

Formation of anorthosite-related Fe-Ti deposits, Namibia

H. FRANKE¹, K. DRÜPPEL¹ AND H. BRÄTZ²

¹TU Berlin, Berlin, Germany, henrike.franke@gmx.de

²Geo-Center of Northern Bavaria, Erlangen, Germany

Massive Fe-Ti ores occur as sharply bounded, oval-shaped bodies of up to 80 m in diameter in Mesoproterozoic massif-type anorthosites, NW Namibia [1]. The ore bodies are always associated with early pyroxene-bearing andesine anorthosites and do not occur within olivine-bearing labradorite anorthosites. They are mainly composed of granular, coarse magnetite (60-80 vol.%; reintegrated composition $\text{Fe}_{2.1}\text{Al}_{0.4}\text{Ti}_{0.5}\text{O}_4$) with delicate ilmenite, spinel and corundum exsolution textures, and of ilmenite with hematite exsolution (20-30 vol.%; reintegrated composition $\text{Fe}_{1.9}\text{Ti}_{1.9}\text{Mn}_{0.1}\text{Mg}_{0.1}\text{O}_3$), together with minor spinel (up to 5 vol.%; $\text{Mg}_{0.5}\text{Al}_{1.9}\text{Fe}_{0.6}\text{O}_4$). The only silicate phase present is euhedral olivine, which is pseudomorphosed by serpentine minerals and magnetite. LA-ICP-MS analysis reveals variable, but generally high trace element concentrations of V (0.1-0.9 wt.%), Cr and Zn (up to 0.2 wt.%), Mn and Ni (up to 0.1 wt.%), and Ga (20-100 ppm) in magnetite and of Mn (0.5-0.8 wt.%) and V (up to 0.1 wt.%) in ilmenite. Temperatures calculated for the reintegrated compositions of coexisting ilmenite and magnetite range between 950°C and 850°C with corresponding oxygen fugacities at the QFM buffer. A distinctly lower temperature range of 650-400°C is calculated from Ilm-Mag oxygen-isotope equilibria for separated ilmenite and magnetite grains. Bulk rock geochemical data reveals significant amounts of Fe_2O_3 (34-49 wt.%), FeO (21-34 wt.%), TiO_2 (15-25 wt.%), Al_2O_3 (4-8 wt.%), MgO (1.5-4 wt.%), and minor SiO_2 . Compared to the bordering anorthosites the Fe-Ti ores contain higher V, Zn, Cr, (\pm Zr, Sn, Co, and Nb), whereas anorthosites are richer in Ba, Y, U, Th, Ta, and the LREE.

Several mechanisms are suggested for the petrogenesis of Fe-Ti deposits associated with anorthosites, i.e. liquid immiscibility, magma mixing, and fractional crystallisation [2]. In case of the Namibian Fe-Ti ores field relationships with the bordering anorthosites suggest their origin by liquid immiscibility. Fe-Ti oxide microtextures and ore compositions, however, clearly demonstrate that they have been formed by accumulation of titanomagnetite, ilmenite, olivine (\pm spinel), followed by post-cumulus reequilibration. The composition of the parental melt apparently plays a major role in the formation of the Fe-Ti deposits.

[1] Drüppel *et al.* (2007) *Prec. Res.* **156**, 1–31. [2] Charlier *et al.* (2006) *Chem. Geol.* **234**, 264–290.

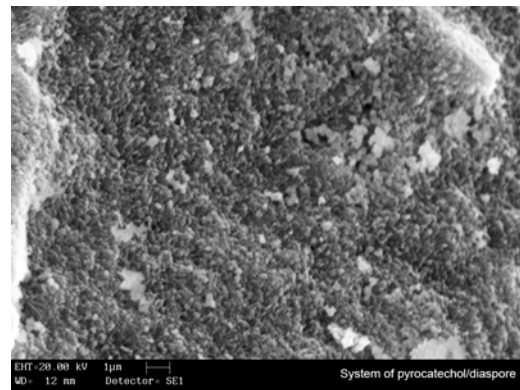
Study of diaspore-pyrocatechol complexation using SEM, EDX and FTIR spectrometry

MARTINA FRANKE

Department of Soil Science, University of Trier, D-54296 Trier, Germany (fran5101@uni-trier.de)

Diaspore ($\alpha\text{-AlOOH}$) was synthesized from corundum ($\gamma\text{-Al}_2\text{O}_3$) over a crystallization period of 48 h at 500°C and 25 kbar in the presence of a surplus of H_2O inside a piston-cylinder apparatus. The lattice parameters of diaspore were analyzed by X-ray powder diffraction (XRD). Furthermore, the particle size of diaspore was determined at an average of 20 μm by using a laser granulometric analysis. The diaspore-pyrocatechol complex was synthesized by adsorption in a gas-solid phase at 50°C in the presence of atmospheric pressure for a period of 60 days in total darkness.

In this study, a comparative structure analysis from diaspore and diaspore-pyrocatechol complex was carried out by using methods of scanning electron microscopy (SEM), energy dispersive X-ray spectrometry (EDX), and Fourier transform infrared (FTIR) spectrometry. The organic coatings from the diaspore-pyrocatechol complex showed cross-linked structures which resembled a moss-like carpet covering the entire mineral surface. In contrast, the diaspore surface showed very smooth structures. The diaspore-pyrocatechol complexation was confirmed by EDX and FTIR. Stabilization mechanisms of the complex were substantiated.



Acknowledgement: Thomas Fockenberg, Ruhr-University of Bochum, Germany, is thanked for the synthesis and investigation of diaspore.

[1] Fockenberg *et al.* (1996) *Eur. J. Mineral.* **8**, 1293-1299.

[2] Franke M., (2002) diploma thesis, University of Trier, 187.