

**67615**  
 Unusual Impact-melt Breccia  
 8.8 grams



Figure 1: Photo of 67615. Sample is about 1 inch long. S72-51058

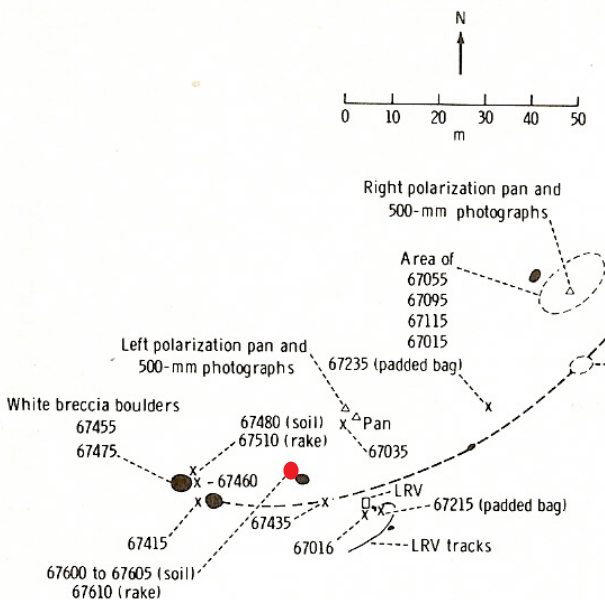


Figure 2: Map of south rim of NRC, A16, with location of rake sample 676xx.

**Introduction**

67615 is a rake sample from inside the rim of North Ray Crater (NRC) – see section on 67601. It is unusual in that it has olivine as the main mafic mineral and it may have a high proportion of opaque phases (figure 3). It is rounded and has zap pits on all sides (figure 1).

**Petrography**

67615 has abundant clasts of plagioclase with a matrix that is described as micropoikilitic by Steele and Smith (1973) and basaltic by Ryder and Norman (1980)(figure 3). Steele and Smith (1973) determined that the plagioclase was  $An_{92-97}$  and olivine  $Fo_{52-64}$ . 67615 apparently lacks pyroxene (figure 4).

**Chemistry**

Stoffler et al. (1985) reported analyses (table) and found it grouped with “granulitic” breccias (figure 6).

**Radiogenic age dating**

Stoffler et al. (1985) reported Ar/Ar data for 67615 (figure 5).

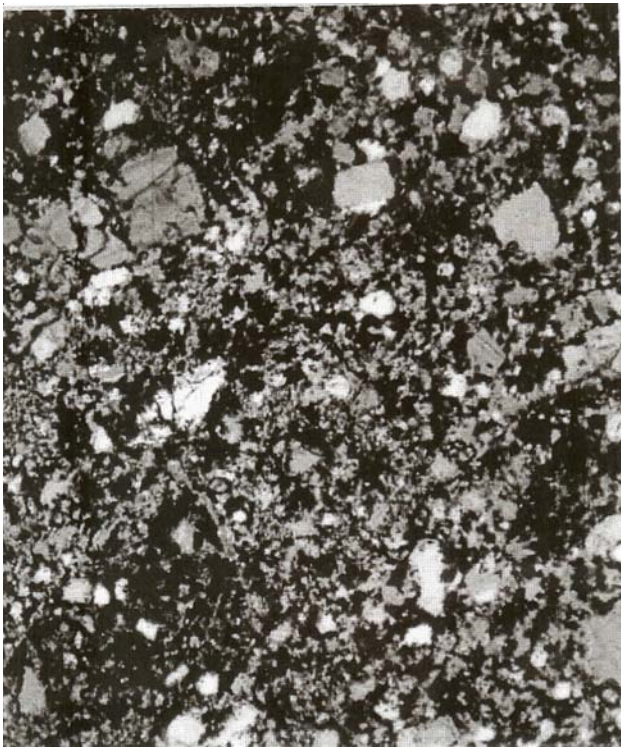


Figure 3: Thin section photomicrograph of thin section 67615,4. Field of view is 2 mm. From Ryder and Norman 1980.

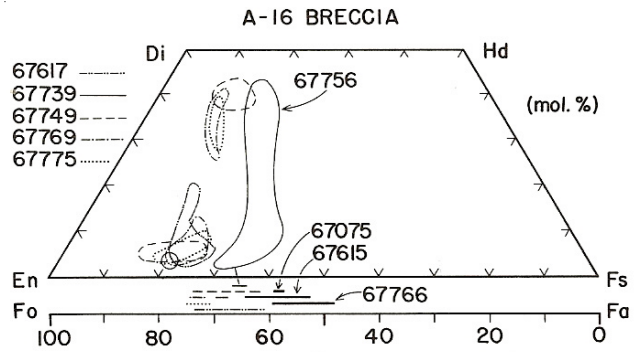


Figure 4: Composition of olivine in rake samples from NRC, including 67615 (from Steele and Smith 1973).

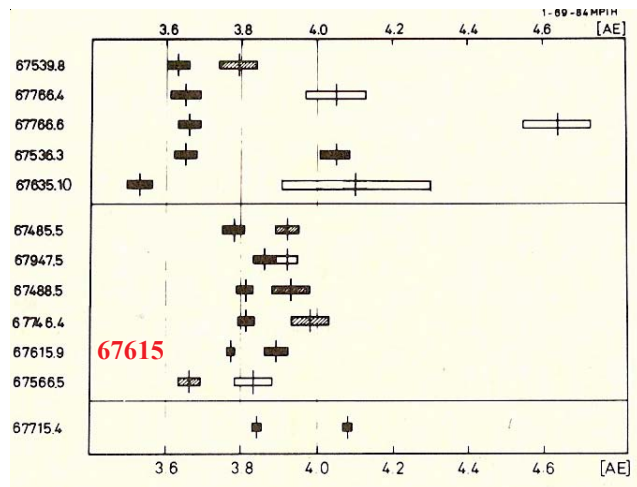


Figure 5: Ar/Ar ages of impact melt samples from NRC (Stoffler et al. 1985).

### Processing

There is only one small thin section and more could be learned if there was another.

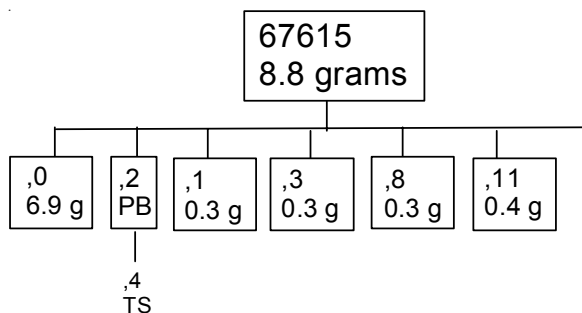


Table 1. Chemical composition of 67615

reference	Stoffler85	
weight		
SiO <sub>2</sub> %	43.51	(a)
TiO <sub>2</sub>	0.23	(a)
Al <sub>2</sub> O <sub>3</sub>	33.33	(a)
FeO	2.12	(a)
MnO		
MgO	1.6	(a)
CaO	18.17	(a)
Na <sub>2</sub> O	0.58	(a)
K <sub>2</sub> O	0.07	(a)
P <sub>2</sub> O <sub>5</sub>	0.06	(a)
Sc ppm	7.2	(b)
Co	7.28	(b)
Ni	35	(b)
Cs ppm		
Ba	64	(b)
Sm	1.79	(b)
Yb	1.41	(b)
technique:	(a) DBA, (b) INAA	

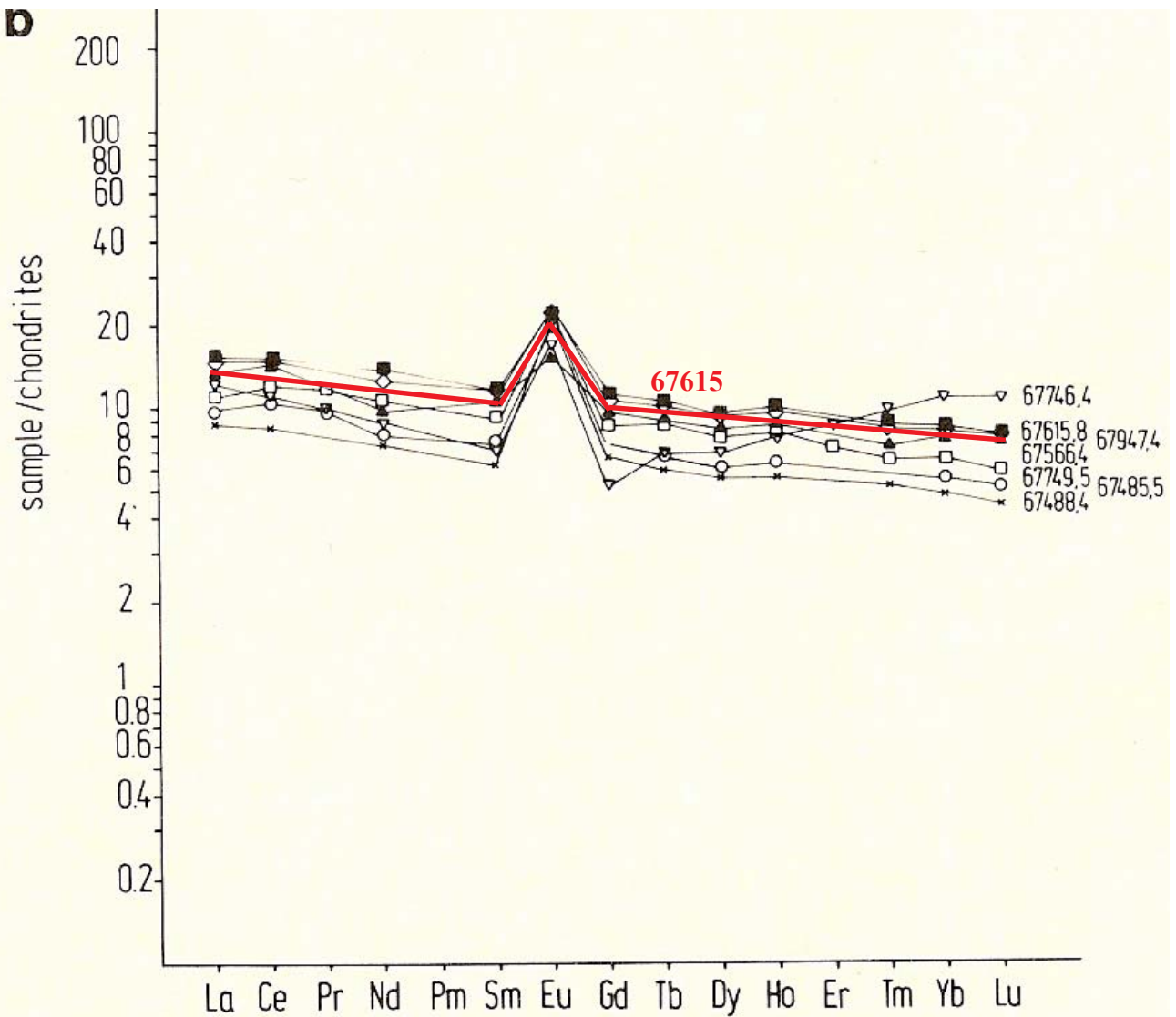


Figure 6: Normalized rare-earth-element diagram for granulitic-textured rake samples from rim of NRC (Stöffler et al. 1985).

#### References for 67615

Butler P. (1972a) Lunar Sample Information Catalog Apollo 16. Lunar Receiving Laboratory. MSC 03210 Curator's Catalog. pp. 370.

LSPET (1973b) The Apollo 16 lunar samples: Petrographic and chemical description. *Science* **179**, 23-34.

LSPET (1972c) Preliminary examination of lunar samples. In Apollo 16 Preliminary Science Report. NASA SP-315, 7-1—7-58.

Ryder G. and Norman M.D. (1980) Catalog of Apollo 16 rocks (3 vol.). Curator's Office pub. #52, JSC #16904

Smith J.V. and Steele I.M. (1972c) Apollo 16 rake samples 67515 to 68537: Sample classification, description and inventory. Curator Catalog, JSC

Steele I.M. and Smith J.V. (1973) Mineralogy and petrology of some Apollo 16 rocks and fines: General petrologic model of the moon. *Proc. 4<sup>th</sup> Lunar Sci. Conf.* 519-536.

Stöffler D., Bischoff A., Borchardt R., Burghelle A., Deutsch A., Jessberger E.K., Ostertag R., Palme H., Spettel B., Reimold W.U., Wacker K. and Wanke H. (1985) Composition and evolution of the lunar crust in the Descartes highlands. *Proc. 15<sup>th</sup> Lunar Planet. Sci. Conf.* in *J. Geophys. Res.* **90**, C449-C506.

Sutton R.L. (1981) Documentation of Apollo 16 samples. In *Geology of the Apollo 16 area, central lunar highlands.* (Ulrich et al. ) U.S.G.S. Prof. Paper 1048.