

Microlite Systematics

Atsushi Toramaru[1]; Sei Tamura[2]; Shinobu Ooyoshihara[2]; Takahiro Miwa[1]

[1] Earth and Planet. Sci, Kyushu Univ.; [2] Dept.Earth Sci. Kanazawa Univ

Microlites in groundmass in volcanic rocks form due to the water exsolution caused by the decompression of magma. So the textural characteristics of microlites are the possible indicators for the decompression process. Although there are much variety in the textural and morphological feature of microlites, we found some systematics among them, which we call microlite systematics. In this paper, we introduce microlite systematics for Izu-Oshima 1986B eruption and Fuji Hoei eruption, consider the origin of the microlite systematics, and refer to the decompression process which accounts for the microlite systematics.

There are following systematics in the vesicle and microlite textures of sub-plinian to plinian eruptions of basaltic andesite magmas.

- (1)Positive correlation between the bubble number density and microlite number density.
 - (2)Positive correlation between the microlite number density and the crystallinity.
 - (3)Negative correlation between the crystallinity and the vesicularity.
 - (4)Negative correlation between the vesicularity and the microlite number density.
- The last systematics can be derived from (2) and (3).

Meanings of microlite systematics are addressed:

(1)The microlite number density is proportional to the water exsolution rate by the power of $3/2$. Since the water exsolution rate is proportional to the bubble number density by the power of $2/3$, the microlite number density is proportional to the bubble number density. The proportionality coefficient depends on the diffusivity and the effective vesicularity at the microlite nucleation, and takes a value of 10^5 to 10^2 . In the example of Fuji Hoei eruption, the coefficient is approximately 10^2 . In addition the bubble number density is proportional to the decompression rate by the power of $3/2$, and then the microlite number density is controlled by the decompression rate at the bubble nucleation.

(2)From the results of recent experiments, the crystallinity of microlite is probably associated with the amount of decompression. So the fact that the crystallinity is not constant and varies systematically, implies that scoriae preserve the systematically different quenched pressure. In this context, the term 'systematically' means that the amount of decompression is determined by the systematic coupling among the microlite number density, bubble number density and decompression rate. So we interpret the systematics (2) as the correlation between the amount of decompression and the decompression rate at the bubble nucleation.

(3)In considering the negative correlation between the crystallinity of microlite and vesicularity, it is important that the vesicularity is controlled by two physical processes: water exsolution and gas phase expansion. Magma that have large decompression rate, and consequent bubble number density is large, and microlite number density is also large, has large crystallinity and extremely large effective viscosity. So, at small pressure, the expansion of gas bubble does not proceed sufficiently. On the other hand the magma that have small decompression rate, and consequent bubble number density is small, and microlite number density is also small, has small crystallinity and low effective viscosity. So, at small pressure, such a magma can fully expand.