

## Influence of solid inclusions on the rheology of silicate melts

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The viscosity of magma is an important parameter for understanding magmatic processes and volcanic eruptions. A great deal of work has been done to understand how the viscosity of silicate melts depends on temperature, on chemical composition, and even on pressure. But natural magmas are not made of only a melt phase; they carry solid and gas inclusions whose influence on viscosity just begin to be investigated.

For solid phase inclusions, reliable and accurate data have previously been gathered for melts with spherical crystalline inclusions of constant size. The viscosity of these melts increases abruptly and becomes non-newtonian when the crystal fraction is about the threshold value of 40% vol. The rheology of real magmas is more complicated because of the diversity of form and size of the crystalline species and the possibility of orientation effects.

This study aims at filling some important gaps which still exist in understanding the rheology of magmas. This work concerns high viscosities where the kinetic of growth of crystals is slow, so the crystal fraction is well known during the experiments. The influence of non-spherical crystals with different sizes has been determined for  $\text{CaAl}_2\text{Si}_2\text{O}_8$  melts,

which crystallize congruently. Thus we avoid strong variations of viscosity due to a change of the chemical composition of the melt by crystallization, and we just consider the physical effect of the crystal fraction.

For a better understanding of the dynamics of volcanic eruptions, the rheological laws obtained with simple systems will be compared with measurements on lavas, and especially on some material from the peléean eruption of 1929.

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