1. Research activity (max 1.000 words)

Many kinetically-controlled crystallisation conditions have been simulated in laboratory by means of undercooling experiments. Experiments were conducted using a non-ended loaded piston cylinder ("QUICKpress" design by Depths of the Earth Co.) installed at the HPHT Laboratory of Experimental Volcanology and Geophysics of the Istituto Nazionale di Geofisica e Vulcanologia. The experimental apparatus is equipped with a 25 mm assembly specifically designed for low-pressure experiments (Masotta et al., 2012). The assemblies were heated at superliquidus conditions (30 min @ 1300 °C), than cooled and hold at 1100°C for a variable time (from 0 to 24 hours) and finally quenched at ambient temperature. During the experiments the pressure was maintained at 400 MPa. Each experiment has been replicated under anhydrous and hydrous (0-2 wt.% H_2O) conditions.

At the present time, the preliminary results show that clinopyroxene and titanomagnetite are ubiquitous in all the run products, irrespective of the time duration of the experiments (Fig. 1). Intriguingly, the crystal size of clinopyroxene and titanomagnetite increases significantly from 0.5 to 24 h. More specifically, the maximum size of titanomagnetite increases from a few to tens of microns, whereas the maximum size of clinopyroxene increases from about five to one hundred of microns.

The most important textural changes are observed by comparing experiments conducted at 0.5, 4, and 24 h where the amount of matrix glass surrounding the crystals apparently increases, evolving from tiny and intricate glass layers at the inter-crystal scale to large pockets of glass in which clinopyroxene crystals are dispersed. This textural maturation is consistent with the crystal growth mechanism previously observed by Iezzi et al. (2011, 2014) and Mollo et al. (2015) during the crystallization of clinopyroxene and plagioclase from alkaline and calc-alkaline magmas undercooled from fast (i.e., disequiulibrium) to slow (i.e., equilibrium) rates.

According to these studies, the textural maturation proceeds by attachment and agglomeration of small crystals by multiple nucleation events. Differently from "coarsening", crystal agglomeration does not imply a dissolution of smaller crystals and the simultaneous growth of larger ones, but rather microlites start to agglomerate to form large crystals with well-developed planar faces. This suggests that, at least in the 24 h experimental run, the chemical equilibrium has been achieved by the crystallizing system.

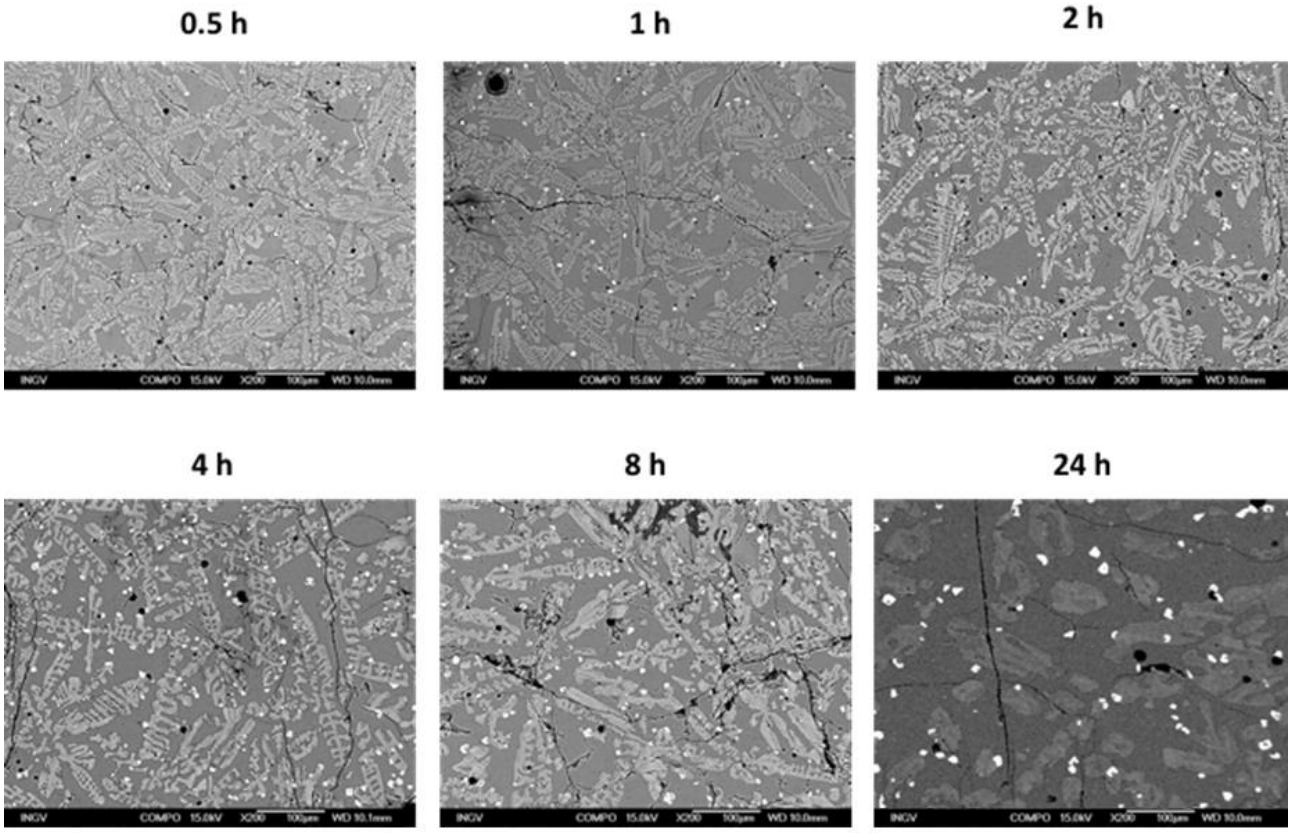

Fig. 1. Clinopyroxene and titanomagnetite progressive textural evolution vs experimental time

REFERENCES

Iezzi, G., Mollo, S., Torresi, G., Ventura, G., Cavallo, A. and Scarlato, P. (2011) Experimental solidification of an andesitic melt by cooling. Chemical Geology, 283, 261273.

Iezzi, G., Mollo, S., Shahini, E., Cavallo, A. and Scarlato, P. (2014) The cooling kinetics of plagioclase feldspars as revealed by electron-microprobe mapping. American Mineralogist, 99, 898907.

Masotta, M., Freda, C., Paul, T.A., Moore, G.M., Gaeta, M., Scarlato, P., Troll, V., 2012. Low pressure experiments in piston cylinder apparatus: calibration of newly designed 25 mm furnace assemblies to P = 150 MPa. Chem. Geol. 312–313, 74–79.

Mollo, S., Giacomoni, P.P., Andronico, D. and Scarlato, P. (2015) Clinopyroxene and titanomagnetite cation redistributions at Mt. Etna volcano (Sicily, Italy): Footprints of the final solidification history of lava fountains and lava flows. Chemical Geology, 406, 4554.

2. Research products

a) Publications (ISI journals)

S. Mollo, J.D. Blundy, P. Giacomoni, **M. Nazzari**, P. Scarlato, M. Coltorti, A. Langone, D. Andronico. Clinopyroxene-melt element partitioning during interaction between trachybasaltic magma and siliceous crust: Clues from quartzite enclaves at Mt. Etna volcano. *Lithos 284–285 (2017) 447–461*. http://dx.doi.org/10.1016/j.lithos.2017.05.003

S. Yao, G. Iezzi, G. Della Ventura, F. Bellatreccia, C. Petibois, A. Marcelli, **M. Nazzari**, F. Lazzarini, M. Di Gioacchino, C. Petrarca. Mineralogy and textures of riebeckitic asbestos (crocidolite): The role of single versus agglomerated fibres in toxicological experiments. *Journal of Hazardous Materials 340 (2017) 472–485*. http://dx.doi.org/10.1016/j.jhazmat.2017.07.027

d) Abstracts

Giuliani L., Iezzi G., Vetere F., **Nazzari M**., Mollo S., Misiti V., Ventura G., Cavallo A., Behrens H. Textural evolution of plagioclase, clynopiroxene and spinel from a basaltic melt as a function of cooling rate. *Geosciences: a tool in a changing world, Pisa 2017*

Giuliani L., Iezzi G., Vetere F., **Nazzari M**., Mollo S., Misiti V., Ventura G., Cavallo A., Behrens H. Chemical variations of phases grown from a basaltic melt cooled at variable rates. *Geosciences: a tool in a changing world, Pisa 2017*

Nazzari M., Mollo S., Blundy J.D., Giacomoni P., Scarlato P., Coltorti M., Langone A., Andronico D. Clinopyroxene-melt element partitioning during interaction between trachybasaltic magma and siliceous crust: Clues from quartzite enclaves at Mt. Etna volcano. *Geosciences: a tool in a changing world, Pisa 2017*

Pontesilli A., Masotta M., **Nazzari M**., Armienti P., Mollo S., Scarlato P., Brenna M. Experimental observation of extremely rapid clinopyroxene growth in a trachybasaltic melt: Clues on phenocryst crystallization kinetics in naturally cooled magmas. *Geosciences: a tool in a changing world, Pisa 2017*

Giuliani L., Vetere F., Iezzi G., Misiti V., **Nazzari M**., Mollo S., Ventura G., Behrens H., Cavallo A. GFA of natural silicate melts: a general reappraisal. *12th International Symposium on Crystallization in Glasses and Liquids – Segovia 2017*