The brittle-ductile transition remains a central question of modern geology as rock failure is the main parameter in mitigating geological risks and more specifically the transitions from effusive to explosive eruptions. If numerical simulations are the only way to fully understanding the physical processes involved, we are in a strong need of an experimental validation of the proposed models.

We present results obtained under torsion and uni-axial compression on both pure glasses and crystal bearing melts. We characterized the brittle onset of two phases magmas from 0 to 65% crystals. The strain-rates span a 5 orders magnitude range, from the Newtonian flow to the Brittle field (10^{-5} - 10^{5} \, s^{-1}). The materials tested are a standard borosilicate glass, a natural sample (Mt Unzen volcano) and a synthetic sample.

For pure glasses, the brittle onset is explained with the visco-elastic theory and corresponds to a Deborah number greater than 10^{-2}. Concerning crystal bearing melts, the global ultimate failure follows the visco-elastic theory. However a crystal contribution has been here detected and correlate with smaller Deborah numbers before failure.

It provides an experimentally-determined, and physically-explained, failure criterion for magmas containing crystals. The consequence of brittle failure depends on the time scale for cracks to heal, function of confining pressure, melt viscosity and crystal fraction. Our model can retrospectively be used to interpret individual eruptions and changes in eruption style. However, by monitoring effusion rate, melt composition and crystal content, the evolution of eruption style and degassing processes can be predicted.