The Breakdown Behavior of Chlorite at high Temperatures: a Combined high-T XRD and DTA/TG Study

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Petrological investigations concerning slags and furnace samples provide information about the firing temperatures during the smelting process since abundant newly formed silicate (olivine, orthopyroxene) and oxide (spinel) phases are present and the breakdown of silicate precursor phases (e.g. biotite, chlorit) also provides limiting temperature estimates (Tropper et al., 2004). In the course of these experimental investigations, the high-*T* behavior of chlorites was examinated. These investigations were conducted using high-temperature X-ray diffraction, differential thermal analysis (DTA) and thermogravimetry (TG). The DTA was calibrated with metal-standards, so the change of enthalpy can actually be quantified. The investigated samples are chlorites with different iron content from X_{Fe} = 0.11 up to X_{Fe} = 0.88. In the experiments with samples with high X_{Fe} melt formed at high temperatures. The dehydroxylation of chlorite can thus be subdivided into two stages: A slow dehydroxylation of the brucite layers until 500-600°C and at higher temperatures a rapid dehydroxylation and subsequent breakdown of the talc layers (Guggenheim and Zhan 1999). Only beyond this point SiO_2, MgO/FeO and Al_2O_3 are able to react and form new components. Depending on the iron content the dehydroxylation and the mineral reactions occur at different temperatures. With high-temperature Xray diffraction the mineral reactions and thus growth of reaction products due to the breakdown of chlorite can be observed in-situ and also allows to investigate the accompanying change of lattice constants. Experiments with low-Fe chlorites show that the first product phase that occurs is olivine at around 800°C, spinel appears at 950°C. These phases, especially the olivine, grow orientated along the schist planes (001). The last phase that formed was orthopyroxene at a temperature of 1000°C most likely due to the breakdown of olivine due to reaction olivine + silica = orthopyroxene (Grapes 2006). Finally, these data provide important *T*-constraints on the firing history of sacrificial burning sites, which are investigated in the course of the Sonderforschungsbereich (SFB) HiMAT at the University of Innsbruck.

References

Grapes, R. H. (2006): Pyrometamorphism. Berlin ; New York, Springer, 275 pp.

Guggenheim, S., Zhan, W. D. (1999): Crystal structures of two partially dehydrated chlorites: The "modified" chlorite structure. Am. Mineral. 84: 1415-1421.

Tropper, P. Recheis, A, Konzett, J. (2004). Experimental investigations on the pyrometamorphic formation of phosphorous-bearing olivines in partially molten metapelitic gneisses. Eur. J. Mineral. 16: 631-640.

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