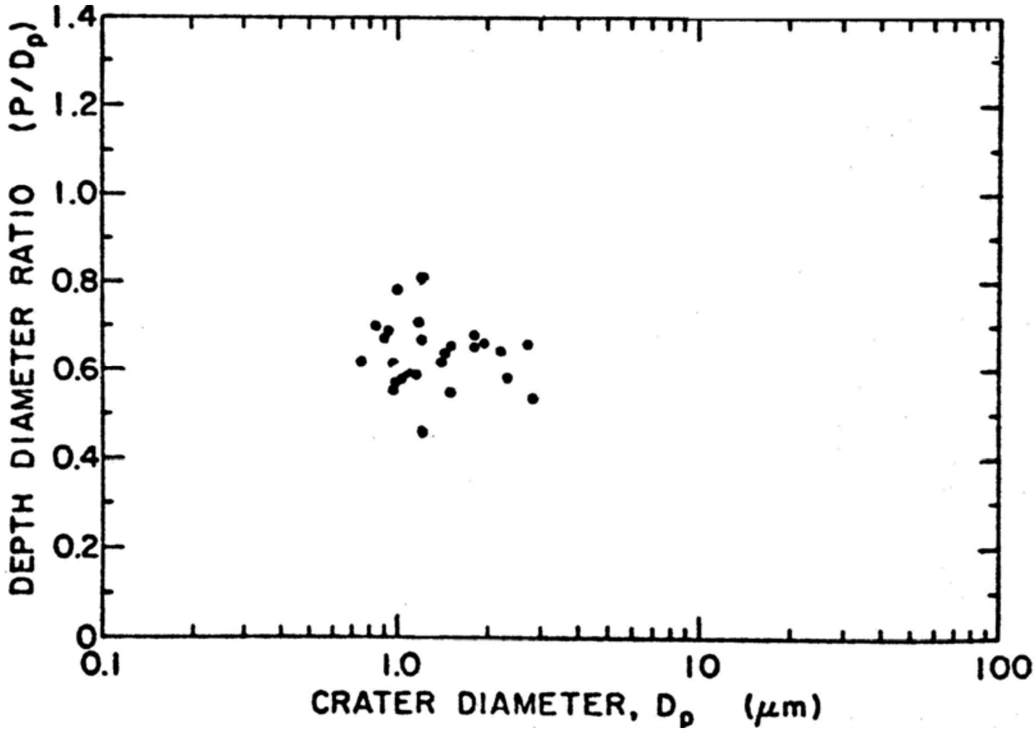

FIGURE 5. Microcraters;
from Brownlee et al. (1975).

PHYSICAL PROPERTIES: Hopper et al. (1974), Uhlmann et al. (1974) and Klein and Uhlmann (1976) provide data relating to the glass-forming process and discuss the kinetics of the transformation (Figs. 6, 7, 8, and 9). Theoretical considerations assuming a nucleation barrier of 50 kT predict that a sphere the size of 60095 should not be glassy. A somewhat higher nucleation barrier (60- 65 kT) and very few heterogeneous nuclei are required to bring prediction in line with observation. The critical cooling rate of an object with the composition of 60095 is 70°C/sec; anhydrous liquidus temperature is 1270°C.

PROCESSING AND SUBDIVISIONS: In 1973, 60095 was cut into two pieces, the smaller being subdivided for allocations. The larger piece (~2/3 of the sample) preserved the entire hemisphere with an intact exterior surface.

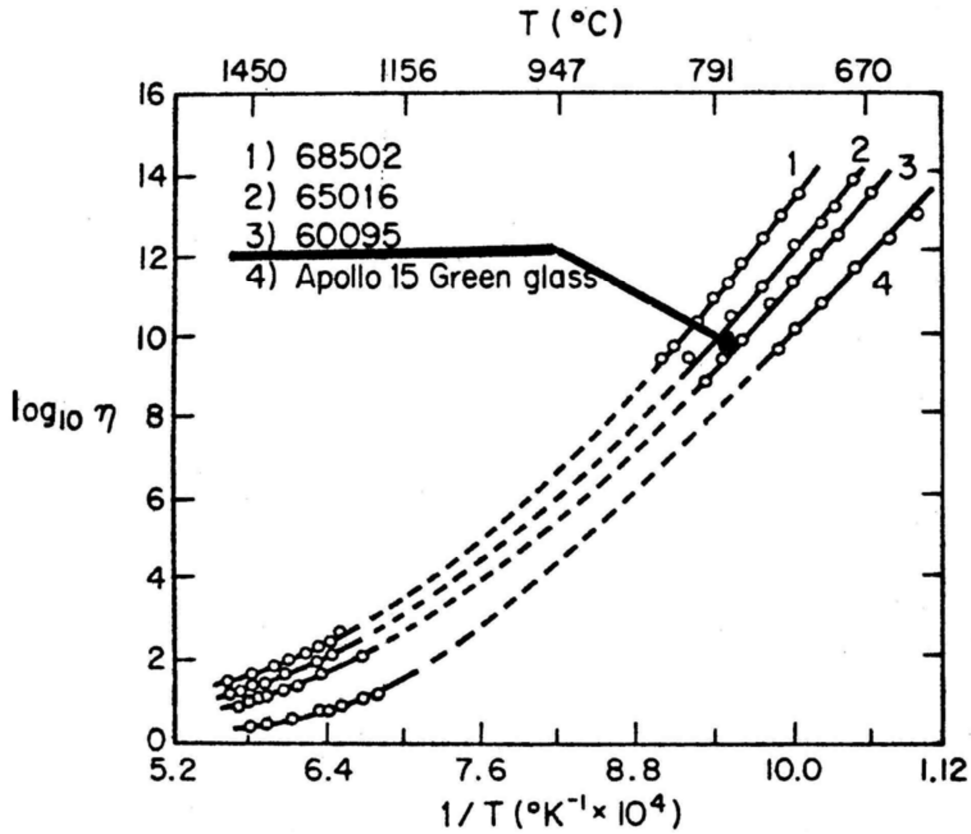

FIGURE 6. Viscosity v. temperature;
from Uhlmann/et al.(1974).

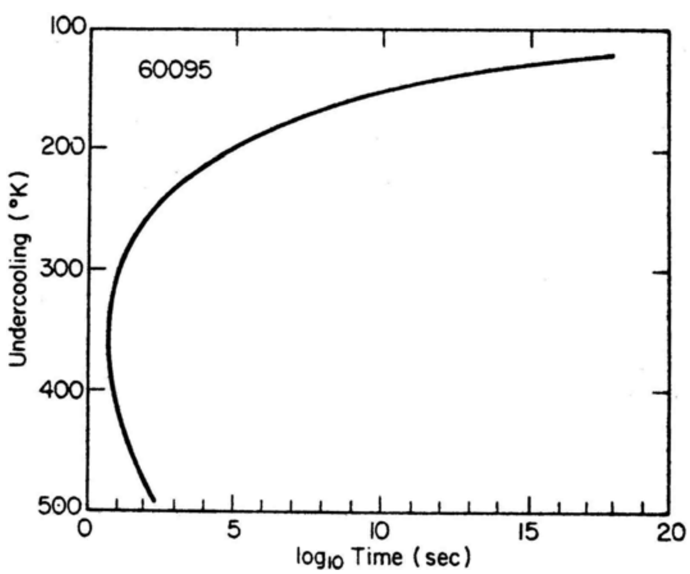

FIGURE 7. Time-temperature-transformation, curve;
from Uhlmann et al. (1974).

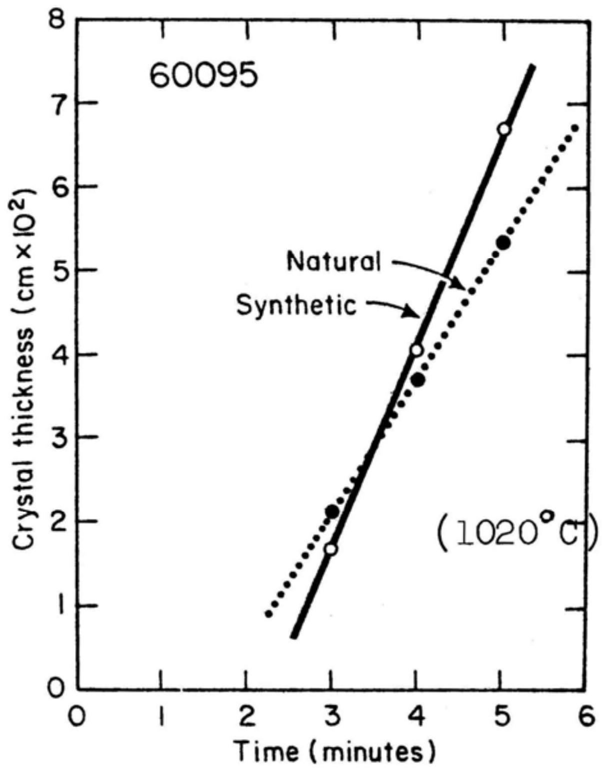

FIGURE 8. Crystal thickness v. time,
from Klein and Uhlmann (1975).

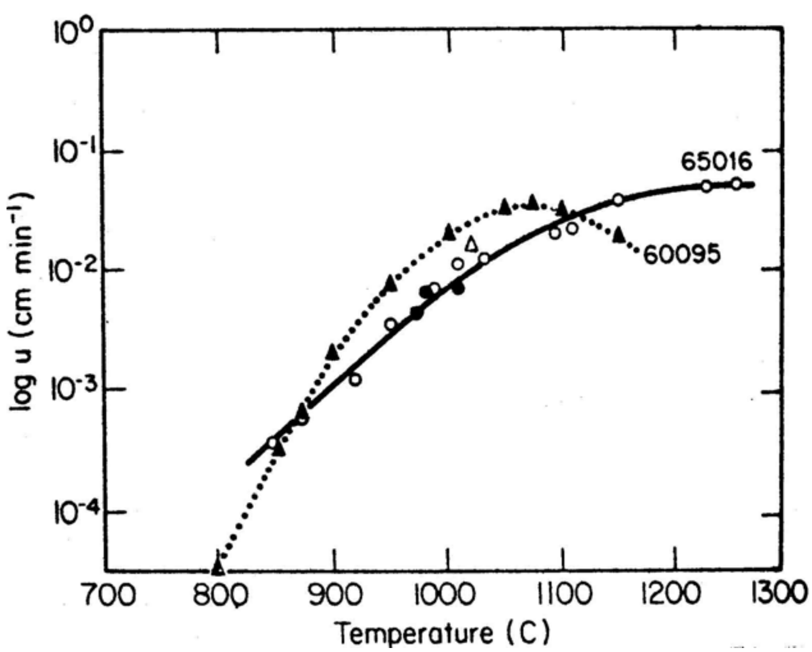

FIGURE 9. Crystal growth rate v. temperature,
from Klein and Uhlmann (1975).