

## **Crystallization of $\text{AlPO}_4\text{-SiO}_2$ solid solutions from granitic melt and implications for P-rich melt inclusions in pegmatitic quartz**

**ILYA V. VEKSLER,\* RAINER THOMAS, AND RICHARD WIRTH**

GeoForschungsZentrum Potsdam, Telegrafenberg B-120, Potsdam D-14473, Germany

### **ABSTRACT**

Aluminum orthophosphate ( $\text{AlPO}_4$ ) has polymorphs isostructural with tridymite, cristobalite, and quartz. Berlinite is the low-temperature form that corresponds to  $\alpha$ -quartz. We report berlinite-quartz solid solutions to crystallize from a synthetic P-rich peraluminous granitic melt, similar in composition to the most volatile-rich silicate melt inclusions found in pegmatites. The crystallization took place in experiments performed in cold-seal pressure vessels at 450–700 °C and 0.1–0.2 GPa  $\text{H}_2\text{O}$  pressure. At these conditions, the berlinite-quartz mutual solubility is limited to 5–7 mol%  $\text{SiO}_2$  on the phosphate side of the solvus and to the maximum of 1 mol%  $\text{AlPO}_4$  on the silica-rich side. The mutual solubility appears to decrease with falling temperature. At low  $T$  the crystals of berlinite-quartz solid solutions are strongly zoned and show complex intergrowths between the P-rich and silica-rich phases. They were studied by electron microprobe, transmission electron microscopy, and Raman spectroscopy. In the light of our new experimental results, the extreme P enrichment reported earlier for some natural quartz-hosted melt inclusions may be explained as a post-entrapment contamination by the berlinite-bearing host.