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Behavior of feldspars during the Giant Impact

Anaïs Kobsch (1) and Razvan Caracas (2)

(1) Laboratoire de Géologie de Lyon, École Normale Supérieure de Lyon, Lyon, France (anais.kobsch@ens-lyon.fr), (2) Laboratoire de Géologie de Lyon, CNRS, École Normale Supérieure de Lyon, Lyon, France (razvan.caracas@ens-lyon.fr)

It is commonly accepted that a Giant Impact between two large planetary embryos formed a debris disk around the proto-Earth, which lead to the formation of the Moon upon cooling and accretion. However, the thermodynamic parameters and constraints are still uncertain. If a substantial part of the silicate disk was in a supercritical state, the evolution of the disk could change dramatically.

Here we use *ab initio* molecular dynamics to investigate the liquid/vapor equilibrium curve and to identify the position of the supercritical point. We work on four different feldspars over a wide range of temperatures – 3000 to 7000 K – and densities – 1.5 to 6.4 g/cm^3.

We identify the pressure – density – temperature conditions for the spinodal decomposition of the liquid – the point at which the liquid becomes unstable and the first gas phase occurs. We also provide equations of states of the liquid and the supercritical fluid for all the compositions, we monitor the atomic coordination and speciation over the entire pressure and temperature ranges, and we calculate the diffusion coefficients in the fluid phase.