

Evaporation and condensation of silicates. M. Klevenz¹, S. Wetzel¹, M. Trieloff², H.-P. Gail³ and A. Pucci¹,
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Introduction: Experimental data on evaporation and condensation processes, i.e., data on vapour pressures, evaporation coefficients, condensation products and their optical properties (for instance on Fe-bearing silicates and Ca-Al-bearing minerals) are needed for reliable theoretical calculations for the early mineralogical and chemical evolution of the material in pre-planetary discs.

We built up two setups to study these properties. Details on our setups, results on SiO [1, 2] and the planned experiments will be presented.

Experimental Setup:

Evaporation Setup. We established an experimental setup for thermal evaporation of silicates under well defined conditions (UHV in general or a certain partial pressure in the range between 10^{-7} to 10^{-9} mbar). A schematic drawing of the existing setup with the intended modifications is shown in Fig. 1.

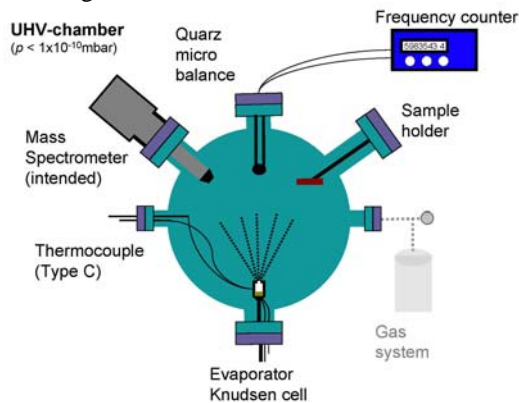


Figure 1: Schematic drawing of the evaporation setup.

It basically consists of a Knudsen cell [3] for the evaporation of materials under equilibrium conditions and a quartz crystal microbalance (QCM), which allows to monitor the mass change of the Knudsen cell *in situ* and hence the

equilibrium vapour pressure within the cell. In this setup the evaporation properties, i.e., vapour pressures, condensation coefficients and gas phase species will be studied.

Condensation Setup. In a second setup the condensation of the evaporated material can be monitored *in situ*. It is also based on a UHV chamber, which is equipped with an evaporator, a quartz micro balance and an appropriate sample holder. A schematic drawing is shown in Fig. 2.

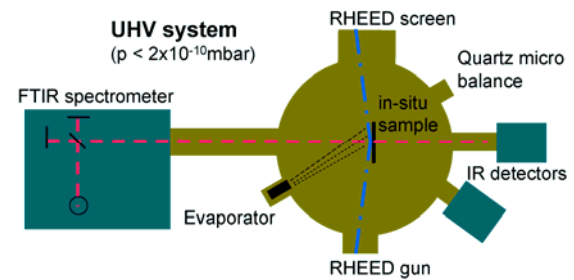


Figure 2: Schematic drawing of the condensation setup.

A Fourier transform infrared (IR) spectrometer flanged to the chamber allows a direct monitoring of the condensation processes, i.e., spectra are measured continuously during the condensation onto appropriate substrates.

A detailed description of both setups, the planned experiments in the future and the results on SiO and SiO₂ evaporation and condensation are presented on two separate posters during this workshop.

References:

- [1] Klevenz, M. et al. (2009) *submitted to Phys Rev. B.*
- [2] Klevenz, M. et al. (2009) *in preparation.*
- [3] Knudsen, M. (1909) *Annalen der Physik*, 333, 999.