POTASSIUM IN CORDIERITE, A GEOBAROMETERIC INDICATOR

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Cordierite, $(Mg, Fe)_2Al_4Si_5O_{18}\cdot n(H_2O, CO_2, Na^+, K^+)$ grouped among the framework silicates is a characteristic mineral in low-medium grade metapelites. The orthorhombic structure is characterized by c-parallel channels that are formed by pseudohexagonal Si/AlO_4 rings, where small amounts of alkalis may be hosted. The channel component sodium has been experimentally shown to exhibit a pressure independent but temperature-inverse behaviour (MIRWALD, 1985) useable as a geothermometer (TROPPER et al., 2017). Incorporation experiments in synthetic Mg-cordierite (800 – 1000° C, 300 - 700 MPa) by THOMPSON et al. (2002) suggested to possible use of the potassium content as a thermometer for melts. An extended experimental study on two natural pelitic rock materials ("W-" and "SP5-cordierite") by Wyhlidal (2008) and TROPPER et al. (2017) allows to study the crystal chemical evolution of Mg-Fe-cordierite (X_{mg} = 0,5± 0,1) as a function of T (MIRWALD & TROPPER, 2015). The data also provided some insights into the problem of potassium incorporation in cordierite. In the course of this study long duration experiments (1225 hrs.) at 600° and 700° C at 20 MPa were conducted to investigate the incorporation of K_2O as a function of pressure. Figure 1 shows that the K_2O-content of cordierite is strongly correlated with low pressures (<300 MPa). This suggests that high potassium contents in natural cordierites, e.g. that one of the Blaue Kuppe (SCHREYER et al., 1990) are related to incorporation processes at very low pressures at intermediate temperatures lasting over a certain geological time span.

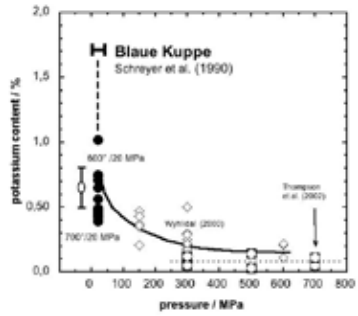

Figure 1: Potassium content of Mg-Fe-cordierite as function of pressure, temperature range 580-780° C.

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