Experimental study of neodymium speciation in water vapour

ZAGRTDENOV N.R.[1]*, BYCHKOV A.Y.[1,2] AND NIKOLAEVA I.Y.[1]

[1]Lomonosov Moscow State University, Moscow, Russia (correspondence: nailzag@yandex.ru)
[2]Vernadsky Institute of Geochemistry and Analytical Chemistry, Moscow, Russia (bychkov@geol.msu.ru)

These days there are data regarding geothermal springs and postvolcanic, hydrothermal deposit formation processes which give evidence of the transportation of rare earth elements in the gaseous phase. Two methods have been used to study the solubility of solid phases of Nd_2O_3 and $Nd(OH)_3$ experimentally. The solubility of $Nd(OH)_3$ has been researched through the use of a static method in autoclaves under 200, 250 °C and pressure ranges from 3 to 15 bars and from 5 to 38 bars respectively. Experimental results have demonstrated that the solubility of $Nd(OH)_3$ doesn't depend on water fugacity and the proposed reaction is as follows: $Nd(OH)_3$ (solid) = $Nd(OH)_3$ (gas).

The logarithms of the equilibrium constants are -9.15±0.42 for 200 °C and -9.30±0.31 for 250°C. The flow method has been used for exploration of Nd_2O_3 solubility in water vapour under 300, 350, 450°C and pressure ranges from 0.025 to 0.7 bar. An air flow of certain humidity has been forced through the quartz tube with Nd_2O_3 and was trapped in 3% solution of HNO_3. Experimental results showed that the solubility increases with water fugacity rising at all temperatures and the slope approximates 1.5 (fig. 1). The logarithms of the equilibrium constants for reaction showed on fig.1 are -8.31±0.42 for 300 °C, -7.74±0.31 for 350 °C and -7.03±0.61 for 450 °C.

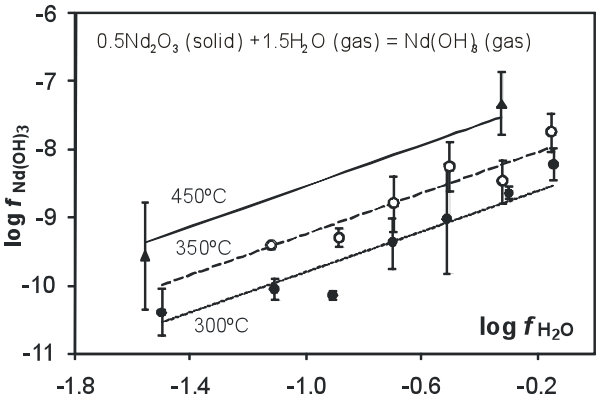

Figure 1. The dependence of Nd fugasity in gas with water pressure.