# Origin of specific textures in granitic pegmatites: an experimental study

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Granitic pegmatites are now considered as sources of critical and strategic elements. Since their crystallization conditions and specific textures control mineral/melt partitioning, experiments are been carried out on the crystallization kinetics of pegmatitic melts. Factors controlling the mechanisms of crystallization such as the cooling rate ($\Delta T/\Delta t$), degree of undercooling ($\Delta T$), liquidus and solidus temperatures ($T_L$ and $T_S$) and melt $H_2O$ content are being considered.

An haplogranitic melt composition was used for all experiments. These were carried out at 2 kbar between 600 and 900°C either in cold-seal or in internally heated pressure vessels, both pressurized with Ar. Phase equilibria were determined to assess liquidus temperatures and their dependency with the initial $H_2O$ concentration in the fluid ($X_{H2O}i$). Crystallization kinetics experiments followed a specific isobaric three-step time-temperature cycle defined for the $H_2O$-rich charges ($X_{H2O}i=1$ and $X_{H2O}i=0.85$). First, a pre-conditioning step at 800°C was imposed for 5 days. Second, the charge was cooled at a fixed $\Delta T/\Delta t$ to a given temperature T ($=T_L-\Delta T$). Third, the charge was kept at T for a given duration (t). Quenching was performed under constant pressure.

Results demonstrate differences in phase assemblages and textures between the phase equilibrium and crystallization experiments. Pegmatitic textures marked by large crystals and graphic intergrowths appear for large $\Delta T$ (175°C for $X_{H2O}i=0.85$, 120°C for $X_{H2O}i=1$), $\Delta T/\Delta t=10$°C/min, T=600°C and t=552 hours. These conditions correspond to crystallization from supercooled melts. For slower cooling rates (1°C/min, 2°C/h), pegmatitic textures are not observed. Our experiments stress the importance of kinetic factors during the crystallization of granitic melts and for the development of pegmatitic textures. Implications for element partitioning will be discussed.