

## **Parageneses of $\text{TiB}_2$ in corundum xenoliths from Mt. Carmel, Israel: Siderophile behavior of boron under reducing conditions**

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### **ABSTRACT**

Titanium diboride ( $\text{TiB}_2$ ) is a minor but common phase in melt pockets trapped in the corundum aggregates that occur as xenoliths in Cretaceous basaltic volcanoes on Mt. Carmel, north Israel. These melt pockets show extensive textural evidence of immiscibility between metallic (Fe-Ti-C-Si) melts, Ca-Al-Mg-Si-O melts, and Ti-(oxy)nitride melts. The metallic melts commonly form spherules in the coexisting oxide glass. Most of the observed  $\text{TiB}_2$  crystallized from the Fe-Ti-C silicide melts and a smaller proportion from the oxide melts. The parageneses in the melt pockets of the xenoliths require  $f_{\text{O}_2} \leq \Delta\text{IW-6}$ , probably generated through interaction between evolved silicate melts and mantle-derived  $\text{CH}_4 + \text{H}_2$  fluids near the crust-mantle boundary. Under these highly reducing conditions boron, like carbon and nitrogen, behaved mainly as a siderophile element during the separation of immiscible metallic and oxide melts. These parageneses have implications for the residence of boron in the peridotitic mantle and for the occurrence of  $\text{TiB}_2$  in other less well-constrained environments such as ophiolitic chromitites.

**Keywords:** Titanium boride, reducing conditions, siderophile element, Mt. Carmel, paragenetic studies; Lithium, Beryllium, and Boron: Quintessentially Crustal