Queen Alexandra Range 93069, 94269

Anorthositic regolith breccia

21.4, 3.1 g

Figure 1: QUE93069 as found in the Queen Alexandra Range of the Transantarctic Mountains, in 1993.

Introduction

On the 1993 to 1994 ANSMET expedition, a small 21.4 lunar meteorite, Queen Alexandra Range (QUE) 93069 (Fig. 1), was discovered in the southern part of the Walcott Neve area, during foot search of a moraine deposit called Footrot Flats (Figs. 2 and 3). Although immediately recognized as a possible lunar meteorite, it was not until later more careful studies revealed it to be a feldpsathic or anorthositic regolith breccia. The next search season, 1994-1995, another paired 3.1 g piece of this breccia was discovered in the same morainal deposit – QUE 94269. At the time these were the 13th and 15th lunar meteorites known.

Figure 2: The Walcott Neve region of the Queen Alexandra Range, home of QUE meteorites. Foggy Bottom region is shown in the southern part of the map.
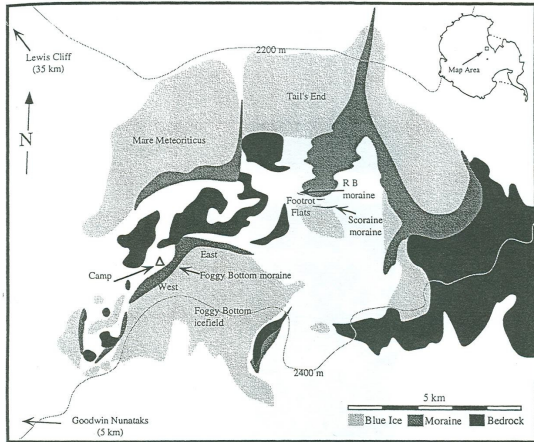
Figure 3: Footrot Flats region where QUE 93069 and QUE 94269 were discovered.

Petrography and Mineralogy

QUE 93069 is a polymict feldspar-rich regolith breccia. This classification is based on the presence of abundant glass spheres, fine grained granulitic breccias, and with few to none preserving original igneous textures (Fig. 4 and Table 1). Also, metallic flakes are distributed throughout the matrix, and inhomogeneously between clasts (Lindstrom et al., 1995).

Mineral fragments include plagioclase feldspar (An_{96-98}), olivine (Fa_{25-45}), and two pyroxenes with unexsolved, finely exsolved, and coarsely exsolved occurrences, as well as clasts of orthopyroxene and pyroxferroite (Fig. 5; Korotev et al., 1996).
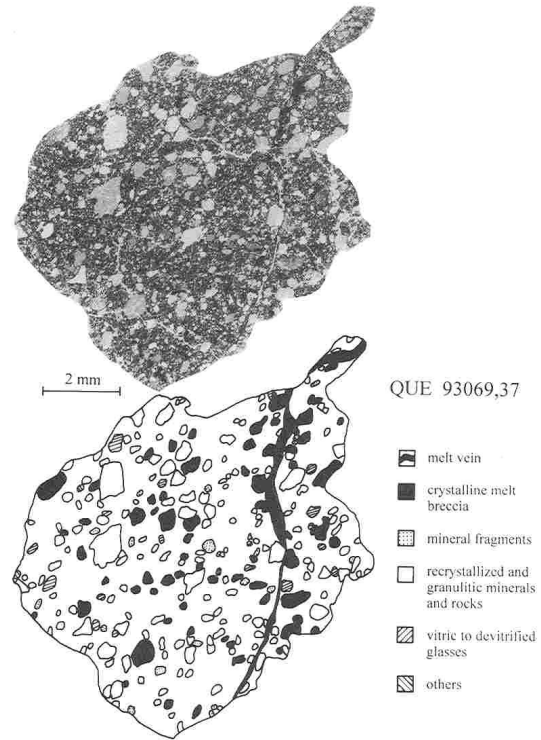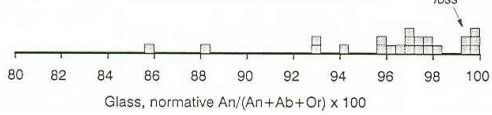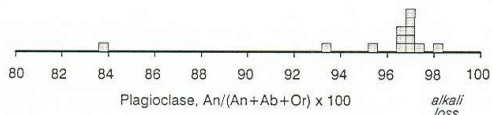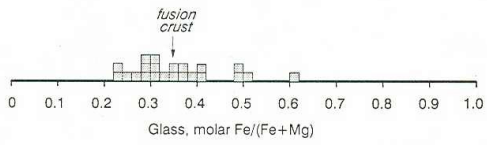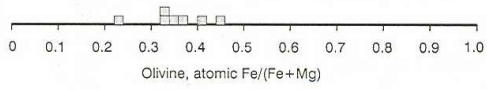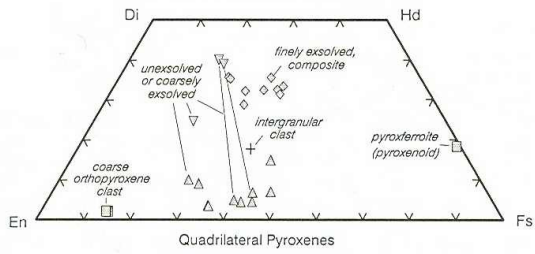

FIG. 1. Transmitted light photograph of the entire thin section of QUE 93069,37 and a sketch map showing the distribution of mineral and lithic clasts. An impact melt vein cuts across the entire thin section.

Figure 4: Photomicrograph and sketch of section ,37 from the study of Bischoff (1996).

QUE93069 Clast Compositions

Quadrilateral Pyroxenes

Labels in the pyroxene quadrilateral: Di, Hd, En, Fs; unexsolved or coarsely exsolved; finely exsolved, composite; intergranular clast; pyroxferroite (pyroxenoid); coarse orthopyroxene clast

Olivine, atomic Fe/(Fe+Mg)

fusion crust

Glass, molar Fe/(Fe+Mg)

Plagioclase, An/(An+Ab+Or) x 100

alkali loss

Glass, normative An/(An+Ab+Or) x 100

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