

## Thermodynamic and kinetic aspects of formation of bauxites

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### Abstract

Experiments in which cleavage nepheline samples were reacted with aqueous solutions at fixed pH's and temperature were carried out in the laboratory. The chemistry of the solution as a function of time was monitored, as well as the chemistry of the nepheline surfaces.

At 25°C, Al derived from the nepheline stays in solution due to slow precipitation kinetics of Al(OH)<sub>3</sub>. At 60° and 80°C, precipitation of Al(OH)<sub>3</sub> is so rapid that Al concentration in solution is below 0.05 ppm. This indicates that precipitation kinetics favour the formation of bauxite deposits in tropical regions (i.e.  $T \geq 25^\circ\text{C}$ ), but not in temperate regions.

Precipitation products on the surface of the nepheline fragments at 60° and 80°C depend on the pH. At pH 3.0, an amorphous aluminium silicate (proto-kaolinite?) is formed. At pH > 7.0, the precipitated phase contains, in addition to Al and Si, high amounts of Na and K (proto-muscovite?). The optimum pH for the formation of bauxite is in the range 5–7. These results are in agreement with thermodynamic calculations.