

der Vegetationsintensität, einem wichtigen Parameter im Rahmen des Rekultivierungsmonitoring.

⁵⁷Fe- and ¹¹⁹Sn- Mössbauer study on stannite (Cu₂FeSnS₄) - kesterite (Cu₂ZnSnS₄) solid solution

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Stannite (Cu₂FeSnS₄) is a very important sulfide both for its occurrence in tin-bearing ore and for its physical and chemical properties. The stannite structure (Brockway, 1934) can be derived from that of chalcopyrite, substituting half of the Fe atoms by Sn atoms, with a change of the symmetry from $\bar{4}2d$ to $\bar{4}2m$. This model was confirmed by Hall et al.'s (1978) structural refinement. In the pseudobinary system Cu₂FeSnS₄ (stannite) - Cu₂ZnSnS₄ (kesterite), a rearrangement of Cu and Zn atoms would lead to the space group 14. Such a rearrangement in the kesterite structure implies that half stannite Cu-sites are occupied by Zn atoms, while all the stannite Fe-sites become Cu-sites. On the other hand, Chicagov et al. (1986), studying the Cu₂Zn_{1-x}Cd_xSnS₄ series, found no evidence supporting the structural model for kesterite proposed by Hall et al. (1978) and assigned kesterite to the same space group as stannite, 142 m. Both Hall et al.'s (1978) structural models for stannite and kesterite are very similar in that Cu, Fe, Zn and Sn cations are in tetrahedral coordination, but these tetrahedra differ in dimension and bond angles. ⁵⁷Fe and ¹¹⁹Sn Mössbauer spectra and magnetic susceptibility data collected firstly on stannite by Eibschütz et al. (1967) suggested the cation valences Cu⁺Fe²⁺Sn⁴⁺S₄.

Kissin and Owens (1979), in their study on the pseudobinary system stannite - kesterite, proposed the existence of a miscibility gap from $x_{Zn} \cong 0.25$ to $x_{Zn} \cong 0.40$. On the other hand Corazza et al. (1986) and

Bernardini et al. (1990) suggested the presence of a complete solid solution, as shown by XRD analyses both on single crystal and powdered samples.

In the present study, a combined ⁵⁷Fe and ¹¹⁹Sn Mössbauer study has been performed on the whole solid solution stannite - kesterite consisting of natural and synthetic samples. No discontinuous change of the Mössbauer parameters of ⁵⁷Fe as well as of ¹¹⁹Sn as function of the composition has been observed, thus confirming the existence of a complete solid solution between both compounds.

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H₂O in synthetic Mg-cordierite

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Anhydrous Mg-cordierite was synthesized at 1 bar and 1380°C for 240 hr. from a glass of bulk composition 2MgO*2Al₂O₃*5SiO₂. The run product was investigated with X-ray powder diffraction and electron microprobe analysis. The powder X-ray pattern was refined by using the Rietveld method yielding the following cell parameters a = 17.0657(4) Å, b = 9.7208(2) Å, c =

9.3406(2) Å (R_{wp}=8%, R_B=3%). The distortion index as defined after Miyashiro (1957) is Δ = 0.25 indicating complete Al/Si ordering. The formula derived by EMPA, on the basis of 18 oxygens, is Mg_{1.98(1)}Al_{3.97(2)}Si_{5.03(1)}O₁₈. Water was incorporated into the structural channels by hydrothermal experiments made at 1, 2, 3, 4 and 5 kbar and 600°C. The water content was determined by Karl