STUDY OF FUZZY GLASSY MATERIALS IN YAMATO 791438 EUCRITE;

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A preliminary study shows that Y791438 is a unique crystalline eucrite with a chemical composition of cumulate eucrites and textures common in ordinary eucrites. A large zircon of about 30 microns in diameter was found in a thin section of this eucrite (1). It has fuzzy glassy materials with chemical compositions intermediate between augite and plagioclase. we could not obtain accurate distribution and abundance of those materials because their backscattered electron image (BEI) is similar to that of plagioclase and their appearances looked like a dirty plagioclase. In this study, we applied a new image analysis system of the Kevex Super 8000 system for digitizing BEI of the JEOL 840A scanning electron microscope (SEM). This system was connected with a personal computer (SHARP X68000) by RS232C cable and transferred image data, so that the BEI data can be processed as we like. We made an image analysis routine for the program to process the BEI images. Using this program we can make mode analyses by painting the BEI with colors which are assigned to each mineral's intensity window. We investigated other eucrites (Juvinas, Millbillillie, Medanitos, Y791195, Serrà de Magé, and Nagaria) searching for fuzzy glassy materials. Laser Raman microprobe spectra of shocked plagioclase in Y791438 and lunar meteorites have been measured by a Jobin-Yvon spectrometer.

The modal analyses data of 6.3 x 3.1 mm of Y791438 are shown in table 1. Ilmenite, chromite, and troirite are not distinguishable because their BEI intensities are so similar. The modal abundance data show that the fuzzy glassy part of Y791438 distribute in very broad area. Many regions we considered as plagioclase through optical microscopic study turned out to be glassy materials. The optical microphotograph of glassy part in Y791438 is shown in Fig. 1. The glassy materials seem to intrude into the plagioclase crystal. The chemical compositions of fuzzy glassy materials were obtained by microprobe analyses (JEOL 733 mark II, at Geol. Inst., Univ. of Tokyo). They are plotted in a Silica-Olivine-Anorthite pseudo-ternary system (Fig. 2). These data show that they are simple mixing composition of plagioclase and pyroxene.

There are three possible origin of these materials as: (a) they were made as mixture of shock melt glass and small plagioclase or maskelynite. (b) they were originally plagioclase and were injected by Fe, Mg and Si (pyroxene components) by shock event and original structures were partly preserved. (c) they are glass made from partial melts of pyroxene and plagioclase and are slightly devitrified. Such glasses have not been found in Juvinas, Millbillillie, Medanitos, Y791195, Serrà de Magé, and Nagaria.

Velde et al. (2) compared Raman microprobe spectra of fused glass with those of shock maskelynitized anorthite and observed specific structural rearrangements of plagioclase. Velde, Takeda and Boyer applied this method to a lunar meteorite breccia, and found that degree of shock maskelynitization can be estimated semiquantitatively. One shock produced glass in the lunar meteorite with minor Fe and Mg seems still to show spectra similar to maskelynite. We also compared the Raman spectra of fuzzy glassy materials in Y791438 to plagioclase, maskelynite and fused glass. The Y791438 spectrum is similar to those of fused glass. Presence of some crystalline materials in the Y791438 glass as observed by a microscope suggests that the glass contains minor devitrified minerals or that minor shocked minerals are left unmelted or both.

Shock melted glasses were reported in the Cachari eucrite (3). The Cachari glass has more homogeneous chemical compositions, and the textures around them are much more disturbed than those of Y791438.

The fact that maskelynite has not been found in Y791438 raises a question why abundant glasses were formed by relatively low impact pressure. One hypothesis we propose is that it was still hot enough to diffuse Fe and Mg from pyroxene into plagioclase when Y791438 was shocked. After the impact shock event, Y791438 is excavated to near the surface of the parent body and cooled relatively quickly so that exsolution of augite lamellae did not continue as in the cumulate eucrites. This scenario is in line with our shallow magma scenario (1), because the possibility of such transportation require shallower location of the cumulate eucrite.

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References:

(1) Saiki K., Takeda H., and Tagai T. (1990) Proc. Lunar Planet. Sci. Conf. 21st. in press.

(2) Velde B., Syono Y., Kikuchi M., and Boyer H. (1989) Phys. and Chemi. of Miner. 16. 436-441.

(3) Fredriksson K. and Kraut F. (1967) Geochimi. Cosmochimi. Acta. 31. 1701-1704.

Table 1. Modes of Y791438. (areal%)

SiO_2	1.5
Plagioclase	42.7
Pyroxene	44.5
Glass	10.3
Troilite +ilmenite +chromite	1.0

Fig. 1 Photomicrograph of glassy part in Y791438. Width is 1.1 mm, open polarizer.

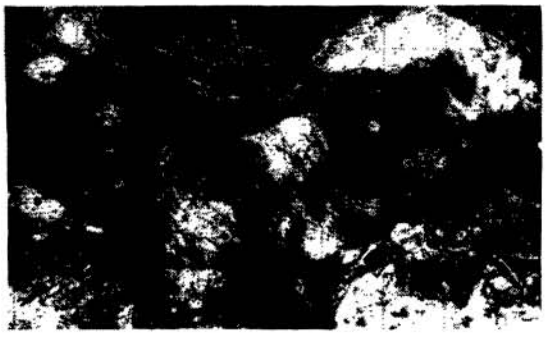

Fig. 2 Pseudoternary projection showing composition of fuzzy glassy materials in Y791438.