Solubility measurements of hydrotalcite-like solid solutions

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Hydrotalcite-pyroaurite $Mg_3(Al,Fe)(OH)_8(CO_3)_{0.5}\cdot nH_2O$ LDH phases are of interest as potential sorbents for anionic radionuclides. Synthesis and analysis of end-members and individual phases in this solid solution series were described in [1]. PXRD measurements confirm the presence of a single phase LDH. Cell parameters as a function of x_{Fe} follow Vegard's law and corroborat the existence of a continuous solid solution series. Measured solute concentrations from coprecipitation and dissolution experiments were modelled using [2]. Results are presented as Lippmann total solubility products $\Sigma\Pi=\{Mg^{2+}\}^3(\{Fe(OH)_4^-\}+\{Al(OH)_4^-\})\{OH^-\}^4\{CO_3^{2-}\}^{0.5}$ in Figure 1, together with the theoretical solidus and solutus curves for the ideal solid solution using $\log_{10}K_{sp}(Ht) = -35.5$ and $\log_{10}K_{sp}(Py) = -34.5$.

Solutus points generally show too low $Fe(OH)_4^-$ aqueous activity fractions, indicating the following complications: (i) too low Fe or high Al concentrations, (ii) not attained equilibrium, (iii) presence of minory secondary phases like *brucite*, *gibbsite*, *ferrihydrite* not detectable by PXRD. Available data within its uncertanty do not contradict the ideal solid solution model Ht–Py. Aging (on-going experiments) results in decreasing total solubility products.

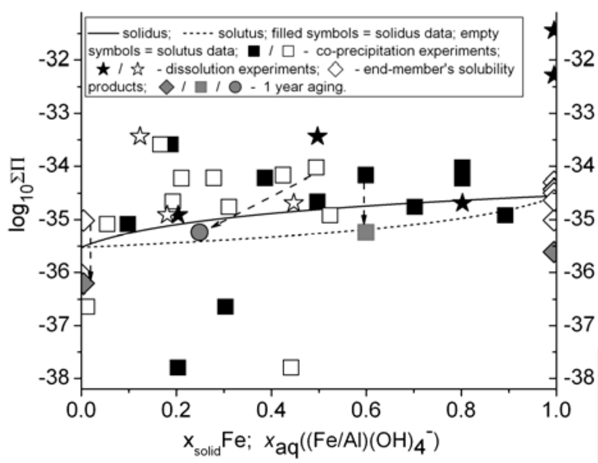

Figure 1: Data for hydrotalcite-pyroaurite solid solutions.

[1] Rozov *et al*. (submitted) *Cem. Conc. Res.* [2] GEMS-PSI code package, http://gems.web.psi.ch.

Timing of melting in collisional orogenies

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Partial melting of the continetal crust commonly occurs in orogenic settings at the root of mountain belts. The timing of melting has significant implications for the modeling of orogenic processes, heat transfer and rheology of the crust. We present here a detailed geochronological study of melting in anatectic terranes in the Alps and the Himalayas using U-Pb ion microprobe dating of zircon and monazite.

In the migmatite belt of the Central Alps, fluid-assisted melting occurred repeatedly, and at roughly constant temperatures of 650-700°C over the period 32-22 Ma. This repeated melting is timed by multiple zircon overgrowths within the same leucosome or even within the same zircon crystal. The melting and remelting events were controlled by the local rock composition and the influx of external fluids. This period of protracted melting was followed by fast cooling of the region from middle to upper crustal levels.

The Sikkim sequence of the Himalayas reached high-grade metamorphic conditions (800°C) followed by rapid isothermal decompression [1]. Geochronology of several samples indicates that high-grade metamorphism and melting occurred over several million years. The growth of zircon and monazite records different snapshots within this period. Melting resulted in the formation of multiple generations of leucosomes but also reworking of previous melt products.

In both localities, melting conditions were protracted over time, but allowed for the crystalization of accessory minerals, and likely of leucosomes, in episodic fashion. The timing of repeated accessory mineral crystallization was diachronous and not systematic within an area.

Despite the extended melting period, the episodic nature of melt production prevented large melt volumes from accumulating in such terranes. This has bearings for tectonic models that predict fast exhumation driven by the buoyancy of mountain roots with a high percentage of melt produced over a short time.

[1] Ganguly *et al*. (2000) *Earth and Planetary Science Letters* **183**, 471-486.